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

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The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.
Research Questions

1. What is the typical growth trajectory for SWSCD in reading across Grades 3-5 in Oregon?
2. How do individual SWSCD growth trajectories vary 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, and/or 2013
- Typical grade level progressions

- 69% Male
- 81% White
- 16% with an ID
- 19% with ASD
- 20% with CD
- 14% with OHI
- 31% with SLD
Oregon Reading AA-AAS

- Assessment composed of 11 performance tasks (total of 60 items)
- Scale is centered on 100 (range is typically between 60-140)
- Reliability:
  - Internal consistency of measures was quite high: Cronbach’s $\alpha = .92, .95, \text{ and } .96$ 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 was non-linear, with most growth occurring between grades 3 to 4
  – Time measured in (0, 1, 1.31)
• Maximum likelihood estimation with robust standard errors (MLR)
  – Robust to violations of multivariate normality
• Mplus, Version 7.1 (Muthén & Muthén, 1998-2007)
Study Methods, cont.

- Three alternate forms (spring 2011, 2012, 2013)
- Calibrated to a common scale (in effect, students took the same test, with different performance expectations)
- Missing data
  - Analyzed using Little’s Missing Completely at Random (MCAR) test with the MissMech R software package (Jamshidian, Jalal, & Jansen, 2014)
Study Methods, cont.

- **Used** a random-effects pattern-mixture model to account for missingness in the data (Enders, 2011)
- **Effect sizes for the average growth between time points were computed** (Bloom, Hill, Black, & Lipsey, 2008)
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 (Hu & Bentler, 1999; Kline, 2013)
  – Comparative Fit Index (CFI) > .95
  – Root-Mean Square Error of Approximation (RMSEA) < .06
  – Standardized Root Mean Square Residual (SRMR) < .08
SEM Model 3

Observed variables

Latent Intercept & Slope

Direct Effects

Disability Predictors

Patterns of missingness

SEM Model 3

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 & 5 had significant intercept differences based on missingness

Only students missing G5 had significant growth differences based on missingness

**Model Parameter Estimates**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Disability-conditional model</th>
<th>Pattern-mixture model</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
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<tr>
<td>Intercept (ID)</td>
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<tr>
<td>CD</td>
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<tr>
<td>Miss G3</td>
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<tr>
<td>Miss G4</td>
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<td>2.28</td>
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<tr>
<td>Miss G5</td>
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<tr>
<td>Miss two years</td>
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<td>Slope (ID)</td>
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<td>Miss G3</td>
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<td>Miss G5</td>
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<td>Miss two years</td>
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<td>1.01</td>
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**Variance comps**

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<th>SD</th>
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**Information criteria**

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*Note. ID = Intellectual Disability. CD = Communication Disorder. OHI = Other Health Impairment. ASD = Autism Spectrum Disorder. SLD = Specific Learning Disorder. Miss G3, G4 and G5 = students who were missing a time point, respectively. Miss two years = students with two missing time points. *p < .05
Predicted Reading RIT Scores

Reading Growth Trajectories Based on Disability

Year

2011
2012
2013

Predicted Reading RIT Scores

ID
CD
ASD
OHI
SLD

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# Growth Effect Sizes

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<th>Variable</th>
<th>Grade 3 to 4</th>
<th>Grade 4 to 5</th>
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<tr>
<td>ID</td>
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<td>0.15</td>
<td>0.75</td>
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<tr>
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<td>0.58</td>
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<tr>
<td>ASD</td>
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<td>0.32</td>
<td>0.74</td>
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<tr>
<td>SLD</td>
<td>0.51</td>
<td>0.06</td>
<td>0.66</td>
</tr>
</tbody>
</table>

*Note. ID = Intellectual Disability; CD = Communication Disorder; OHI = Other Health Impairment; ASD = Autism Spectrum Disorder; SLD = Specific Learning Disability.*
Figure 2. Means across the three test occasions (2011, 2012, and 2013) for students who took the Oregon AA-AAS, by missing data pattern.
## Conclusions

1. **What is the typical growth trajectory for SWSCD in reading across Grades 3-5 in Oregon?**

2. **How do individual SWSCD growth trajectories vary around the typical growth trajectory?**

3. **Do students with different disability classifications progress at significantly different rates?**
Discussion

• First study on growth for SWSCDs to consider non-linear growth and include missingness patterns
• Critical to include variables to account for group heterogeneity (i.e., disability) for this population
• Conflicting evidence of which model fit the data better; both fit well
• Missingness patterns need further exploration (adding in interactions)
Limitations

- Disability classification was assumed as non-varying.
- Interpretation of the missingness pattern results 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.
- We assumed that one assessment was sufficient to model growth across three years of content (including assumptions regarding the vertical articulation of standards and ALDs across this range).


Thank You!

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