Results from a Longitudinal Reading Intervention Study with Students with Cognitive Disabilities

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Overview of SMU Presentation

- Overview of Overall Research Project
- Study with Students with Moderate Intellectual Disabilities (ID)
  - Purpose and literature review
  - Design and participants
  - Measures
  - Intervention
  - Results and Discussion
- Additional Q&A

Overview of Project Maximize: Project Staff

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Overview of Project Maximize: Purpose

Determine if a ***comprehensive***, phonics-based, direct instruction ***reading program*** would be effective in teaching early reading and language skills to ***students with IQs ranging from 40-79***

Overview of Project Maximize: Design

- Longitudinal – 4 years (05-06 through 08-09)
- Random assignment to intervention or contrast group
  - Within school
  - Within IQ range (40-54; 55-69; 70-79)
- Students in Grades 1-4 when they began the study

Current Participants (07-08)

	Treatment	Contrast
Borderline IQ (70-79*) *WASI or school testing	n= 25 (2^{nd} = 8; 3^{rd} = 10; 4^{th} = 5; 5^{th} = 2)	n= 26 (2^{nd} = 4; 3^{rd} = 15; 4^{th} = 4; 5^{th} = 3)
Mild IQ (55-69)	n= 24 (1^{st} = 1; 2^{nd} = 4; 3^{rd} = 6; 4^{th} = 7; 5^{th} = 6)	n= 20 (2^{nd} = 7; 3^{rd} = 6; 4^{th} = 6; 5^{th} = 1)
Moderate IQ (40-54)	n= 18 (2^{nd} = 4; 3^{rd} = 1; 4^{th} = 6; 5^{th} = 7)	n= 10 (2^{nd} = 2; 3^{rd} = 1; 4^{th} = 2; 5^{th} = 5)
TOTAL	n= 67	n= 56

Focus of Today's Presentation

- Students with moderate intellectual disabilities (ID; 40-54)
- Data from the first two years (05-06 through 06-07)
- Manuscript is in review
- Manuscript and this presentation will be available on the website

Purpose

Determine if a ***comprehensive***, phonics-based, direct instruction ***reading program*** would be effective in teaching early reading and language skills to ***students with IQs ranging from 40-54***

Literature Review: Reading and Intellectual Disabilities (ID)

- Minimal amount of research
- Focused on mild ID, not moderate ID
- Focused on isolated subskills
  - Even students with moderate to severe levels of ID can learn to automatically recognize a fairly large number of words (sight words)
  - Phonics research is promising

Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006; Conners, Rosenquist, Sligh, Atwell, & Kiser, 2006

Literature Review: Reading and Intellectual Disabilities (ID)

No research has been conducted to determine whether students with ID can learn to read by fully processing the print and meaning of connected text, as is consistent with current theories of reading development

Research Questions

- Does a ***comprehensive reading program*** taught to primary-grade students who have ***moderate ID*** (IQ scores ranging from 40-55) result in better reading outcomes than typical special education instruction on measures of (a) ***phonemic awareness***, (b) ***alphabetic decoding***, (c) ***word recognition***, and (d) ***oral language/comprehension***?
- After receiving this instruction for ***1 to 1 ½*** academic years, what ***level of reading competence*** is achieved? How does this compare to similar peers?

Design and Participants

- Longitudinal – 1 to 1½ academic years (05-06 through 07-08)
- ***Random assignment*** to ***intervention*** or ***contrast*** group, within each of the 10 schools
- Grades 1-4 when they began the study
- IQs ranged from 40-54
- Intervention, n=16; contrast, n=12
  - 21 began the study in 05-06; 7 began in 06-07

Intervention

- Comprehensive, explicit, systematic phonics-based reading program
- Implemented daily by research teachers
- Instructional Sessions
  - Approximately 45-minute sessions
- Students taught in groups of 1-4

Curriculum: *Early Interventions in Reading*

- "Foundation" Level (60 Lessons)
  - Skills typically taught in kindergarten
  - in press
- Level One (120 Lessons)
  - Skills typically taught in first grade
  - Published
- Level Two (120 Lessons)
  - Skills typically taught in second-fourth grades
  - Recently published

Students began in either "Foundation" or Level One

Curriculum: Critical Features

- Explicit and Systematic
  - Explicit strategies
  - Cumulative review
  - Careful sequencing
- Phonics-based
- Fast-paced
- Immediate Feedback
- Teaching to Mastery
  - Lessons or lesson components repeated, as needed
- Increased Opportunities to Respond

Activity 5

Sounding Out

Teacher Led

(Remember to hold continuous sounds 2 seconds, but quickly move off stop sounds. There should be no pauses between sounds when sounding out.)

Now you are going to sound out words. When I touch under a sound, say the sound. Keep saying the sound until I touch under the next sound. Do not stop between sounds. Then, you will read the word the fast way.

(Place your finger under the word hams, *and say:)* **Sound it out.** /h/aaa/mmm/sss/

Read it fast. hams

Note: The *s* at the end of the word *hams* makes the /zzz/ sound. If a student asks about this sound, you can say that sometimes *s* will have the /zzz/ sound when it comes at the end of a word.

Repeat the process with the following words: dad, did, hid, cast, *Matt.

Note: *Remind students that when the same letter is written twice, as in the word *Matt*, we say the sound only once.

Individual Practice

(Provide individual practice.)

You are sounding out and reading words! Excellent! I will put a check mark on the Mastery Sheet.

hams

dad

did

hid

cast

Matt

Activity 4

Sounding Out

(Have students turn to page 26 of **Activity Book A.***)*

(Hold continuous sounds for about 2 seconds, but quickly move off stop sounds. There should be no pauses between sounds when sounding out.)

Now you're going to sound out words on your own. Point to each sound when I tap, and say the sound until I tap again. Do not stop between sounds. You will hum the word. Then you will read the word.

(Demonstrate by placing your finger next to the word in, *and say:)* **Place your finger under the /iii/ sound.** *(Monitor.)* **When I tap, you say the first sound.** *(Tap.)* **/iii/**

(Wait 2 seconds, and tap again for the /nnn/ sound. Be sure students hold the sound until you tap again.)

Read it fast. in
Good job sounding out by yourselves. Let's continue!

Repeat the process with the following words: am, ram, fan, rim, man.

Individual Practice

(Provide individual practice.)

You are sounding out and reading words! Excellent! I'll put a check mark on the Mastery Sheet.

Activity 5

Stretch and Spell

(Direct students to the correct section of the activity sheet.)

Now I will say a word, and you will spell it. First, I will say the word fast. Then, you will stretch it.
Listen for each sound as you stretch it. Then write the letters for each sound in the order you heard them.

First word. Fists up.
Stretch *and.* /aaa/nnn/d/
(Hold up one finger for each sound as you stretch the word.)

Write each sound in the order you heard it. Stretch the word in your head while you write it. *And.*
(Monitor to see if each student writes the letters in the correct order.)

Read the word you spelled. and
Excellent stretching and spelling! Next word.

Repeat the process with the following words: in, act, raft, rat, mint.

(Scaffold as necessary.)

Good job stretching and spelling. We have finished this activity, and I am going to put a check mark on the Mastery Sheet.

Activity 6

What Word Now? Game

(Use the marker board for this game. Begin by writing the word it *on the board.)*

Note: Use the following format to play this game:

1. *Sound it out.*
2. *Read it fast.*
3. *Change 1 phoneme.*
4. *Sound it out.*
5. *Ask students, "What word now?"*

We are going to play the game called What Word Now?
(Point to it, *and say:)* **Sound the word out.** /iii/t/
Read the word fast. it

(Add f *to* it, *and say:)* **Now I'll change the word.**
(Point to fit, *and say:)* **Sound it out.** /fff/iii/t/
What word now? fit

Foundation and Level One: Reaching Language Goals through **Read-Alouds**

- Very important when students are unable to read much text independently
- Key Elements
  - Direct teaching of key vocabulary
  - Providing key background knowledge as needed
- Discussion
  - Prior to reading to build background knowledge and vocabulary
  - During reading to elicit student language and extend it.
  - After reading to identify key information

Measures: Alphabet Soup

- Comprehensive Test of Phonological Processing (CTOPP)
- Test of Word Reading Efficiency (TOWRE)*
- Dynamic Indicators of Early Literacy Skills (DIBELS)**
- Woodcock Language Proficiency Battery (WLPB)
- Peabody Picture Vocabulary Test (PPVT)
- Expressive Vocabulary Test (EVT)
- Test of Narrative Language (TNL)

- *timed
- **ongoing, progress monitoring measures, timed

Measures by Construct

- **Phonological Awareness**
  - CTOPP subtests (untimed)
  - DIBELS (timed)
    - Initial Sound Fluency and Phoneme Segmentation Fluency
- **Alphabetic Decoding**
  - DIBELS Nonsense Word Fluency (timed)
  - TOWRE Phonemic Decoding (timed)
  - WLPB Word Attack (untimed)
- **Word Recognition**
  - TOWRE Word Reading Efficiency (timed)
  - WLPB Word Identification (untimed)

Measures by Construct (cont.)

- **Comprehension**
  - WLPB Passage Comprehension (untimed)
- **Language**
  - WLPB Language Subtests
  - PPVT (untimed)
  - EVT (untimed)
  - TNL
- Survey Measures, including Vineland Adaptive Behavior, and parent and teacher perceptions

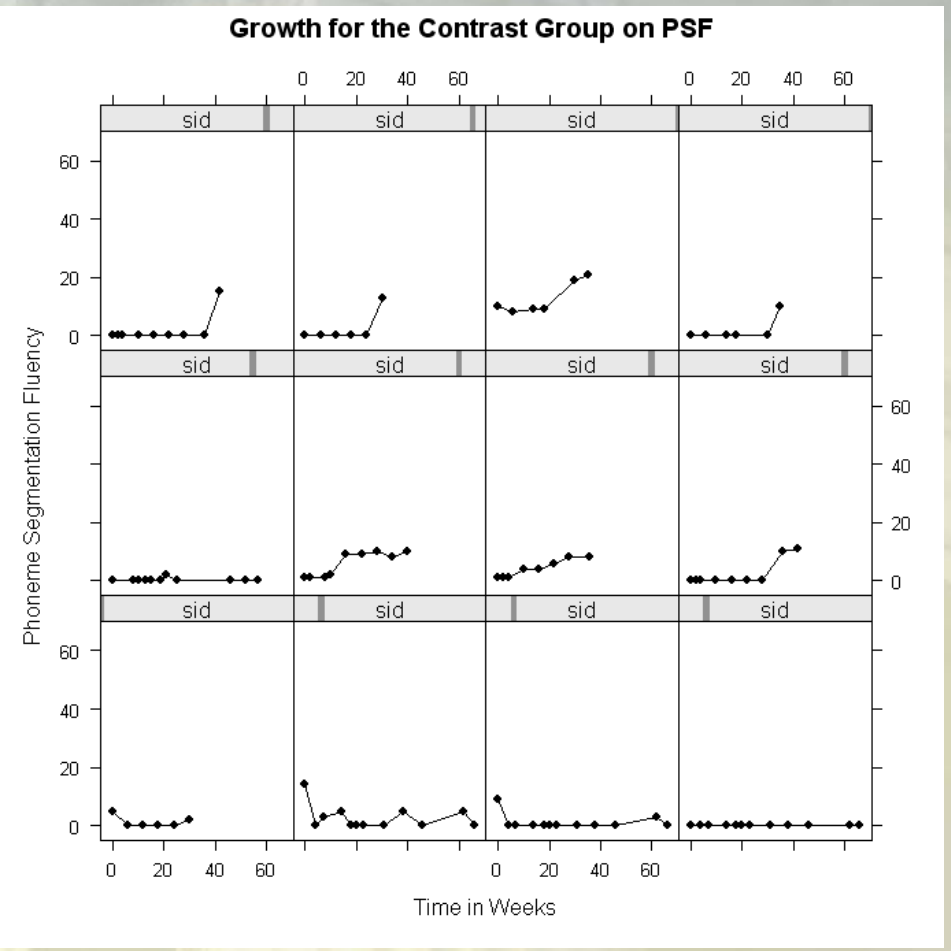
Research Question #1

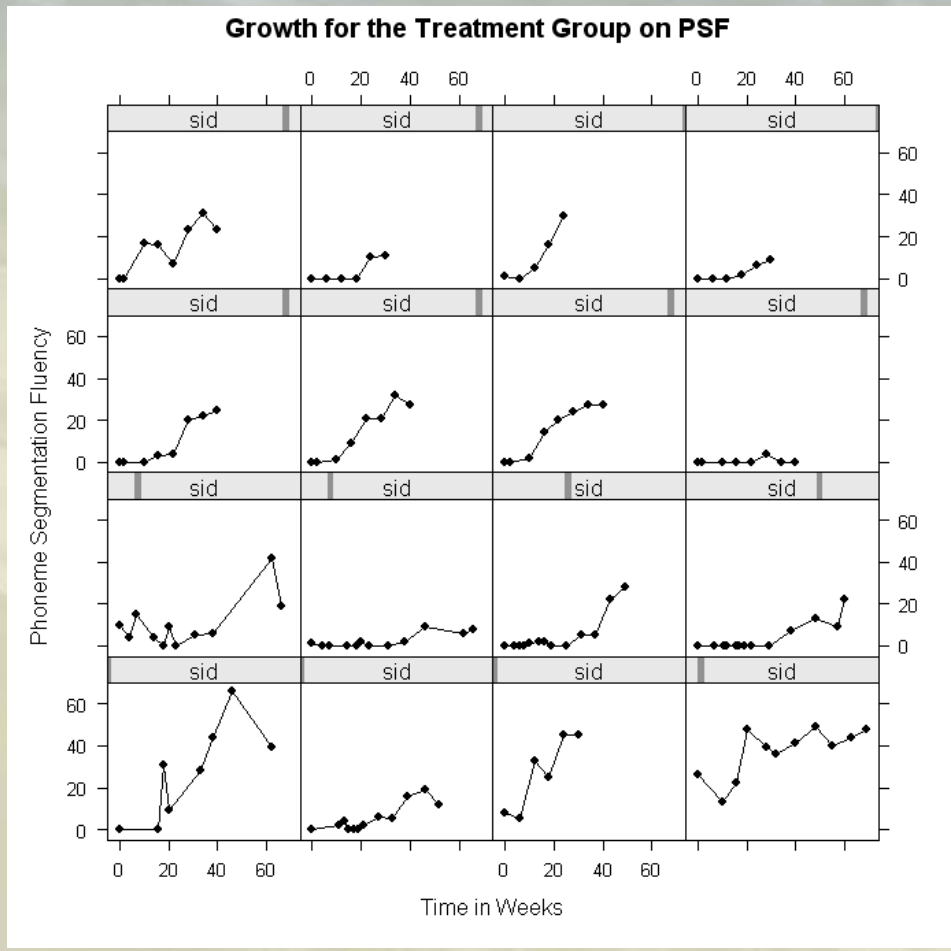
- Does a ***comprehensive reading program*** taught to primary-grade students who have ***moderate ID*** (IQ scores ranging from 40-55) result in better reading outcomes than typical special education instruction on measures of (a) ***phonemic awareness***, (b) ***alphabetic decoding***, (c) ***word recognition***, and (d) ***oral language/comprehension***?

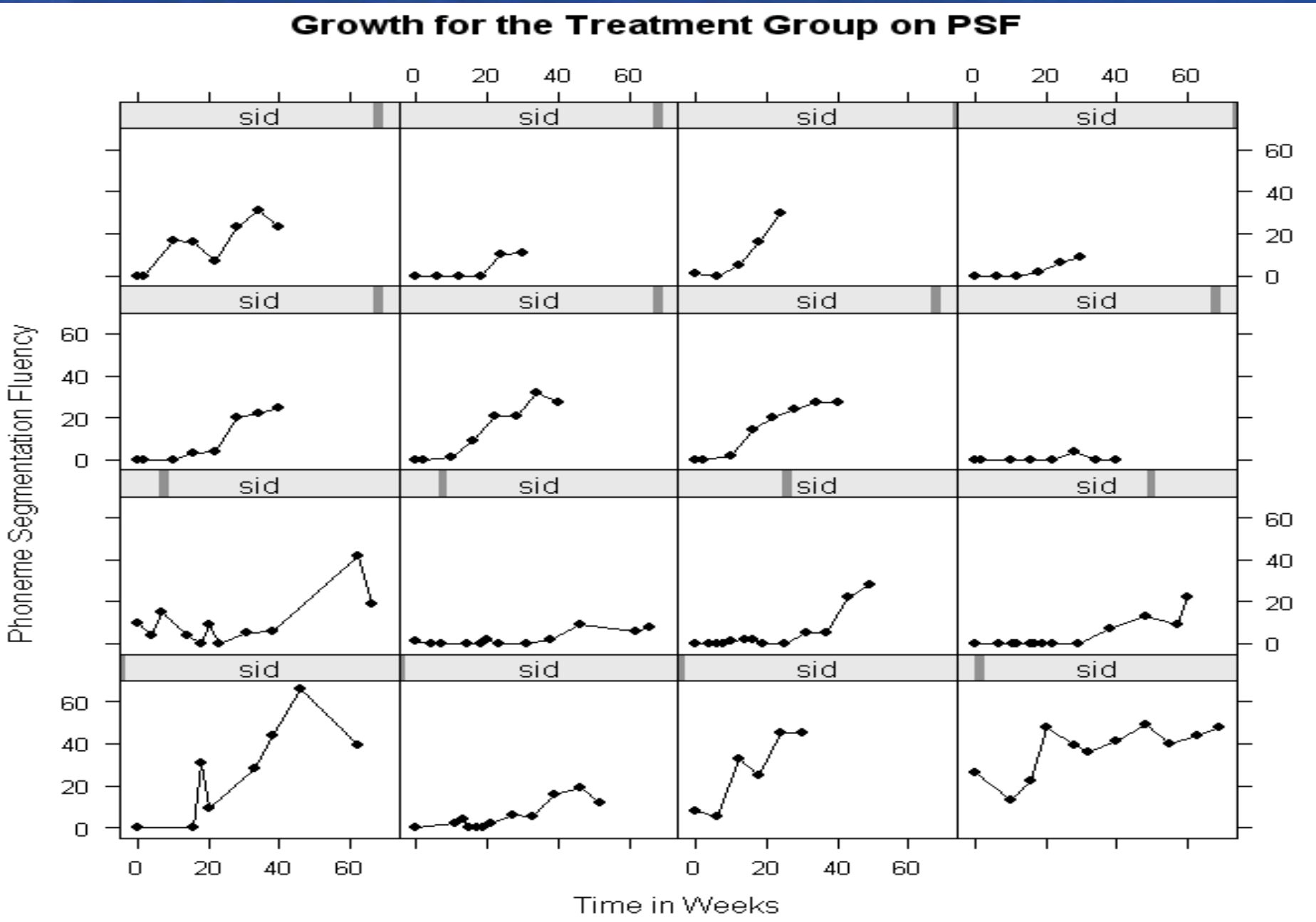
Data Analysis

- Annual Measures
  - Independent t-tests on gain scores
  - Followed by Bonferroni correction because multiple, related measures
- Ongoing (progress monitoring) Measures
  - Hierarchical linear modeling
  - Two level model
    - measurement occasion
    - students

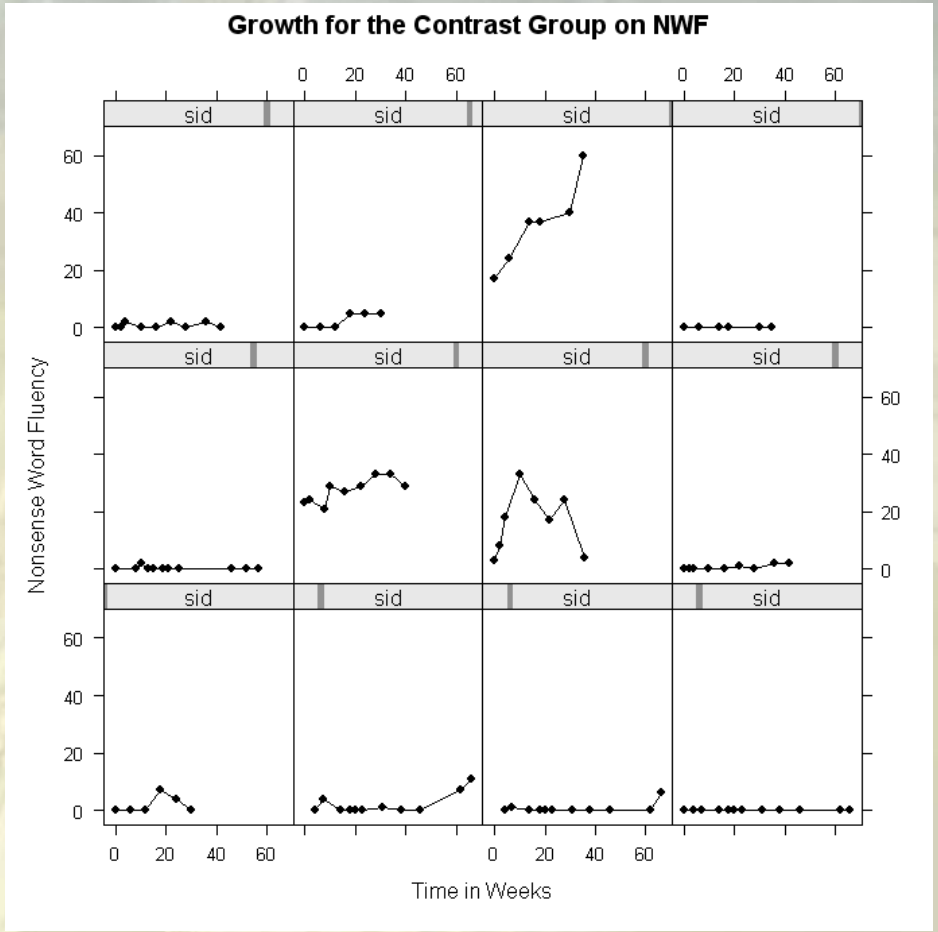
Growth Trajectories for Phoneme Segmentation Fluency

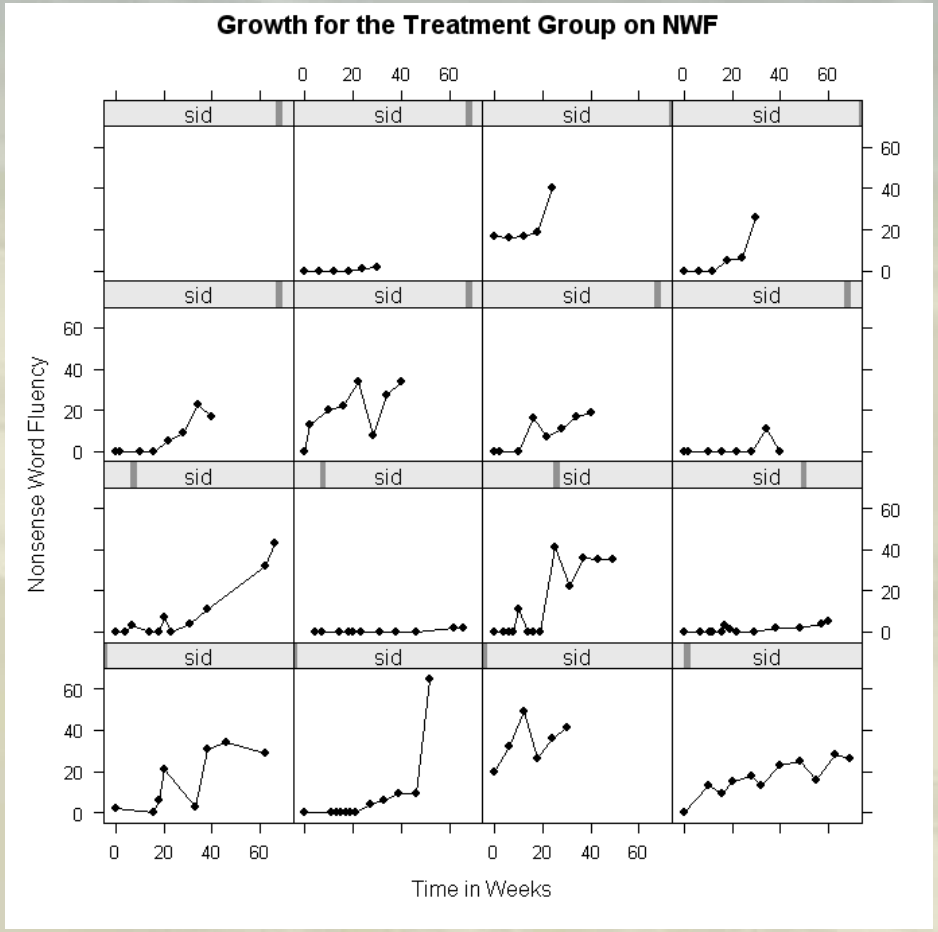


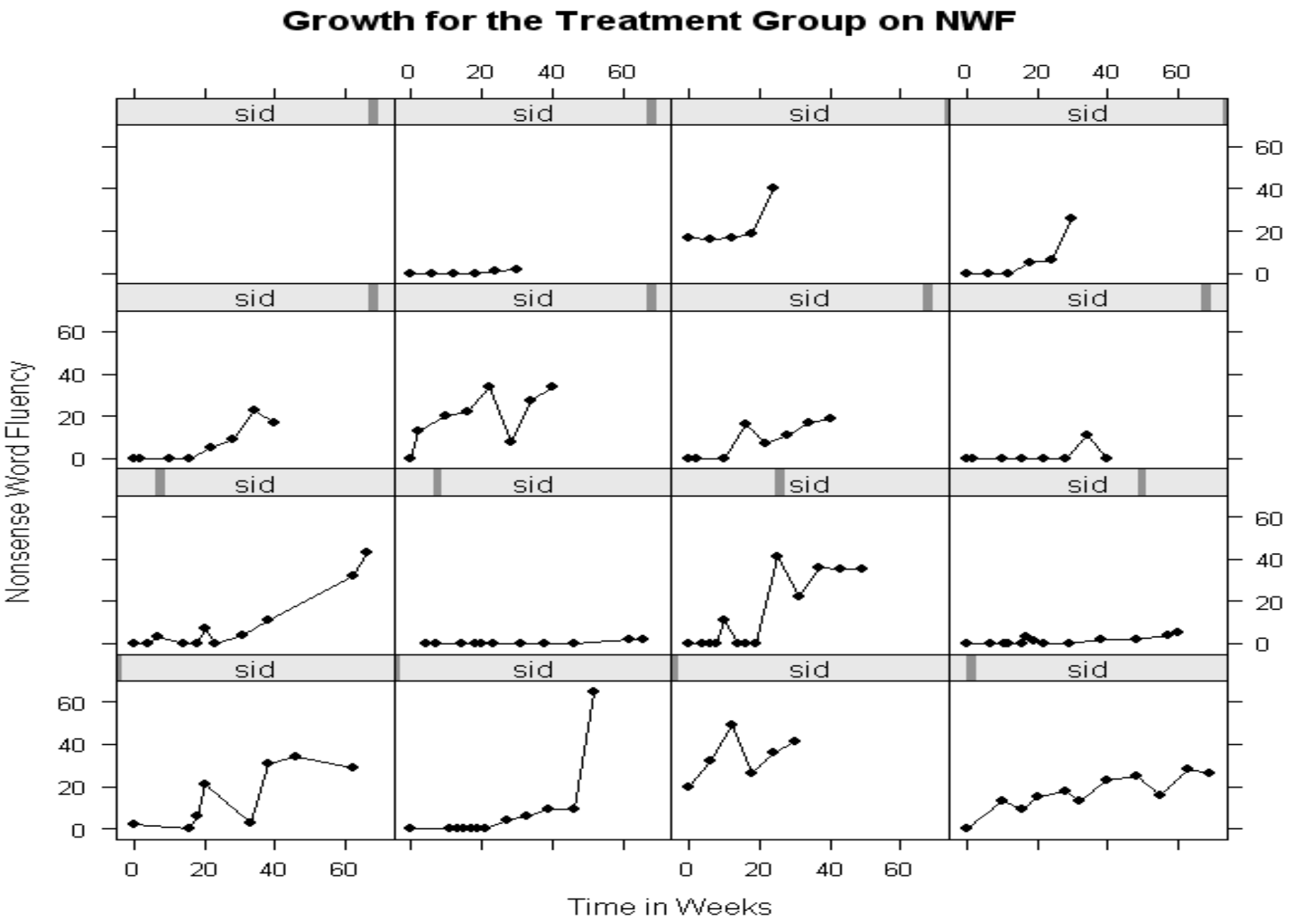



Growth for the Treatment Group on PSF
sid
Phoneme Segmentation Fluency
Time in Weeks
0
20
40
60

Growth Trajectories for Nonsense Word Fluency






Growth for the Treatment Group on NWF
sid
Nonsense Word Fluency
Time in Weeks
0
20
40
60

Multilevel Growth Models

Null Model

$$y_{ti} = \gamma_{00} + \gamma_{10} * time + u_{0i} + u_{1i} * time + e_{ti}$$

Full Model

$$y_{ti} = \gamma_{00} + \gamma_{10} * time + \gamma_{01} * group + \gamma_{11} * time * group + u_{0i} + u_{1i} * time + e_{ti}$$

Growth Model for PSF

	M_0: Null model			M_1 : + group & interaction		
Fixed Effects:	estimate	s.e.	*p*-value	estimate	s. e.	*p*-value
Intercept γ_{00}	0.681	1.032	0.509	0.883	1.608	0.584
Time γ_{10}	0.369	0.066	< .001	0.124	0.081	0.130
Group γ_{01}				-0.199	2.139	0.927
Time*Group γ_{11}				0.417	0.108	< .001
Random Effects:						
σ^2_e	27.819			27.832		
σ^2_{u0}	20.332			22.102		
σ^2_{u1}	0.107			0.062		
$COV\ (u_0.u_1)$	0.231			0.247		
Fit:						
AIC	1666.922			1657.986		
BIC	1687.979			1685.996		
X^2	1654.922			1641.986		

Growth Model for NWF

	M_0: Null model			M_1 : + group & interaction		
Fixed Effects:	estimate	s.e.	*p*-value	estimate	s. e.	*p*-value
Intercept γ_{00}	2.786	1.794	0.122	4.845	2.668	0.071
Time γ_{10}	0.327	0.065	<0.001	0.140	0.085	0.102
Group γ_{01}				-3.725	3.586	0.309
Time*Group γ_{11}				0.337	0.114	0.003
Random Effects:						
σ^2_e	37.252			37.266		
σ^2_{u0}	73.907			73.004		
σ^2_{u1}	0.088			0.064		
$COV\ (u_0.u_1)$	0.455			0.828		
Fit:						
AIC	1673.274			1666.205		
BIC	1694.057			1693.847		
X^2	1661.274			1650.205		

Results

- Means favored intervention group on all measures
- **Phonological Awareness**
  - Moderate to strong **ESs (.50 to .99)**
  - Significant differences on 2 of the 4 CTOPP subtests
    - Blending nonwords and **segmenting words**
    - After Bonferroni correction, blending nonwords no longer significant
    - On average, students in the intervention group outperformed those in the contrast group
  - **PSF statistically significant** interaction (intervention group tended to have a higher rate of growth than contrast)
  - ISF not significant

Results (cont.)

- **Alphabetic Decoding**
  - **TOWRE Phonemic Decoding, ES=1.0, significant**
  - WLPB Word Attack, **ES=.66**, nonsignificant
  - **DIBELS Nonsense Word Fluency, significant interaction**
- **Word Recognition**
  - TOWRE Word Reading Efficiency, **ES=.71**, nonsignificant
  - WLPB Word Identification, **ES=.66**, nonsignificant

Results (cont.)

- **Comprehension**
  - **WLPB Passage Comprehension, ES=.94, significant**
- **Language**
  - WLPB Memory for Sentences, **ES=.30**, nonsignificant
  - WLPB Listening Comprehension, **ES=.47**, nonsignificant
  - PPVT, **ES=.80**, nonsignificant
  - EVT, **ES=.37**, nonsignificant
  - TNL – not analyzed yet
- Survey Measures, including Vineland Adaptive Behavior, and parent and teacher perceptions
  - not analyzed yet

Research Question #2

- After receiving this instruction for ***1 to 1 ½*** academic years, what ***level of reading competence*** is achieved? How does this compare to similar peers?

Results

- Chi-Square Analyses
  - Categorized DIBELS data as deficit, emerging, or established at pretest and posttest
  - Compared the number of students who improved in the intervention group to the number who improved in the contrast group
- Findings
  - More students in the treatment group improved (i.e., moved to higher category) on PSF and NWF; very little progress on ORF
  - Differences significant on PSF only

Results: Level of Performance

- By the end of 06-07 school year…
  - 8 of 16 intervention students were approximately halfway through Level One or further
- Assuming mastery…
  - Identify most common sound for all individual letters
  - Read words made up of those letters
    - Ex: last, mom, slip, step
  - Apply basic comprehension strategies
    - Ex: retelling, sequencing events, story grammar

Currently, of the 16 students in the treatment…

- PSF (mastery=35)
  - 10 have mastered
  - Other 6 high scores were 10,32,17,0,7,20
- NWF (mastery=50)
  - 8 have mastered
  - Other 8 high scores were 37,34,31,45,38,4,6,15

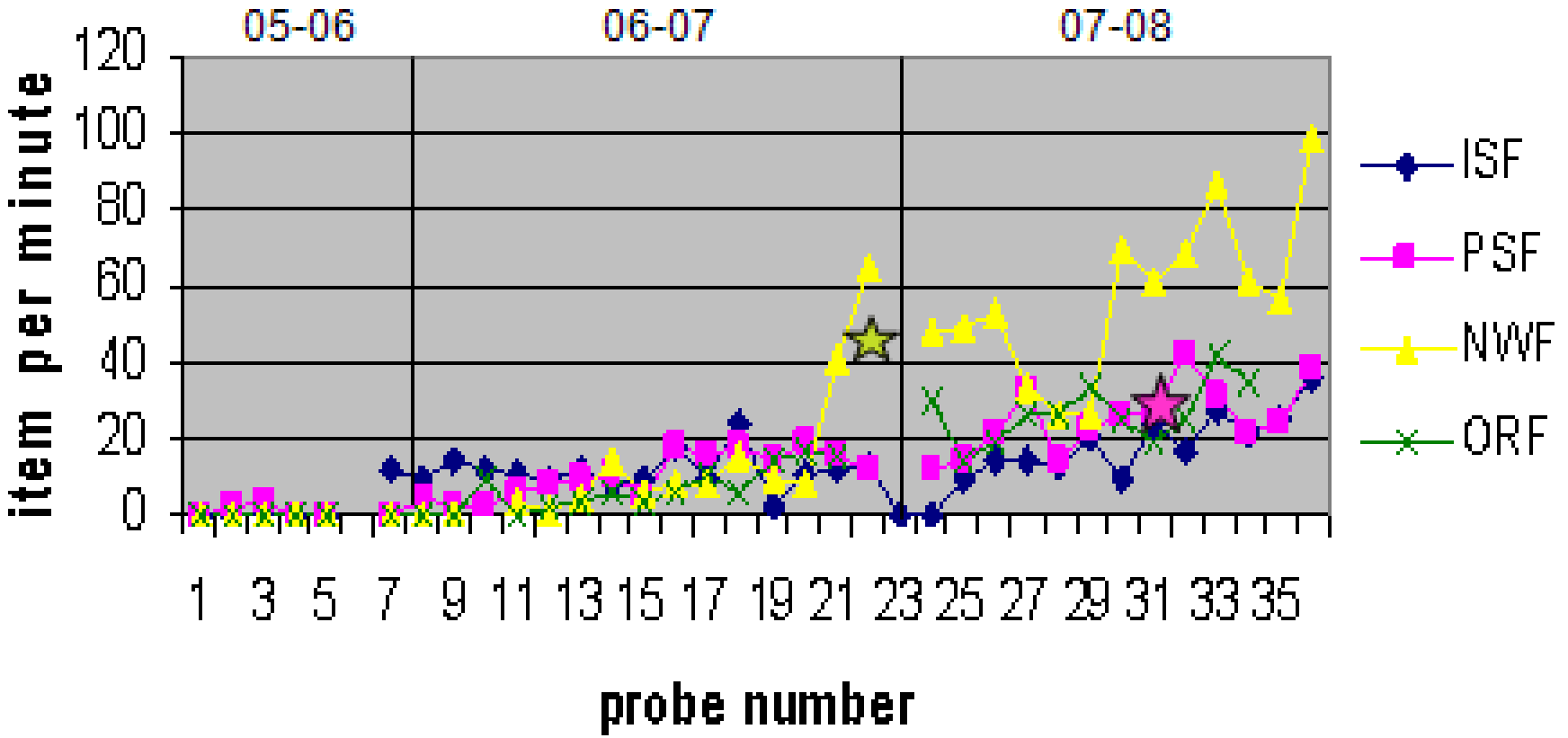
Currently, of the 16 students in the treatment…

- Oral Reading Fluency (ORF: 1st grade benchmark=40)
  - 2 reached first grade benchmark: scores were 43,88
  - Other high scores were 6, 36, 10, 17, 35, 16, 0, 15, 0, 17, 30, 7, 35, 32
- Overall
  - 3 show very slow progress
  - Implementing intense modifications of curriculum

Discussion

- Support for raising expectations for reading for students with moderate ID
- Can make important gains in reading and language
- IF provided intensive, comprehensive instruction over an extended period of time

Austin's PM Data



= met first grade benchmark

Austin’s Story

- IQ: 47 (moderate)
- Grade: 5
- Diagnosis: Autism and ID
- Placement: self contained unit for student with autism
- Began in foundation; currently in second half of level one

Project Maximize

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