

Language Impaired or Learning Disabled: Same Children Labeled Differently or Different Children

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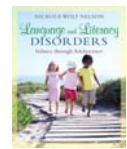
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- Nelson, N. W., Plante, E., Helm-Estabrooks, N., & Hotz, G. (2015). Test of Integrated Language and Literacy Skills (TILLS). Baltimore, MD: Paul H. Brookes Publishing, Inc. (with potential royalties)
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- Nelson, N. W. (2010). *Language and Literacy Disorders: Infancy through Adolescence*. Boston, MA: Allyn & Bacon.

TILLS
TEST OF INTEGRATED
LANGUAGE & LITERACY SKILLS

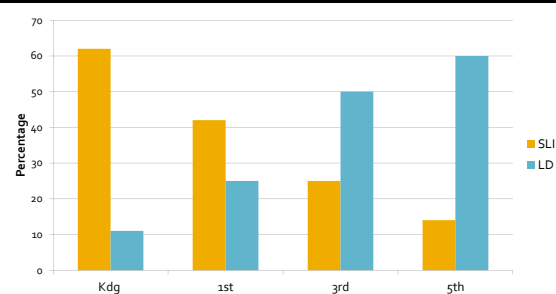


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Questions

- Relationships of language disorders and learning disabilities
 - Same children labeled differently?
 - Different children?

Data from Mashburn & Myers (2010)

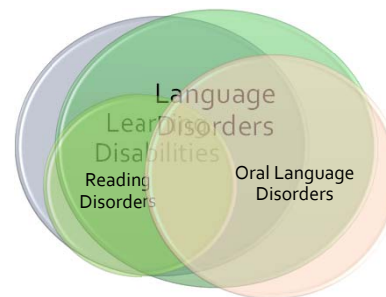


Mashburn, A. J., & Myers, S. S. (2010). Advancing research on children with speech-language impairment: An introduction to the Early Childhood Longitudinal Study—Kindergarten Cohort. *LSHSS*, 41, 61-69.

Questions re shifts in proportions

- Who are they?
 - Same students reclassified?
 - Different students, newly classified?
 - Some of both?
- What happens?
 - Do the young students no longer have disorders?
 - Do their language problems now involve reading and writing?
- Overlaps?
 - Any children with oral language problems without co-occurring written problems?
 - Any children with written language problems without co-occurring oral problems?

Relationships?



Language is Reciprocal and Interactive Across Modalities

- Thinking
- Writing
- Reading
- Speaking
- Listening



Two-Dimensional Quadrant model

- Evidence for differences by language level (vocabulary & sentence use) but *not* receptive & expressive (Tomblin & Zhang, 2006)
- Two dimensions may explain relationship between dyslexia and specific language impairment (SLI)
 - Phonological skills (sound/word level)
 - Perceiving and saying complex words
 - Phonemic awareness
 - Reading decoding
 - Spelling
 - Nonphonological skills (sentence/discourse level)
 - Sentence and discourse level comprehension
 - Sentence and discourse level formulation

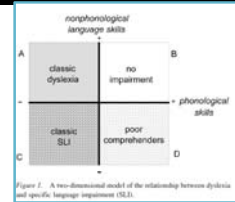
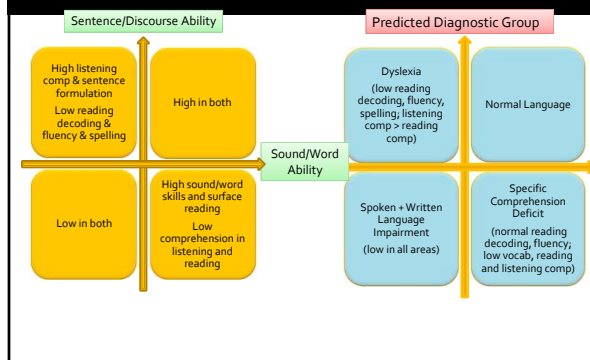


Figure 1. A two-dimensional model of the relationship between dyslexia and specific language impairment (SLI).

(Bishop & Snowling, 2004; Catts, Adlof, Hogan, & Weismer, 2005)

Applying the Quadrant Model



University of Washington Multidisciplinary Learning Disabilities Center

Virginia W. Berninger and colleagues
Family genetics studies of dyslexia & dysgraphia

Exclusion criteria for Family Genetics Studies of Dyslexia & Dysgraphia

—Normal range on:

- 1) Cognition and memory
- 2) Social emotional
- 3) Attention and executive functions
- 4) Sensory and motor
- 5) Oral language

Berninger, V., & Richards, T. (2010). Inter-relationships among behavioral markers, genes, brain, and treatment in dyslexia and dysgraphia. *Future Neurology*, 5, 597-617.

Dyslexia

LEARNING PROFILE

- First signs in Kdg or 1st grade
 - naming letters
 - associating sounds with them
- No preschool history of problems in oral language milestones or primary oral language disability
- Impaired accuracy and/or rate in lists or passage context
 - word decoding (pseudowords)
 - word reading (real words), and/or
 - word spelling (dictation and composing)

PHENOTYPE PROFILE

- Impaired phonological coding
- Impaired orthographic coding
- Impaired phonological loop
- Impaired orthographic loop
 - internal codes for letters and written words
 - finger sequencing plans
 - integration of orthographic codes with finger movements for letter and word production

Silliman, E. R., & Berninger, V. W. (2011). Cross-disciplinary dialogue about the nature of oral and written language problems in the context of developmental, academic, and phenotypic profiles. *Topics in Language Disorders*, 31(1), 6-23.

Oral and Written LLD

DEVELOPMENTAL PROFILE

- Preschool history of oral language delay
- Persisting oral and written language problems
- All other developmental domains in normal range
- Specific language impairment (SLI) or language learning disability (LLD) occurs in which one or more but not all language skills are impaired

LEARNING PROFILE

- Impaired reading comprehension
 - Word level (vocabulary)
 - Sentence level (sentence comprehension)
 - Text level (factual and inferential questions) following oral and/or silent reading during the school years
- Impaired syntax or other language problems affect written composition
- Same impairments as in dyslexia may occur

PHENOTYPE PROFILE

- Impaired morphological coding
- Impaired syntax coding
- Impaired word retrieval
- Impaired listening comprehension
- Same impairments as profile for dyslexia may occur

Evidence from a new test

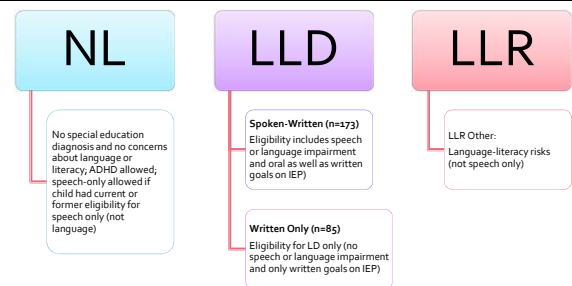
TILLS™ TEST OF INTEGRATED LANGUAGE & LITERACY SKILLS™		
Modality	Language Level	
	Sound/Word Level	Sentence/Discourse Level
Listening	1. Vocabulary Awareness (VA)	6. Listening Comprehension (LC)
	2. Phonemic Awareness (PA)	8. Following directions (FD)
Speaking	4. Nonword Repetition (NWRep)	3. Story retelling (Comp Qs) (SRcomp) 13. Social communication (SC)
Reading	10. Nonword Reading (NWRd) 11. Reading Fluency (RF)	7. Reading comprehension (RC)
Writing	5. Nonword Spelling (NWSp) 12c. Written Exp - word score (WEwd)	12a. Written Exp discourse score (Wedisc) 12b. Written Exp sentence combining score (WEscs)
Memory	14. Digit Span Forward (DSF) 15. Digit Span Backward (DSB)	9. Delayed story retelling (DSR)

Nelson, N. W., Plante, E., Helm-Estabrooks, N., & Hotz, G. (2015). Test of Integrated Language and Literacy Skills™ (TILLS™). Brookes Publishing Co., Inc.

Overview of Groups and TILLS Subtests

Michele A. Anderson

Groups for Analyses



1. Vocabulary Awareness

- "Here are three words. Let's read them together."
- "dog-cat-bone"
- Say, "Tell me two words that go together."
- Then ask, "Why?"

SUBTEST 1 Practice Items	
dog	
cat	
bone	

Practice Items	
dog-cat-bone Both animals / pets (not dogs chase cats [not core meaning])	dog-cat-bone Dogs like / eat / chew / bury bones
light-sun-feather Sun gives light / both bright	light-sun-feather Feather is light / not heavy

2. Phonemic Awareness

- "If the word is bip, and we take away the first sound, the word becomes [hesitate]... ip." "If the word is stig, and we take away the first sound, the word becomes... tig."

Practice Items		
Item	Phonetic spelling	Spoken response
bip → ip	/bɪp/ → /ɪp/	
stig → tig	/stɪɡ/ → /tɪɡ/	

3. Story Retelling

Select the age-appropriate story and say, "I'm going to read you a story. Listen carefully. Your job is to tell the story back to me just like I tell it to you."

STORY 3A: "TOMMY THE THICKSKIN" (from STUDENTS ANSWER BOOK 1-12)

"Tommy's mother thought he was getting fat from eating too much junk food. So she started the refrigerator with fruit and cereal only. She gave him these things at his bedtime. But Tommy was a little stubborn. He asked to be wakened by his mother. But neither was his father. Then he asked his aunt and cousins for their cookies. His mother didn't know why Tommy kept gaining weight when all she had given him were healthy foods."

Try: "We tell me the same story. Start now."

Answer: If you answer does not follow the story, say, "What was the story about? What happened?"

Content Units	Score	Content Units	Score
1. Tommy's mother gave him junk food to eat.	1	11. Ask a "test taker" figurative meaning.	1
2. mother	1	12. Ask a "test taker" figurative meaning.	1
3. thought he (Tommy)	1	13. Ask a "test taker" figurative meaning.	1
4. he was getting fat (gaining weight)	1	14. Ask a "test taker" figurative meaning.	1
5. fruit eating	1	15. Ask a "test taker" figurative meaning.	1
6. food eating	1	16. Ask a "test taker" figurative meaning.	1
7. junk food	1	17. Ask a "test taker" figurative meaning.	1
8. on other	1	18. Ask a "test taker" figurative meaning.	1
9. mother	1	19. Ask a "test taker" figurative meaning.	1
10. the refrigerator	1	20. Ask a "test taker" figurative meaning.	1
11. that (healthy) food only comes from	1	21. Ask a "test taker" figurative meaning.	1
12. candy (junk) (healthy food)	1	22. Ask a "test taker" figurative meaning.	1
13. who even said	1	23. Ask a "test taker" figurative meaning.	1
14. these things	1	24. Ask a "test taker" figurative meaning.	1
15. the refrigerator	1	25. Ask a "test taker" figurative meaning.	1
16. but Tommy (he)	1	26. Ask a "test taker" figurative meaning.	1
		27. Ask a "test taker" figurative meaning.	1
		28. Ask a "test taker" figurative meaning.	1
		29. Ask a "test taker" figurative meaning.	1
		30. Tommy (he)	1
		31. Ask a "test taker" figurative meaning.	1
		32. Ask a "test taker" figurative meaning.	1
		33. Ask a "test taker" figurative meaning.	1
		34. Ask a "test taker" figurative meaning.	1
		35. Ask a "test taker" figurative meaning.	1
		36. Ask a "test taker" figurative meaning.	1
		37. Ask a "test taker" figurative meaning.	1
		38. Ask a "test taker" figurative meaning.	1
		39. Ask a "test taker" figurative meaning.	1
		40. Ask a "test taker" figurative meaning.	1
		41. Ask a "test taker" figurative meaning.	1
		42. Ask a "test taker" figurative meaning.	1
		43. Ask a "test taker" figurative meaning.	1
		44. Ask a "test taker" figurative meaning.	1
		45. Ask a "test taker" figurative meaning.	1
		46. Ask a "test taker" figurative meaning.	1
		47. Ask a "test taker" figurative meaning.	1
		48. Ask a "test taker" figurative meaning.	1
		49. Ask a "test taker" figurative meaning.	1
		50. Ask a "test taker" figurative meaning.	1
		51. Ask a "test taker" figurative meaning.	1
		52. Ask a "test taker" figurative meaning.	1
		53. Ask a "test taker" figurative meaning.	1
		54. Ask a "test taker" figurative meaning.	1
		55. Ask a "test taker" figurative meaning.	1
		56. Ask a "test taker" figurative meaning.	1
		57. Ask a "test taker" figurative meaning.	1
		58. Ask a "test taker" figurative meaning.	1
		59. Ask a "test taker" figurative meaning.	1
		60. Ask a "test taker" figurative meaning.	1
		61. Ask a "test taker" figurative meaning.	1
		62. Ask a "test taker" figurative meaning.	1
		63. Ask a "test taker" figurative meaning.	1
		64. Ask a "test taker" figurative meaning.	1
		65. Ask a "test taker" figurative meaning.	1
		66. Ask a "test taker" figurative meaning.	1
		67. Ask a "test taker" figurative meaning.	1
		68. Ask a "test taker" figurative meaning.	1
		69. Ask a "test taker" figurative meaning.	1
		70. Ask a "test taker" figurative meaning.	1
		71. Ask a "test taker" figurative meaning.	1
		72. Ask a "test taker" figurative meaning.	1
		73. Ask a "test taker" figurative meaning.	1
		74. Ask a "test taker" figurative meaning.	1
		75. Ask a "test taker" figurative meaning.	1
		76. Ask a "test taker" figurative meaning.	1
		77. Ask a "test taker" figurative meaning.	1
		78. Ask a "test taker" figurative meaning.	1
		79. Ask a "test taker" figurative meaning.	1
		80. Ask a "test taker" figurative meaning.	1
		81. Ask a "test taker" figurative meaning.	1
		82. Ask a "test taker" figurative meaning.	1
		83. Ask a "test taker" figurative meaning.	1
		84. Ask a "test taker" figurative meaning.	1
		85. Ask a "test taker" figurative meaning.	1
		86. Ask a "test taker" figurative meaning.	1
		87. Ask a "test taker" figurative meaning.	1
		88. Ask a "test taker" figurative meaning.	1
		89. Ask a "test taker" figurative meaning.	1
		90. Ask a "test taker" figurative meaning.	1
		91. Ask a "test taker" figurative meaning.	1
		92. Ask a "test taker" figurative meaning.	1
		93. Ask a "test taker" figurative meaning.	1
		94. Ask a "test taker" figurative meaning.	1
		95. Ask a "test taker" figurative meaning.	1
		96. Ask a "test taker" figurative meaning.	1
		97. Ask a "test taker" figurative meaning.	1
		98. Ask a "test taker" figurative meaning.	1
		99. Ask a "test taker" figurative meaning.	1
		100. Ask a "test taker" figurative meaning.	1

4. Nonword Repetition

Say, "I am going to play a voice recording for you. The person on the recording will say a pretend word that is not a real word. You will only hear the word once. Listen carefully so you can say the word just like the person you hear." Start the CD.

Subtest 4

Stimulus word	Actual/target spoken response	Imitation Score
1. tep	/tɛp/	1
2. gid	/gɪd/	1
22. doplɪn'clan	/dɒplɪn'clan/	1
23. proder'opla	/prɒdɜ'opla/	1
24. stren'opius	/stren'opius/	1

5. Nonword Spelling

Administer immediately after Nonword Repetition. Say, "I am going to play another voice recording of pretend words. These are the same words you said before. This time your job is to spell the words." "Remember, these are not real words, but they are like real words..."

Subtest 5

Child's written response	Spelling Score
1. tep	1
2. gid	1
22. doplɪn'clan	1
23. proder'opla	1
24. stren'opius	1

6. Listening Comprehension

Say, "I'm going to read some very short stories. Your job is to listen and pay careful attention. Then I'll ask you some questions about the story. Tell me 'yes' if you are sure the answer is 'yes.' Tell me 'no' if you are sure the answer is 'no.' If the story doesn't clearly tell you the answer, tell me 'maybe.'"

6. The land beyond the mountains was divided into two new territories. Each was to have its own governor, who would be selected by the President following consultation with his advisors.

	(Y) N M	0	1
a. Was a different governor going to be appointed for each new territory?	Y (N) M	0	1
b. Were the mountains part of the new territories?	(Y) N M	0	1
c. Was the President in charge of choosing the new governors?	(Y) N M	0	1

7. Reading Comprehension

Administer immediately following Listening Comprehension: "Now, it's your turn to read some short stories and answer the questions in your Student Book. Circle yes if you are sure the answer is yes. Circle no if you are sure the answer is no. If the story doesn't clearly tell you the answer, circle maybe."

6.	"What I Did on My Summer Vacation" is the topic the teacher makes her class write about the first day of school every year. When school started a month ago, the teacher gave her usual first writing assignment.	Yes	No	Maybe
a.	Was "The Middle East" the first writing assignment?	Yes	No	Maybe
b.	Did all of the students take a trip on their summer vacation?	Yes	No	Maybe
c.	Did the teacher ask her class to write about their summer vacations?	Yes	No	Maybe

8. Following Directions

"I'm going to give you some directions to follow with your pencil in your Student Book. Listen carefully because I can only say them once. When I say 'Go,' move the card and use your pencil to follow the directions."

Instructions	Student's response (from Student Book)	Score
Number 1: Draw a circle around the heart. Go.		0 1
Number 5: Draw a line above the tree and circle the lock. Go.		0 1
Number 8: If there is an arrow pointing down, draw a circle under the moon. If not, circle the star.		0 1

Turn to the age-appropriate story and say, **"Remember the story [Tommy the Trickster/The Rubber Raft]? Tell me the story again. Try to remember as much as you can. Start now."**

Content Units	Score	Content Units	Score
1. Tommy's must use proper name to count	1	17. was a "fast taker" (figurative meaning)	1
2. mother	1	18. at school	1
3. thought he (Tommy)	1	19. he convinced (talked them into, told)	1
4. he was getting fat (bigger, gaining weight)	1	20. his friends	1
5. from eating	1	21. that cookies	1
6. too much	1	22. were bad	1
7. junk food	1	23. for them	1
8. so she	1	24. then he traded	1
9. stocked	1	25. his fruit	1
10. the refrigerator	1	26. carrots	1
11. fruit (healthy foods) (only scores once)	1	27. cookies	1
12. candy (sweets) (healthy foods)	1	28. his mother	1
13. she even put	1	29. didn't know why	1
14. these things	1	30. Tommy (he)	1
15. in his lunchbox	1	31. kept gaining weight (getting bigger/fatter)	1
16. but Tommy (he)	1	32. when all she had given him	1
		33. were healthy foods	1

10. Nonword Reading

Say, **"These are pretend words that are not real words, but they are like real words. Your job is to read these words out loud."**

Stimulus word	Expected production (and acceptable alternatives)	Score
1. keb	/kɛb/	0 1
2. pog	/pɒg/	0 1
3. dipe	/dɪp/	0 1
4. broom	/brʊm/	0 1
16. mistation	/mɪs'teɪʃən/	0 1
17. redikament	/rɛdɪ'kəmənt/	0 1
18. periothial	/pɛrɪ'oʊθiəl/	0 1
19. tyvology	/tɪvə'lɒdʒi/	0 1
20. interdeapable	/ɪntər'di:əpəbəl/	0 1
22. Karmancian	/kɑ:m'nɛɪʃən/	0 1
23. gorenobia	/gɔ:r'nɒbiə/	0 1
24. smorfous	/smɔ:f'ʊs/	0 1

11. Reading Fluency

Say, **"Here are some facts that tell a story. First, read the title out loud."**

"Now read the facts." If the student is an emergent reader, you may say, **"Just read the words you know."**

The Principal's Daughter
We have a principal.
The principal has a daughter.
Her name is Sara.
She wants to be a clown.
She came Monday.
She came to our school.
She put on makeup.
She looked scary.
She walked into a class.
The children were young.
Some children cried.
They were scared.
She took off her red.
The children were happy.
They knew Sara.

READING FLUENCY SCORING FORM			
Story B: The Principal's Daughter (pages 8-10/11)			
Story elements	Score	Story elements	Score
Title: The Principal's Daughter	15	11. It was fog.	15
1. We have a principal.	15	12. She walked into a class.	15
2. The principal has a daughter.	15	13. The children were young.	15
3. Her name is Sara.	15	14. The children take her.	15
4. She wants to be a clown.	15	15. Some children cried.	15
5. She came Monday.	15	16. They were scared.	15
6. She came to our school.	15	17. They were happy.	15
7. She put on makeup.	15	18. The children were happy.	15
8. She looked scary.	15	19. They knew Sara.	15
9. She walked into a class.	15		
10. The children were young.	15		
Column total	150	Column total	150
Reading Fluency Score		(150)	

12. Written Expression – Discourse, Sentence, and Word Scores

- "Here's another story. It has facts about a little dog. It's okay, but it sounds choppy. Here is an example of how you could put the facts together to make it sound less choppy and more interesting."
- "Now it's your turn to put the facts for your story together in a way that sounds better."

WRITTEN EXPRESSION SCORING FORM			
Story B: The Principal's Daughter (pages 8-10/11)			
Discourse	Sentence	Word	Score
1. We have a principal.	1	1	1
2. The principal has a daughter.	1	1	1
3. Her name is Sara.	1	1	1
4. She wants to be a clown.	1	1	1
5. She came Monday.	1	1	1
6. She came to our school.	1	1	1
7. She put on makeup.	1	1	1
8. She looked scary.	1	1	1
9. She walked into a class.	1	1	1
10. The children were young.	1	1	1
11. It was fog.	1	1	1
12. She walked into a class.	1	1	1
13. The children were young.	1	1	1
14. The children take her.	1	1	1
15. Some children cried.	1	1	1
16. They were scared.	1	1	1
17. They were happy.	1	1	1
18. The children were happy.	1	1	1
19. They knew Sara.	1	1	1
Column total	150	Column total	150
Discourse Score		Sentence Score	
Word Score		Total Score	

The principal has a daughter
We have a principal.
The principal has a daughter.
Her name is Sara.
She wants to be a clown.
She came Monday.
She came to our school.
She put on makeup.
She looked scary.
She walked into a class.
The children were young.
Some children cried.
They were scared.
She took off her red.
The children were happy.
They knew Sara.

WRITTEN EXPRESSION SCORING FORM
Story B: The Principal's Daughter (pages 8-10/11)

Discourse	Sentence	Word	Score
1. We have a principal.	1	1	1
2. The principal has a daughter.	1	1	1
3. Her name is Sara.	1	1	1
4. She wants to be a clown.	1	1	1
5. She came Monday.	1	1	1
6. She came to our school.	1	1	1
7. She put on makeup.	1	1	1
8. She looked scary.	1	1	1
9. She walked into a class.	1	1	1
10. The children were young.	1	1	1
11. It was fog.	1	1	1
12. She walked into a class.	1	1	1
13. The children were young.	1	1	1
14. The children take her.	1	1	1
15. Some children cried.	1	1	1
16. They were scared.	1	1	1
17. They were happy.	1	1	1
18. The children were happy.	1	1	1
19. They knew Sara.	1	1	1
Column total	150	Column total	150

Discourse Score: 18/20
content units = 90%
Sentence Score: 18
content/7 T-units = 2.57
Word Score: 74/88 wds
without error = 84%

13. Social Communication

"This activity is about acting a scene, like from a show on TV or a movie. Your job is to be an actor."

Say, **"I'll give you a really short scene. Then I'll ask you to tell me what one of the people would say. This is important—you should say it how the person would say it in the scene. Remember, you're the actor! Let's try one. I'll do the first one to show you."**

Character	Script
David	"It is red. It is my favorite color, and I will kiss you if you buy it."
David always uses hints to get his grandmother to buy him things. David is out shopping with his grandmother and sees some boots he wants. What do you think David would say?	

14. Digit Span Forward
15. Digit Span Backward

14. Say, "I am going to say some numbers. Listen to the numbers, and when I finish, you say them back to me exactly the same way."

15. "This time, when I read the numbers to you, I want you to listen carefully and say them back to me in backward order."

Corroborating Information

Test of Integrated Language and Literacy Skills™ – Student Rating Scale (TILLS™-SRS)

(Standardization Version 1)

by Rickula Wolf Nelson, Ph.D., and Barbara M. Howes, Ph.D.

Your time and careful attention will help the research team learn how to improve this rating scale. If you are willing to help, please complete all items. If you have questions, call 800-368-6646 or visit our website: www.tills.com

Person responding: ☐ General Ed. Teacher ☐ Special Ed. Teacher ☐ Other _____

☐ Student ☐ Parent/Guardian _____

Student's research date: _____ Student's grade level: _____ Today's date: _____

Multiple sources Co-norming Student Rating Scale

Completed with other students of the same age, circle the number to show how good this student is at:	not good	very good
1. Understanding school vocabulary words	1 2 3 4 5 6 7	
2. Using school vocabulary words when talking	1 2 3 4 5 6 7	
3. Figuring out new words when reading	1 2 3 4 5 6 7	
4. Spelling words correctly when writing	1 2 3 4 5 6 7	
5. Understanding a story when listening	1 2 3 4 5 6 7	
6. Telling a story that makes sense	1 2 3 4 5 6 7	
7. Understanding a story when reading	1 2 3 4 5 6 7	
8. Writing a story that makes sense	1 2 3 4 5 6 7	
9. Following spoken directions	1 2 3 4 5 6 7	
10. Being organized about school work	1 2 3 4 5 6 7	
11. Paying attention in school	1 2 3 4 5 6 7	
12. Interacting socially with other students	1 2 3 4 5 6 7	

Please check the things that you think are easiest for this student to do:
☐ Art (drawing/painting) ☐ Dance ☐ Music ☐ Mechanical ☐ Sports ☐ Math ☐ Social ☐ Listening ☐ Talking
☐ Reading ☐ Writing ☐ Other: _____

Please check the things that you think are hardest for this student to do:
☐ Art (drawing/painting) ☐ Dance ☐ Music ☐ Mechanical ☐ Sports ☐ Math ☐ Social ☐ Listening ☐ Talking
☐ Reading ☐ Writing ☐ Other: _____

Comments: _____

What one thing do you think is most important to help this student do better at school?

NOTE: All components of the TILLS Standardization Manual are protected by copyright and may not be copied or distributed to others. These materials are provided to _____.

Evidence for Group Differences

Externally Based Classification and Internally Based Classification

Externally-Based Classification

Discriminant Function Analysis & Logistic Regression

Mean z-scores for 5 Language Groups (Based on School Classification)

Mean z-scores for LLD-SW & LLD-W (School Classification)

Canonical Discriminant Function

Predictor Variables: Age in years + 17 subtest z-scores

Canonical Correlation	Squared CC	Likelihood Ratio	Approx F	p-value
0.461	0.213	0.7971	3.37	<0.0001

Group	Class Means
LLD+SW	-0.3594
LLD+W	0.7462

Stepwise Discriminant Function

- Predictor Variables
 - Age in years + 17 subtest z-scores
- Completed 5 iterations

Step	Entered	Removed	Partial R ²	Wilks λ	p-value	Avg Sq CC
1	NWRep	---	0.0715	0.9285	<0.0001	0.0715
2	Age	---	0.0339	0.8970	<0.0001	0.1030
3	PhonAw	---	0.0359	0.8649	<0.0001	0.1351
4	NWread	---	0.0183	0.8490	<0.0001	0.1510
5	NWSpel	---	0.0294	0.8241	<0.0001	0.1759

DFA Classification: (starting from stepwise DFA)

- DFA Classification based on group prior probability & generalized squared distances among the groups

Canonical Correlation	Squared CC	Likelihood Ratio	Approx F	p-value
0.422	0.178	0.8217	10.90	<0.0001

Group	Class Means
LLD+SW	-0.3594
LLD+W	0.7462

DFA Classification

Linear Discriminant Functions			Statistical Classification Results			
Variable	LLD SW	LLD W				
Constant	-9.706	-12.431				
Age	1.835	2.098				
PA	-0.130	0.224				
NWR	-0.796	-0.571				
NWS	0.711	1.344				
NWread	-0.435	-0.979				
			To	LLD SW	LLD W	Total
			From			
			LLD SW	156 90.70	16 9.30	172 100.
			LLD W	49 57.65	36 42.35	85 100.
			Total	205 100.	52 20.23	
			Priors	0.669	0.331	
			Error Rate	0.0930	0.5765	0.2529

Logistic Regression: Modeling LLD-W

Overall Model: Global Null Hypothesis: Beta = 0

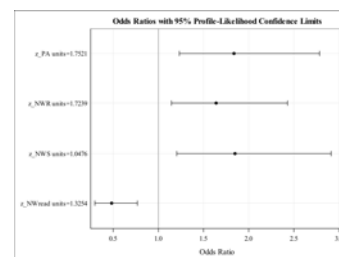
Test	Chi-square	df	p-value
Likelihood Ratio	49.759	5	<0.0001
Score	45.833	5	<0.0001
Wald	37.395	5	<0.0001

Hosmer & Lemeshow GoF Test $\chi^2 = 6.9107$, df = 8, p = 0.5463

ML Estimates					
	df	Est	Wald χ^2	p	Exp(est)
Const	1	-2.422	12.2884	0.0005	0.089
Age	1	0.233	12.1787	0.0005	1.262
PA	1	0.347	8.6756	0.0032	1.415
NWR	1	0.288	6.8730	0.0092	1.334
NWS	1	0.588	7.5935	0.0059	1.799
NWread	1	-0.544	8.8961	0.0029	0.581

Logistic Regression

Odds ratio values are based in a 1 SD unit change

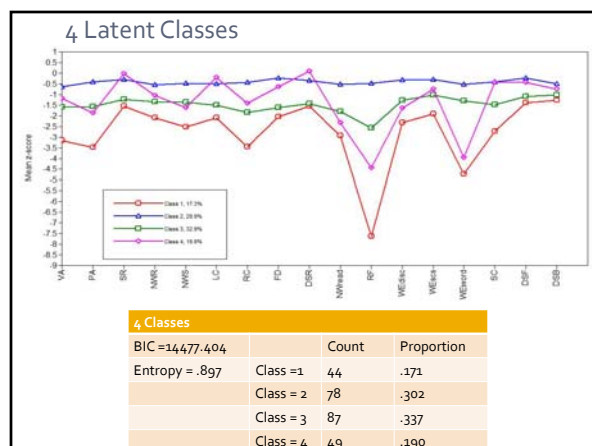
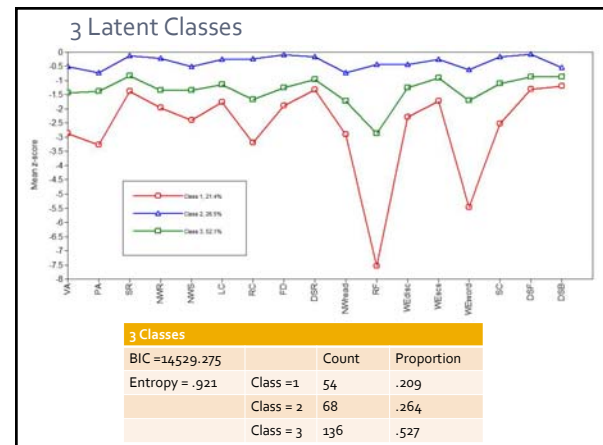
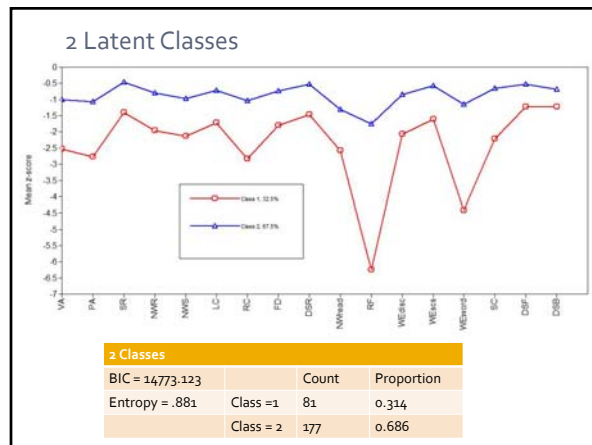


Summary of School-based (external) Classification

- We started with 4 basic groups: NL, LLD-SW, LLD-W, and LLR
- Each group shows a unique profile among the TILLS subtest scores
- Concentrating on just 2 LLD groups (LLD-SW & LLD-W) suggests
 - They are statistically different and can be reasonably predicted based on a subset of TILLS tests
 - There is considerable heterogeneity in both groups

Internally-Based Classification

Latent Class Analysis



External to Internal Comparison

LCA(2)				LCA(3)				
Freq	LC-1	LC-2	Total	Freq	LC-1	LC-2	LC-3	Total
Percent	LLD-SW?	LLD-W?		Percent	LLD-SW?	Mis-Labeled NL?	LLD-W?	
Row %				Row %				
Col %				Col %				
LLD-SW	60	113	173	LLD-SW	41	37	95	173
	23.26	43.80			15.89	14.34	36.82	
	34.68	65.32	67.05		23.70	21.39	54.91	67.05
	74.07	63.84			75.93	54.41	69.85	
LLD-W	21	64	85	LLD-W	13	31	41	85
	8.14	24.81			5.04	12.02	15.89	
	24.71	75.29	32.95		15.29	36.47	48.24	32.95
	25.93	36.16			24.07	45.59	30.15	
Total	81	177	258	Total	54	68	136	258
	31.40	68.60	100		20.93	26.36	52.71	100

LCA(4)					
Freq	LC-1	LC-2	LC-3	LC-4	Total
Percent	LLD-SW?	Mis-Labeled NL?	LLD-W?	Classic Dyslexia	
Row %					
Col %					
LLD-SW	35	47	63	28	173
	13.57	18.22	24.42	10.85	67.05
	20.23	27.17	36.42	16.18	
	79.55	60.26	72.41	57.14	
LLD-W	9	31	24	21	85
	3.49	12.02	9.30	8.14	32.95
	10.59	36.47	28.24	24.71	
	20.45	39.74	27.59	42.86	
Total	44	78	87	49	258
	17.05	30.32	33.72	18.99	100

External – Internal Comparison

- School-based (external) classification for LLD-SW and LLW-W can be statistically validated – but there is a considerable amount of within group heterogeneity
- Statistically-based (internal) classification reveals a resolving pattern that clarifies the heterogeneity of LLD

Differential diagnosis
Different children?
--based on true and detectable differences
Same children with different labels?
--based on school district
--based on diagnostic team members
Children whose individual differences > than their subgroup differences

Clinical Significance

Nicki Nelson

Identification Core Subtests, Cut Scores, and Sensitivity/Specificity

6-7 YEAR OLDS

- Core subtests
 - Vocab Aware
 - Phoneme Aw
 - NW Rep
- Cut score 24
- Sensitivity 84%
- Specificity 84%

8-11 YEAR OLDS

- Core subtests
 - Vocab Aware
 - NW Spell
 - NW Read
 - WE-Discourse
- Cut score 34
- Sensitivity 88%
- Specificity 85%

12-18 YEAR OLDS

- Core subtests
 - Vocab Aware
 - Phoneme Aw
 - Rdg Comp
 - NW Read
 - Reading Flu
- Cut score 42
- Sensitivity 88%
- Specificity 90%

7 year 9 month old First Grade Boy

- History of articulation difficulties
- Working on /l/
- Getting RtI Tier 2 help for reading delays



7 year 9 month old boy

TILLS
TEST OF INTEGRATED
LANGUAGE & LITERACY SKILLS

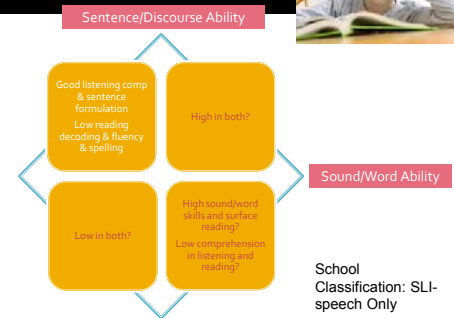
Stand Score	Sound/Word				Oral				Written			
	PA	NW	DSF	DSB	VA	LC	PD	SR	DSR	SC	NW	NW
	Rep										Rd	Sp
											WE	RC
											WE	WE
											Disc	Sent
15 SD	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-
13 SD	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
Mean	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-
5 SD	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
3 SD	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
1 SD	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-

Interpreting the core composite score

Age Band	Identification Composite Standard Score	Cut Score	Sensitivity	Specificity	Decision: Is the identification composite less than the cut score? Yes This score is consistent with the presence of language and literacy disorders. No This score does not meet the criterion for identifying language and literacy disorders.
6-7 years	22	24	84	84	
8-11 years		34	88	85	
12-18 years		42	86	90	

- Core subtests
 - Vocab Aware
 - Phoneme Aw
 - NW Rep

Pattern observed?



10 year 7 month old Fifth Grade Boy



- Identified as having a learning disability
- Reading goals on IEP
- ADHD
- No history of spoken language problems
- What evidence do you see of spoken as well as written language problems?

10 year 7 month old boy

TILLS
TEST OF INTEGRATED
LANGUAGE & LITERACY SKILLS

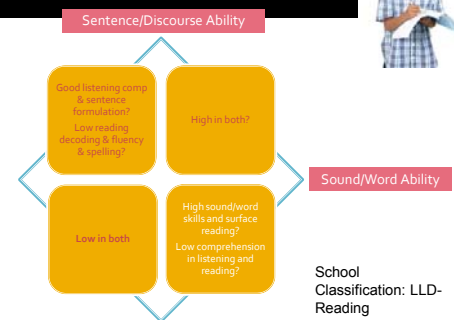
Stand Score	Oral										Written					
	Sound/Word			Sent/Disc				Sound/Word			Sent/Disc					
	PA	NW	DSF	VA	LC	FD	SR	DSR	SC	NW	NW	RF	WE	RC	WE	WE
	Rep									Rd	Sp		Wd		Disc	Sent
+1.5 SD	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+1.5 SD	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mean	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+1.5 SD	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+1.5 SD	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+1.5 SD	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+1.5 SD	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Interpreting the core composite score

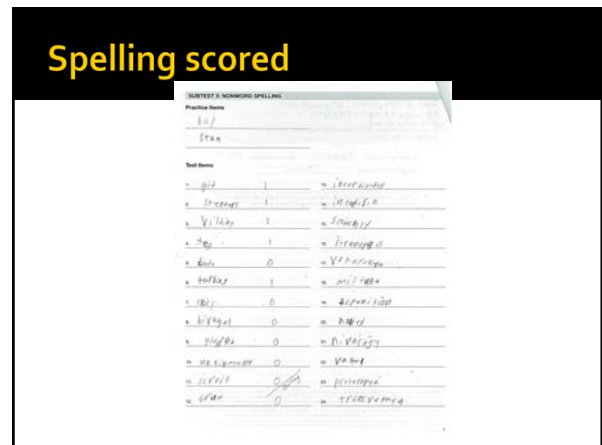
Age Band	Identification Composite Standard Score	Cut Score	Sensitivity	Specificity	Decision: Is the identification composite less than the cut score? Yes This score is consistent with the presence of language and literacy disorders. No This score does not meet the criterion for identifying language and literacy disorders.
6-7 years		24	84	84	
8-11 years	25	34	88	85	
12-18 years		42	86	90	

- Core subtests
 - Vocab Aware
 - NW Spell
 - NW Read
 - WE-Discourse

Pattern observed?



- [illegible]



Pattern observed?

Sentence/Discourse Ability

<p>Good listening comp & sentence formulation</p> <p>Low reading decoding & fluency & spelling</p> <p>High in both?</p>	<p>High sound/word skills and surface reading?</p> <p>Low comprehension in listening and reading?</p>
<p>Low in both?</p>	<p>High in both?</p>

Sound/Word Ability

School Classification: No IEP; Section 504

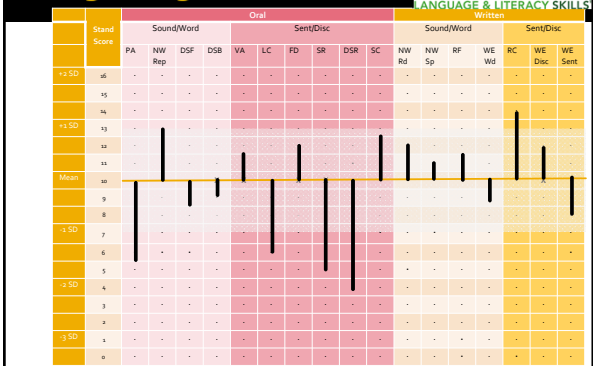
School
Classification: No
IEP; Section 504
Plan

17 year 5 month old 11th grade girl



- Had an IEP for Speech, language, reading in elementary school; no IEP currently
- 11th grade. See parental SRS for listening to a story
- Example of student with oral but not written problems?

17 year 5 month old 11th grade girl



Parent SRS

Test of Integrated Language and Literacy Skills™ – Student Rating Scale (TILLS™-SRS)

Standardization Version 2.0
by Nickola Wolf Nelson, Ph.D., and Barbara M. Howes, Ph.D.

Your time and careful attention will help the respondent learn how to improve this rating scale. If you are willing to help, please complete all items. If you have questions, call Dr. Anderson at 202-367-6444 or send your e-mail comment.

Person responding: ☐ General Ed. Teacher ☐ Special Ed. Teacher ☐ Other

Student's research ID: 376567 Student's grade level: 11 Today's date: 5-25-12

Compared with other students of the same age, circle the letter to show how good this student is at:	Not good	Very good
1. Understanding school vocabulary words	1 2 3 4 5 6 7	
2. Using school vocabulary words when talking	1 2 3 4 5 6 7	
3. Spelling out new words when reading	1 2 3 4 5 6 7	
4. Spelling words correctly when writing	1 2 3 4 5 6 7	
5. Understanding a story when listening	1 2 3 4 5 6 7	
6. Telling a story that makes sense	1 2 3 4 5 6 7	
7. Understanding a story when reading	1 2 3 4 5 6 7	
8. Writing a story that makes sense	1 2 3 4 5 6 7	
9. Following teacher directions	1 2 3 4 5 6 7	
10. Being organized about school work	1 2 3 4 5 6 7	
11. Paying attention in school	1 2 3 4 5 6 7	
12. Interacting socially with other students	1 2 3 4 5 6 7	

Please check the things that you think are easiest for this student to do:
☐ Art ☐ Drawing ☐ Dance ☐ Music ☐ Mechanical ☐ Sports ☐ Math ☐ Social ☐ Listening ☐ Talking

Comments:

Please check the things that you think are hardest for this student to do:
☐ Reading ☐ Writing ☐ Other

Comments:

What one thing do you think is most important to help this student do better at school?

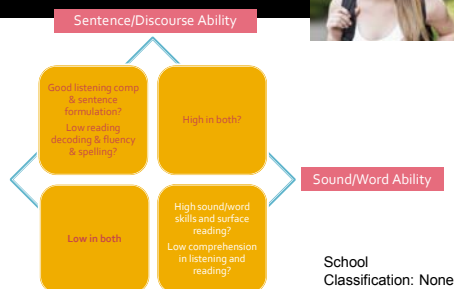
Answering and writing w/ extended time, possibly having the test read to him

Interpreting the core composite score

Age Band	Identification Composite Standard Score	Cut Score	Sensitivity	Specificity	Decision: Is the identification composite <u>less</u> than the cut score? Yes No This score is consistent with the presence of language and literacy disorders. This score does not meet the criterion for identifying language and literacy disorders.
6-7 years		24	84	84	
8-11 years		34	88	85	
12-18 years	54	42	86	90	

- Core subtests
 - Vocab Aware
 - Phoneme Aw
 - Rdg Comp
 - NW Read
 - Reading Flu

Pattern observed?



So what do you think?



- Are there different profiles?
- Are students with LLD-SW different from students with LLD-W in consistent ways?
- If a student has an oral language disorder, is he or she likely to have a written language disorder?
- If a student has a written language disorder is he or she likely to struggle with at least some aspects of phonological language skills?
- How important are individual differences?

Comments
Questions
Thank you!

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