

Associations between English and Spanish Cognitive and Language Skills in Young English Language Learners

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Introduction

Increasing growth in the Spanish-speaking population in the United States has generated interest in the best ways to facilitate academic achievement for children who are English language learners. One issue centers on the value of supporting children's home language while children are attending classrooms primarily or solely providing instruction in English. Resolving this issue requires understanding how children's level of skills and patterns of growth in one language relate to those in the other language. Especially for young children learning cognitive and language skills in English-language pre-k environments, it is particularly important to understand how emerging and acquired skills in both languages may impact school readiness and later academic success.

Study Purpose

The current study was designed to investigate whether pre-kindergarten dual language learners exhibited similar patterns of growth in cognitive and language skills when assessed in Spanish versus English and the extent to which changes in one language were related to changes in the other. The study was part of a larger study evaluating the impact of participation in a statewide school readiness pre-kindergarten program for at-risk children. Children's growth in cognitive and language skills assessed in both Spanish and English from the beginning of their pre-k year through the end of kindergarten was examined. Associations of children's initial skills in Spanish at entry into pre-k and growth in Spanish with their growth in English through the end of kindergarten were calculated to examine how skill development in their home language may be related to school readiness skills measured in English. It is important to note that both the pre-k and kindergarten programs used English as the primary language of instruction, and typically provided a monolingual English environment.

Participants

- Spanish-speaking children participating in a larger evaluation of a pre-kindergarten program who scored in the non-proficient to limited proficient range on a test of English language proficiency.
- 120 participants in pre-k and 92 in kindergarten.

Measures

Table 1: Child Outcome Measures

Domain	Measure	Skills Assessed	Scoring
Language and Literacy	Peabody Picture Vocabulary Test-III (PPVT-III) ¹ Test de Vocabulario en Imagenes Peabody (TVIP) ²	Receptive vocabulary	Standardized measure, Mean=100, SD=15
	Woodcock Johnson-III Tests of Achievement (WJ-III) ³ Rhyming (Subtest 21A, Sound Awareness test) Batería III Pruebas de Aprovechamiento ⁴ Rima (Prueba 21A, Discernimiento de sonidos)	Phonological awareness	Range=0–17
	Naming Letters Task ⁵ (English and Spanish versions)	Alphabet knowledge	Range=0–26
	Story and Print Concepts Task ⁶ (English and Spanish versions)	Early literacy skills including book knowledge, story comprehension, and print awareness	Range=0–14
Math	Woodcock Johnson-III Tests of Achievement ³ Applied Problems Test (Test 10) Batería III Pruebas de Aprovechamiento ⁴ Problemas Aplicados (Prueba 10)	Ability to solve practical math problems including counting, simple addition, and subtraction	Standardized measure, Mean=100, SD=15
	Counting Bears Task ⁷ (English and Spanish versions)	Ability to count in one-to-one correspondence	Range=0–40
General Knowledge	Social Awareness Task ⁸ (English and Spanish versions)	Knowledge of child’s full name, age and birth date	Range=0–6
	Color Bears Task ⁹ (English and Spanish versions)	Knowledge of 10 basic colors	Range=0–20

Procedures

Independent individual assessments of children's language and literacy skills, math skills, and general knowledge in both English and Spanish were gathered twice each year, in the fall and spring of pre-k and kindergarten.

Analysis

LONGITUDINAL GROWTH

Child outcomes were analyzed with a series of longitudinal growth models. Separate analyses were conducted for each measure using a mixed model approach to account for repeated measures within children and multiple children within classes. Covariates included: grade (pre-k vs. kindergarten); assessment variations (age at first assessment, time between assessments/enrollment); More at Four dosage; child characteristics (gender, cumulative risk factor score, initial English proficiency level); and pre-k classroom quality (ECERS-R total child items score). As a precaution against Type I error, all analyses included adjustments to the p-values using the Benjamini and Hochberg¹⁰ correction for multiple comparisons.

ASSOCIATIONS BETWEEN ENGLISH AND SPANISH

A series of longitudinal growth models were calculated to test whether growth on the English measures from pre-k through kindergarten was related to children's initial scores in Spanish at entry into pre-k (fall pre-k scores) and/or gains on the Spanish measures from pre-k through kindergarten for the same outcomes (e.g., receptive language as measured by the PPVT-III and the TVIP). These models accounted for repeated measures within each child and multiple children within each classroom.

Results

LONGITUDINAL GROWTH

Children exhibited significant growth over this two-year period on most of the English and Spanish measures, including language/literacy skills, math skills, and general knowledge. The one area that showed no significant growth in Spanish was receptive language skills, although children did show significant growth in English. For most of these skills, Spanish-speaking children made similar amounts of gain during pre-k and kindergarten, with a few exceptions. Children exhibited significant growth only during the pre-k period for social awareness in Spanish and for color knowledge in English (which had reached a ceiling by kindergarten). In contrast, they showed significant growth only during kindergarten for rhyming and letter naming in Spanish. For counting in both Spanish and English, children exhibited significant growth at both times, but with greater growth during kindergarten. (See Table 2.)

ASSOCIATIONS BETWEEN ENGLISH AND SPANISH

Children's initial skills in Spanish were positively associated with their rate of growth in English through kindergarten for some measures of language/literacy skills (receptive language) and general knowledge (social awareness). Children's growth in Spanish was associated with their growth in English from pre-kindergarten through kindergarten for two language/literacy measures (rhyming and story/print concepts) and one math measure (counting). (See Table 3.)

Conclusions

In general, these children showed growth on all English skills and most Spanish skills (except receptive language) over this period. Children made similar amounts of gain during pre-k and kindergarten on most measures, although they exhibited greater growth in pre-k on some more basic skills (social awareness and color knowledge) and greater growth in kindergarten in some more academic skills (rhyming, letter naming, and counting). For some basic language and cognitive skills—receptive language and social awareness—growth in English was related to children’s initial skill levels in Spanish at entry into pre-kindergarten, but not growth in Spanish. In contrast, children’s growth on some of the more specific academic skills in English (rhyming, story/print concepts, counting) was associated with growth rates in Spanish, but not initial levels.

The different patterns of growth and associations between Spanish and English skills may reflect differences in the difficulty of the tasks which are further highlighted for children who are attempting to learn bilingually. Children may first master easier skills in both languages, and then move to learning more difficult tasks during pre-kindergarten and kindergarten as they are ready. For simpler tasks, children entering pre-kindergarten at a higher level of knowledge in one language are able to more quickly develop skills in a second language. As the tasks become more difficult developmentally, skill growth in the home language becomes a stronger predictor of their growth in a second language. These findings speak to the importance of promoting children’s native language skills in conjunction with their growth in English skills. Interestingly, there was no significant growth in Spanish receptive language and growth in English receptive language was only related to initial Spanish skills, which may reflect the emphasis on English for all children once they enter the pre-kindergarten program and as they continue into kindergarten.

Table 2: Child Outcome Scores on English and Spanish Assessments

Domain	Outcome (Possible Range)	English				Total Growth ^{a,b}	Spanish				Total Growth ^{a,b}
		Pre-kindergarten		K			Pre-kindergarten		K		
		Fall n=74-120	Spring ^{a,c} n=89-108	Fall n=76-94	Spring ^{a,c} n=78-93		Fall n=114-120	Spring ^{a,c} n=101-106	Fall n=91-92	Spring ^{a,c} n=91	
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Language and Literacy	Receptive Language PPVT-III/ TVIP (Standardized score)	55.3 (14.5)	66.1*** (16.6)	72.2 (15.0)	78.3*** (13.6)	***	79.9 (14.8)	79.6 ^{NS} (16.0)	81.4 (18.5)	84.7* (18.8)	NS
	Rhyming WJ-III/Batería (Standardized score)	0.4 (0.9)	1.8*** (2.3)	3.5 (3.1)	6.0** (4.0)	***	0.8 (1.1)	1.2 ^{NS} (2.0)	1.7 (2.2)	4.0*** (3.3)	***
	Story and Print Concepts (0-14)	1.2 (1.4)	3.4*** (2.2)	5.7 (2.4)	7.5*** (2.4)	***	2.6 (2.0)	4.3*** (2.4)	5.8 (2.4)	7.1*** (2.2)	***
	Naming Letters (0-26)	1.0 (2.8)	5.9*** (8.5)	10.0 (10.0)	15.7*** (11.0)	***	0.6 (1.7)	1.2 ^{NS} (2.9)	2.9 (5.0)	6.5*** (8.1)	***

^a *p < .05, **p < .01, ***p < .001, NS=nonsignificant.

^b Significance levels indicate results of t-tests of the parameter estimates for the adjusted gains over time based on longitudinal growth model estimations.

^c Significance levels indicate results of t-tests of the parameter estimates for the adjusted gains from fall to spring over the program year based on longitudinal growth model estimations.

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		Fall n=74-120	Spring ^{a,c} n=89-108	Fall n=76-94	Spring ^{a,c} n=78-93		Fall n=114-120	Spring ^{a,c} n=101-106	Fall n=91-92	Spring ^{a,c} n=91	
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Math	Applied Problems WJ-III/Batería (Standardized score)	77.8 (15.5)	86.5*** (14.9)	91.0 (11.3)	97.2*** (11.4)	***	80.1 (15.6)	84.0 ^{NS} (15.8)	85.5 (12.8)	90.0 ^{NS} (11.7)	***
	Counting Task (0-40)	6.8 (4.5)	14.1*** (8.2)	20.3 (11.4)	34.4*** (9.6)	***	4.2 (3.8)	7.7* (5.3)	10.5 (6.9)	14.5*** (9.5)	***
General Knowledge	Social Awareness (0-6)	1.4 (1.1)	2.8*** (1.4)	3.6 (1.4)	4.7*** (1.2)	***	2.6 (1.3)	3.0* (1.4)	3.4 (1.2)	3.8 ^{NS} (1.2)	***
	Color Knowledge (0-20)	10.9 (6.7)	17.4*** (4.4)	19.0 (2.5)	19.7 ^{NS} (1.1)	***	7.0 (5.5)	9.3** (5.5)	12.0 (6.3)	14.2** (5.7)	***

^a * $p < .05$, ** $p < .01$, *** $p < .001$, NS=nonsignificant.

^b Significance levels indicate results of t-tests of the parameter estimates for the adjusted gains over time based on longitudinal growth model estimations.

^c Significance levels indicate results of t-tests of the parameter estimates for the adjusted gains from fall to spring over the program year based on longitudinal growth model estimations.

Table 3: Associations of Growth on English Assessments with Initial Skills and Growth on Spanish Assessments

Domain	Assessment	Association with English Growth ^{a,b}	
		Initial Spanish Skill Level ^c	Spanish Growth ^d
		Parameter Estimate (Standard Error)	Parameter Estimate (Standard Error)
Language and Literacy	Receptive Language	0.15* (0.06)	-0.06 (0.09)
	Rhyming	0.23 (0.13)	0.34** (0.12)
	Story and Print Concepts	0.06 (0.08)	0.15* (0.07)
	Naming Letters	0.18 (0.29)	-0.13 (0.25)
Math	Applied Problems	0.07 (0.07)	0.12 (0.09)
	Counting Task	0.05 (0.19)	0.31* (0.16)
General Knowledge	Social Awareness	0.21* (0.09)	0.14 (0.08)
	Color Knowledge	-0.13 (0.07)	-0.09 (0.09)

^a * $p \leq .05$, ** $p < .01$, *** $p < .001$

^b Represents total growth over time from fall pre-k through spring kindergarten on English assessments.

^c Represents fall pre-k scores on Spanish assessments. Significance levels indicate results of t-tests of the parameter estimates for Spanish fall pre-k scores based on longitudinal growth model estimations.

^d Represents growth during fall pre-k to spring kindergarten on Spanish assessments. Significance levels indicate results of t-tests of the parameter estimates for slope of Spanish growth based on longitudinal growth model estimations.

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