English Language Learners: Language growth within structured/sheltered English immersion programs

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Background

The language growth of English Language Learners (ELLs; Rojas & Iglesias, under review)

Modeled the language growth of 1,723 (Spanish-English) ELLs
- Fall of kindergarten to spring of second grade
- 12,248 Narrative retell language samples:
  - 6,516 Spanish; 5,732 English
- Covariates: Gender; summer vacation
- Outcome measures: Mean length of utterance in words (MLUw); Number of different words (NDW)

Aims
- Differences with respect to prototypical language trajectories
- Intra- and inter-individual differences
- Systematic relationship between initial status and growth

Purpose & Method

What is the effect of program type on ELLs' language growth?

Structured/sheltered English immersion (SEI) programs involve all academic instruction in English
- Goal of SEI programs is to attain fluency in English

Language growth of ELLs in SEI programs was contrasted with the language growth of "overall" ELLs across a variety of programs

Participants

Subset of ELL children from overall sample used in Rojas & Iglesias (under review)
- ELLs enrolled in schools that offered SEI programs exclusively
- 419 ELLs: 198 girls; 221 boys
- 2,924 narrative retell language samples:
  - 1,427 Spanish; 1,497 English
- 65% of ELLs provided language samples in ≥ 4 semesters

Method (continued)

Growth curve modeling (GCM)
- Maximum likelihood estimation method to handle missing data and estimate fixed effects and variance components
- Academic semester served as time metric
- Centering relative to fall of kindergarten as initial status
- GCM testing to determine final GCMs for each outcome measure:
  - Unconditional means model → Unconditional growth models (linear, quadratic, and cubic; fixed and randomly varying slope configurations) → Conditional growth models (gender and discontinuous time; gender *x* slope interactions)
  - Goodness of fit indices (-2LL for nested models; BIC for non-nested models) and Pseudo-R^2 statistics with χ^2 testing estimated and tested across models
  - Prototypical growth curve trajectories generated from final GCM parameter estimates

Summary

ELLs' language growth in Spanish and English: **Overall sample**

	Spanish		English	
	MLUw	NDW	MLUw	NDW
Linearity	Curvilinear	Curvilinear	Linear	Linear
Direction	Non-monotonic	Non-monotonic	Non-monotonic	Non-monotonic
Continuity	Continuous	Continuous	Discontinuous	Discontinuous
Gender	Girls outpace boys	Girls outpace boys	Girls outpace boys (spring)	Girls outpace boys (spring)
Summer vacation	n/a	n/a	Negative growth	Slower growth
Initial status-growth covariance	Positive (↑ initial status = ↑ growth)	No systematic relationship	Negative (↓ initial status = ↑ growth)	Negative (↓ initial status = ↑ growth)

ELLs' language growth in Spanish and English: **SEI Programs**

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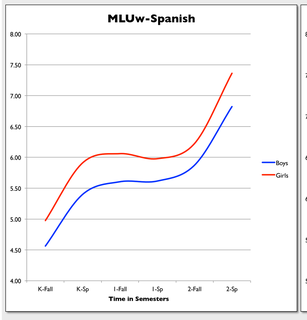
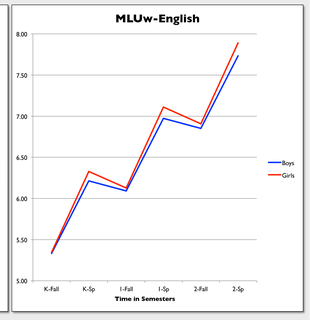
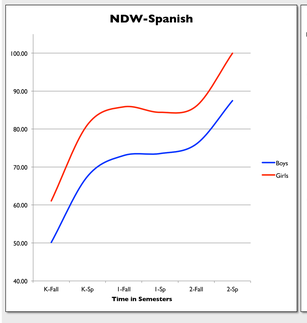
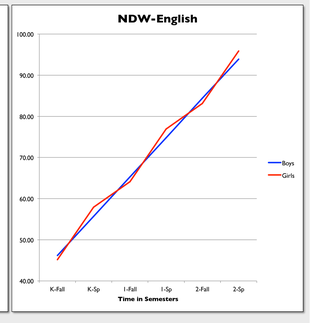
Continuity	Continuous	Continuous	Discontinuous	Discontinuous
Gender	Girls outpace boys ***(K-fall)***	Girls outpace boys	Girls outpace boys ***(fall)***	***Girls ~ boys***
Summer vacation	n/a	n/a	Negative growth	***Near parallel growth***
Initial status-growth covariance	***No systematic relationship***	No systematic relationship	Negative (↑ ↓ initial status = ↑ growth)	***No systematic relationship***

Growth curve trajectories: Overall sample









Final growth curve models

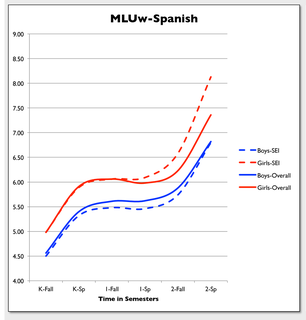
Table 1. Comparisons of continuous and discontinuous growth curve model parameter estimates for Mean Length of Utterance in words in Spanish and English (MLUw-S/E), and for Number of Different Words in Spanish and English (NDW-S/E)

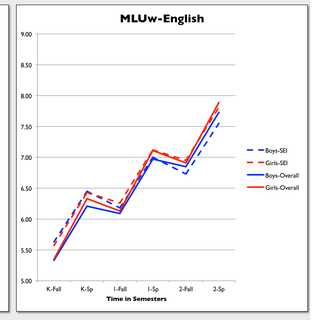
		Overall-MLUw-S CG-Cb+G	*SEI-MLUw-S CG-Cb+G*	*Overall-MLUw-E CG-Dc+G*	*SEI-MLUw-E CG-Dc+G*	*Overall-NDW-S CG-Cb+G*	*SEI-NDW-S CG-Cb+G*	*Overall-NDW-E CG-Dc+G*	*SEI-NDW-E CG-Dc+G*
Fixed effects									
Intercept	γ_{00}	4.56[c]	4.5[c]	5.33[c]	5.63[c]	50.13[c]	47.04[c]	46.17[c]	56.27[c]
Linear Slope	γ_{10}	1.30[c]	1.31[c]	0.76[c]	0.55[c]	25.69[c]	21.29[c]	19.11[c]	16.42[c]
Quadratic Slope	γ_{20}	-0.54[c]	-0.57[c]	0.88[c] Summer	0.82[c] Summer	-9.44[c]	-7.63[c]	9.52[c] Summer	8.21[c] Summer
Cubic Slope	γ_{30}	0.07[c]	0.08[c]			1.16[c]	0.93[c]		
Gender (G)	γ_{01}	0.21[c]	0.24[a]	0.01	-0.06	5.46[c]	5.85[a]	-1.02	-0.4
G x Linear Slope	γ_{11}	0.21[a]	0.17	0.02	0.14[a]	5.17[a]	7.17[~]	-0.12	1.13
G x Quadratic Slope	γ_{21}	-0.14[b]	-0.10	0.10[a] G x Summer	0.04 G x Summer	-2.87[b]	-4.37[a]	3.25[c] G x Summer	0.79 G x Summer
G x Cubic Slope	γ_{31}	0.02[b]	0.02			0.38[b]	0.59[a]		
Variance components									
L1: Within-person variance	σ_ε^2	0.56[a]	0.53[a]	0.69[a]	0.65[a]	211.74[a]	216.35[a]	207.97[a]	245.67[a]
L2: B/w-person intercept	σ_0^2	0.30[a]	0.28[a]	0.99[a]	0.67[a]	200.64[a]	180.74[a]	484.94[a]	314.73[a]
L2: B/w-person linear slope	σ_1^2			0.15[a]	0.05		1.18	18.25[a]	
L2: B/w-person quadratic slope	σ_2^2	0.003				0.006			6.12 Summer
L2: B/w-person cubic slope	σ_3^2	0.0001	0.00001[a]						
Covariance (σ_0^2, σ_1^2)	σ_{01}			-0.31[a]	-0.15[a]		-1.07	-46.17[a]	
Covariance (σ_0^2, σ_2^2)	σ_{02}	-0.01				-0.85			-15.38 Summer
Covariance (σ_0^2, σ_3^2)	σ_{03}	0.003[a]	0.0002						
Proportional variance reduction									
L1: Within-person variance	R_ε^2	48%	44%	50%	42%	38%	31%	57%	46%
L2: B/w-person intercept	R_0^2	6%	7%	<1%	<1%	5%	9%	<1%	<1%
L2: B/w-person linear slope	R_1^2			<1%	<1%		10%	<1%	
L2: B/w-person quadratic slope	R_2^2	<1%				<1%			<1% Summer
L2: B/w-person cubic slope	R_3^2	50%	2%						
Goodness-of-fit									
-2LL		16757.6[a]	3607.0[c]	15237.8[a]	3648.5[c]	55748.8[a]	12253.5[c]	46608.7[a]	11713.2[c]
BIC		16889.3	3694.1	15323.6	3720.4	55854.2	12340.6	46694.4	11785.1

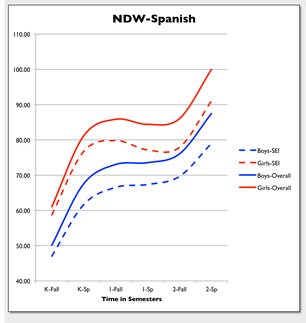
[~] $p < .10$. [a] $p < .05$. [b] $p < .01$. [c] $p < .001$.

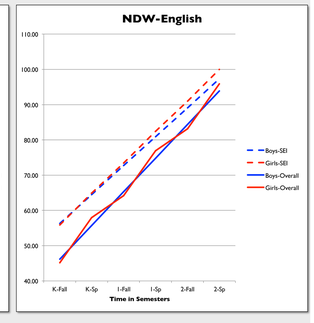
Note. SEI: Structured/Sheltered English Immersion; CG-Cb+G: Conditional cubic growth model with gender; CG-Dc+G: Conditional discontinuous growth model with gender; L1: Level-1 submodel; L2: Level-2 submodel; -2LL: -2 log-likelihood deviance statistic; BIC: Schwarz's Bayesian information criterion.

Growth curve trajectories: SEI programs vs. Overall sample









Conclusions & Next steps

ELLs in SEI programs differed from overall sample

Based on systematic, academic instruction in English, some growth patterns were expected:
- Boys' MLUw- and NDW-Spanish slower than overall sample
- Girls' NDW-Spanish slower than girls in overall sample
- Girls' and boys' NDW-English faster than overall sample

However, other growth patterns were unexpected:
- Girls' MLUw-Spanish faster than overall sample
- Girls' MLUw-English with similar growth rates to overall sample
- Boys' MLUw-English slower than overall sample

Necessary to model bilingual programs
- Transitional bilingual education programs involve initial instruction in the native language, which gradually transitions to English
- Beyond "program type", could also consider the fidelity of language instruction by teacher in order to use actual language of instruction as a covariate of language growth

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