Modeling Reading Growth in Grades 3-5 with the Oregon Alternate Assessment

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Purpose

- The purpose of this study was to model reading growth for Students with Significant Cognitive Disabilities (SWSCDs), particularly for students with different disability eligibilities.

- Determining how to address missingness was another critical dimension for our study.

Research Questions

1. What is the typical growth trajectory for SWSCDs in reading across Grades 3-5 in Oregon?
2. How do SWSCDs growth trajectories vary between students around the typical growth trajectory?
3. Do students with different disability classifications progress at significantly different rates?

Study Sample

- 1,464 Oregon students
- Participated in the Oregon AA-AAS Reading assessment in 2011, 2012, <u>and/or</u> 2013
- Typical grade level progressions

- 68.6% Male
- 81.4% White
- 16.3% with an ID
- 18.9% with ASD
- 19.9% with CD
- 14.3% with OHI
- 30.6% with SLD

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Oregon Reading AA-AAS

- One, grade-banded assessment (G3-5), with a common scale across all three years
- Scale is centered on 100 (range is typically between 60-140)
- Reliability:
  – Internal consistency of measures was quite high: Cronbach's α = .92, .95, and .96 for 2011, 2012, and 2013, respectively (ODE)
- Validity:
  – Documentation framed by the work of Messick, with construct validity as the overall framework (ODE)

Study Methods

- Nonlinear latent growth curve model with an estimated factor score (Kamata, Nese, Patarapichayatham, & Lai, 2013)
  - Growth appeared to decelerate
- MLR estimation with robust standard errors (MLR) through *Mplus*
- Effect sizes for the average growth between time points were computed (Bloom, Hill, Black, & Lipsey, 2008)

Missing Data

- Missing data

  - Failed Little's Missing Completely at Random (MCAR) test with the MissMech *R* software package (Jamshidian, Jalal, & Jansen, 2014)

- We thus used a random-effects pattern-mixture model to account for missingness in the data (Enders, 2011)

Missing Data Patterns

Patterns of Missingness

Pattern	Academic year			n
	2010-11	2011-12	2012-13	
1*	0	0	1	114
2*	0	1	0	113
3*	1	0	0	263
4	1	1	0	212
5	0	1	1	127
6	1	0	1	48
7	1	1	1	587

Note. A zero indicates that the student did not participate in the AA-AAS that year, while a one indicates the student did participate.

*Groups were collapsed prior to analysis.

Only 40% of sample has no missing data

Study Results

- Three models
  - Model 1: Unconditional
  - Model 2: Including static disability predictors
  - Model 3: Pattern-mixture model, including static disability predictors and missingness patterns
- Model fit evaluated with SRMR, CFI, and RMSEA (Hu & Bentler, 1999; Kline, 2013)
- Competing models evaluated with AIC and BIC (Akaike, 1973; Schwarz, 1978)

SEM Model 3

Observed variables

Correlated Latent Intercept & Slope

Direct Effects

Disability Predictors

Patterns of missingness
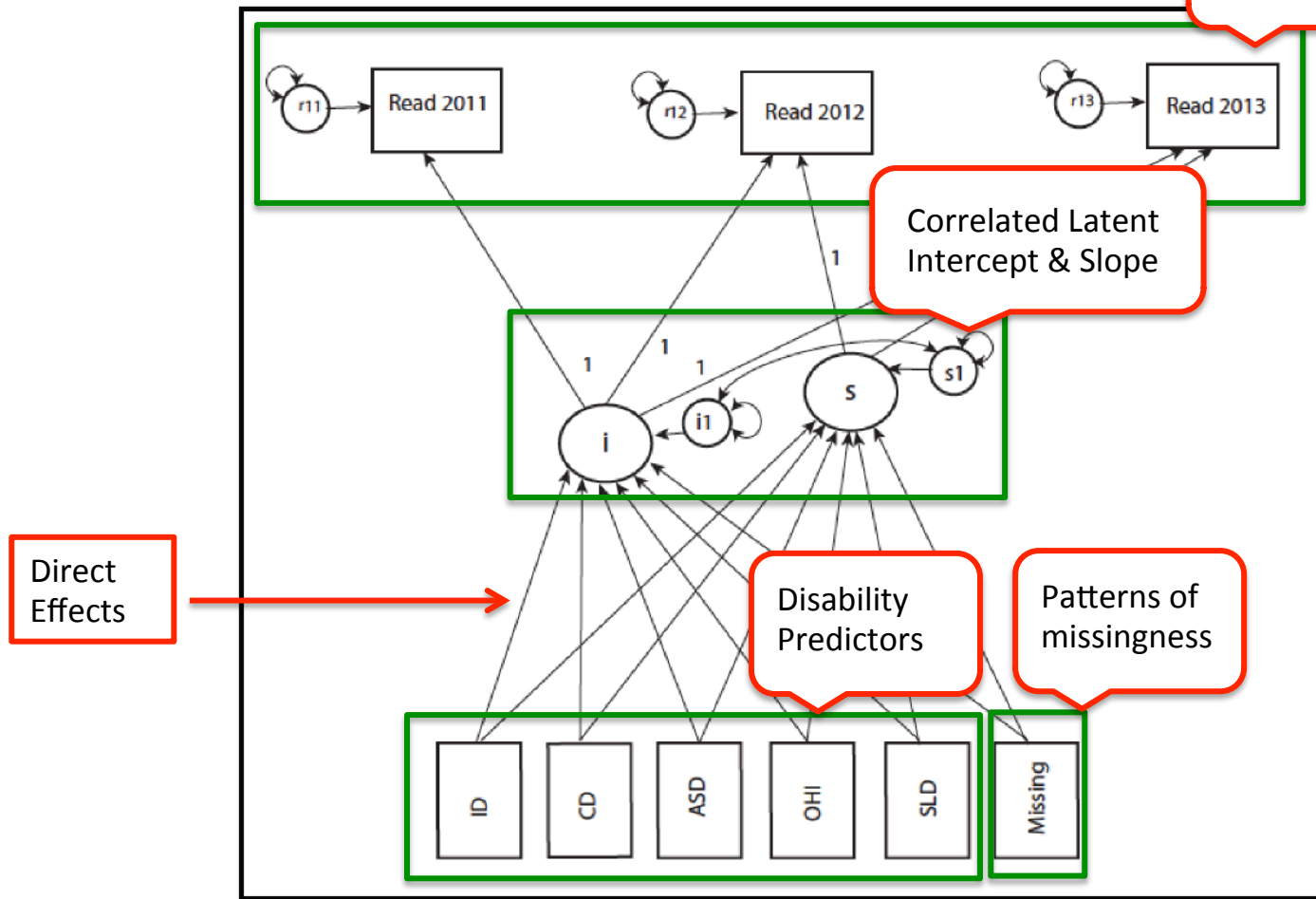
Significant intercept differences across all disability categories except for ASD (all higher than reference group)

Significant slope differences for CD and SLD (negative); ASD & OHI indistinguishable from reference group

Only students missing G4 or 5 had significant intercept differences based on missingness

The variance around the slope estimates is higher than the estimate, suggesting wide variation in slope estimates

Only students missing G5 had significant growth differences based on missingness

Model Parameter Estimates

Parameter	Disability-conditional model		Pattern-mixture model	
	Coefficient	SE	Coefficient	SE
Intercept (ID)	96.57*	1.19	96.80*	
CD	13.97*	1.34	13.99*	
ASD	-1.82	1.80	-1.50	
OHI	10.11*	1.79	9.90*	
SLD	17.50*	1.28	17.28*	
Miss G3			2.32	
Miss G4			-8.20*	
Miss G5			-2.02*	
Miss two years			-0.07	
Slope (ID)	6.37*	0.79	5.86*	
CD	-2.28*	0.87	-2.32*	
ASD	0.96	1.08	0.93	
OHI	-1.10	1.05	-1.15	
SLD	-1.89*	0.83	-2.09*	
Miss G3			-0.02	
Miss G4			1.85	1.27
Miss G5			1.98*	0.93
Miss two years			1.76	1.01
Variance comps	Variance	SD	Variance	SD
Intercept	231.95	15.23	219.45	14.81
Slope	66.76	8.17	57.54	7.59
Residual 2011	1.73	1.32	10.71	3.27
Residual 2012	67.94	8.24	67.64	8.22
Residual 2013	12.60	3.55	12.47	3.53
Information criteria	AIC	BIC	AIC	BIC
	22898.36	22988.27	22886.93	23019.16

Note. ID = Intellectual Disability. CD = Communication Disorder. OHI = Other Health Impairment. ASD = Autism Spectrum Disorder. SLD = Speci[...]
Miss G3, G4 and G5 = students who were missing a time poin[...]
respectively. Miss two years = students with two missing time[...]
*p < .05

Model Based Reading Growth Trajectories Based on Disability
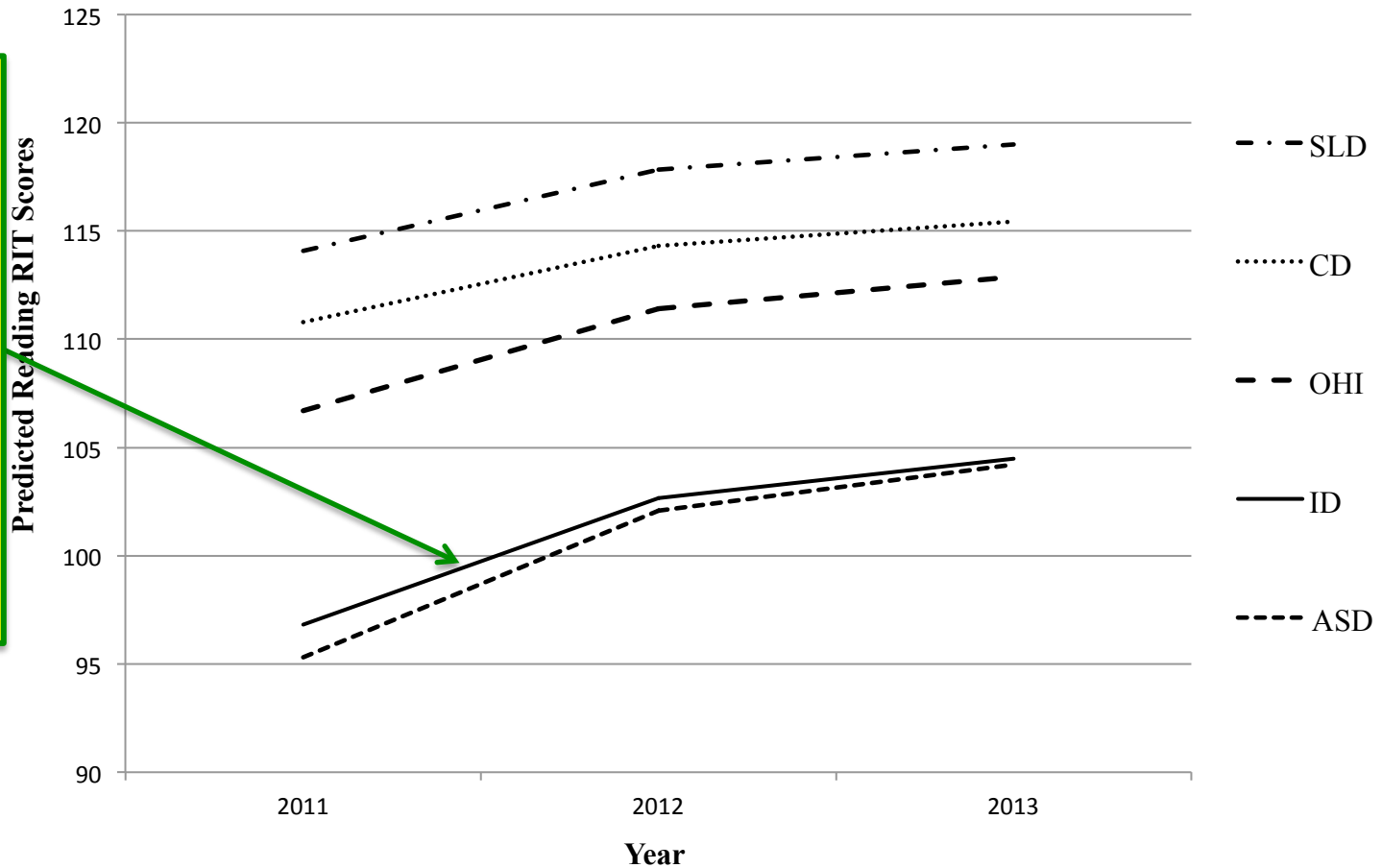
Students with ID and no missing data were our reference group

Growth Effect Sizes

Most Growth

Effect Sizes by Disability Group and Transition Years

Variable	Grade 3 to 4	Grade 4 to 5	Grade 3 to 5
ID	0.53	0.15	0.75
ASD	0.39	0.32	0.74
OHI	0.45	0.09	0.58
SLD	0.51	0.06	0.66
CD	0.53	-0.06	0.46

Note. ID = Intellectual Disability; ASD = Autism Spectrum Disorder; OHI = Other Health Impairment; SLD = Specific Learning Disability; CD = Communication Disorder.

Least Growth

ASD results do not appear to be nonlinear, though peers do.
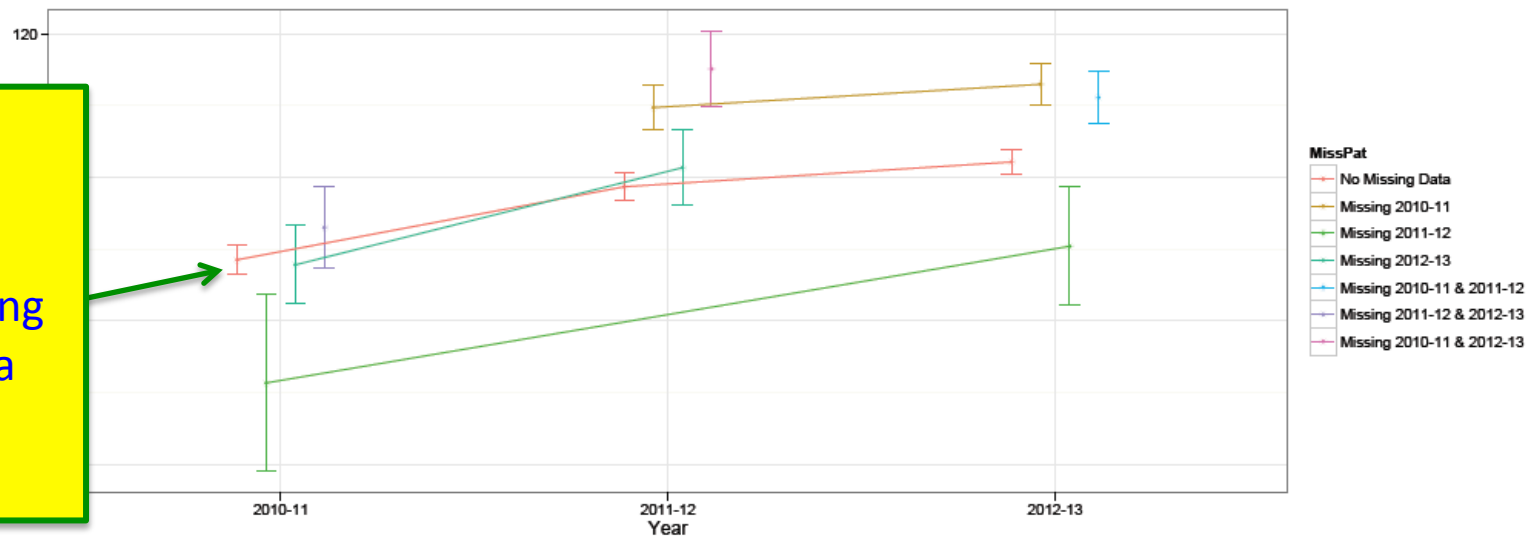
Means Missingness Patterns

Figure 2. Means across the three test occasions (2011, 2012, and 2013) for students who took the Oregon AA-AAS, by missing data pattern.

Limitations

- Interpretation of the missingness patterns was difficult, suggesting the possibility of an omitted variable
- Modeling assumed that growth deceleration was consistent across all groups, but this was clearly not the case for students with ASD
- Results may not generalize outside of our sample

Conclusion & Discussion

- SWSCDs are growing in reading across grades 3-5 in Oregon

- Growth was substantially nonlinear, except for students with ASD

- Missing data are pervasive and worthy of future research

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Thank You!

- Dan Farley, Behavioral Research & Teaching
  - Please email me if you would like a complete copy of the paper.
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RQ Answers

- **RQ1:** The typical growth trajectory ranges from effect sizes of .46 (CD) to .75 (ID).

- **RQ2:** Slope variance is estimated as 7.59 RIT score points (whereas the actual slope estimate for model 3 was 5.67).

- **RQ3**: Growth trajectories for ID and ASD students were significantly higher - pattern is low intercept is related to higher growth/high intercept is related to lower growth.