The Effect of Feature Complexity in Spanish Spelling in Grades 1-3

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April 6, 2014

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A090015 to the University of Virginia. The opinions expressed are those of the authors and do not represent views of the Institute or the Department of Education.

Abstract

The current study explored a possible continuum of spelling features that children receiving literacy instruction in Spanish might be expected to master in Grades 1-3. We administered a developmental spelling inventory representing nine distinct Spanish spelling features to 864 students in bilingual and dual language schools across the U.S. Findings revealed a distinct hierarchy of Spanish spelling features that move from reliance solely on sound-symbol correspondences (e.g., open syllables, closed syllables, blends, nasals, diphthongs) to word patterns (e.g., inconsistent consonants and rule-based consonants) and finally to meaning units (e.g., affixes and roots).

Keywords: developmental spelling; literacy assessment; Spanish; spelling features

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Objective & Purpose

Research has shown that spelling skills in English are acquired according to a predictable developmental progression (Beers & Henderson, 1977; Schlagal, 1989; Templeton & Morris, 2000). By analyzing children's spelling attempts, we can gain a unique insight into their overall literacy development (Ehri, 1997). For that reason, developmental spelling inventories have been used for many years in English to assess children's growing understandings about written language. Although some work has been done to explore the possibility of a developmental construct in Spanish (e.g., Defior, Jiménez-Fernández, & Serrano, 2009; Defior & Serrano, 2005; Diuk, Sánchez Abchi, & Ferroni, M., 2009; Jiménez et al., 2008), further research is needed to clearly define the continuum for Spanish spelling features and to explore the application of such a construct with bilingual children in an English-dominant culture. The purpose of the current study was to identify a possible continuum of spelling features that children receiving literacy instruction in Spanish might be expected to master in Grades 1-3.

Theoretical Framework

Research on how children learn to spell words in an alphabetic orthography has consistently revealed that orthographic features are internalized in a systematic, developmental progression (Bear, Templeton, Helman, & Baren, 2003; Ferreiro, 1991; Hachén, 2002; Henderson & Beers, 1980). Children's first attempts at writing consist of scribbles that have no association with letters or sounds. However, once they begin to develop an understanding of the *alphabetic principle* (i.e., an understanding that letters are symbols that represent the sounds in speech), children attempt to represent the sounds they hear in words in their spelling. In the beginning, children spell by writing one letter for each sound they hear in a word, and their spelling is often incomplete (i.e., representing only the most salient sounds in a word). Next, they begin to recognize that some words cannot be spelled by simply using one letter for each sound, and they learn to pay attention to spelling patterns in which multiple letters work together to make one sound or the spelling of a particular sound depends upon the sounds that precede or follow it in a word. In the final stage of spelling development, children learn to use their knowledge of morphemes, such as affixes and roots, to help them spell unknown words. As children move through these stages of spelling development in English, they master specific spelling features in a predictable order, beginning with those that simply require an understanding of sound-symbol correspondences (e.g., beginning and ending consonants, digraphs, blends, short vowels, nasals), followed by those that require an understanding of word patterns (e.g., long vowels, r- and l-influenced vowels, ambiguous vowels), and finally those that require an understanding of morphological units (e.g., affixes and roots).

While most of the research on developmental spelling has been conducted in English, a language with an opaque orthography, some recent research has begun to explore how spelling develops in Spanish, a language with a transparent orthography. For example, Jiménez and colleagues (2008) examined the types of spelling features that Spanish children on the island of Tenerife typically master between second and sixth grade. Diuk, Borzone, Sánchez Abchi, and Ferroni (2009) analyzed the spelling development of Argentinian children in Grades 1-3 to determine the relationship between phonological and orthographic skills in Spanish spelling, looking specifically at whether context-dependent or context-independent spelling features were more difficult for children to master. Defior and her colleagues have explored the effect of lexicality (i.e., spelling real words vs. pseudowords) and spelling feature complexity on Spanish children's spelling (Defior, Jiménez Fernández, & Serrano 2005/2006, 2008), as well as the use of morphological clues in Spanish spelling (Defior, Alegría, Titos, & Martos, 2008). The current study was designed to extend this previous research in Spanish developmental spelling by clearly identifying the continuum of spelling features typically mastered by children in Grades 1-3 who are receiving literacy instruction in Spanish in U.S. schools.

Methods

Procedure

Children in Grades 1-3 were administered a 36-word spelling inventory representing nine distinct spelling features (i.e., open syllables, closed syllables, blends, nasals, diphthongs, inconsistent consonants, silent H, rule-based consonants, and affixes/roots). The features were chosen based on previous research on reading and writing development in Spanish, specifically research related to the relative challenge that certain word patterns and syllable structures pose for children learning to read and write in Spanish (Defior, Jiménez-Fernández, & Serrano, 2009; Defior & Serrano, 2005; Ferreiro, 1991; Hachén, 2002). There were four words representing each spelling feature. Words were selected based on frequency of occurrence and linguistic attributes, as well as their ability to elicit responses to particular speech sounds and syllable patterns that represent developmental spelling stages in Spanish.

The inventory was organized into three sets based on the characteristics of the spelling features and their expected level of difficulty (i.e., Set 1 = sound-based features/easiest, Set 2 = pattern-based features/more challenging, Set 3 = meaning-based features/most challenging). All students were administered Set 1; students who scored at least 50% correct on Set 1 were administered Set 2; and students who scored at least 50% correct on Set 2 were administered Set 3. In this discussion, students who did not score high enough to move on to Set 2 will be referred to as Level 1 spellers; students who took Sets 1 and 2 but did not score high enough to move on to Set 3 will be referred to as Level 2 spellers; and students who took Sets 1, 2, and 3 will be referred to as Level 3 spellers.

Participants

Participants were 864 first- (*n* = 541), second- (*n* = 160), and third-grade (*n* = 163) students (female = 50.0%) from 30 schools in seven U.S. states (i.e., Wisconsin, Virginia, Pennsylvania, Minnesota, California, Missouri, North Carolina) and the District of Columbia. All students were in dual language or transitional bilingual programs in which they were receiving literacy instruction in Spanish. Of these students, 462 (53%) were administered Set 1 words, 298 (34.5%) were administered Sets 1 and 2, and 104 (12.0%) were administered Sets 1, 2, and 3.

Data Analysis

To test our hypothesis of increasing spelling feature difficulty, we used a multilevel logistic regression model with responses nested within students. Alternatively, this has been referred to as an explanatory item response theory model or a linear logistic test model (LLTM; see Justice et al., 2006 for an example). As with a logistic regression model, coefficients can be expressed as odds ratios (*OR*s) that show a change in odds with a one unit increase in the predictor.

The outcome of our model was whether a child spelled the targeted spelling feature in each of the 36 words correctly (1) or incorrectly (0). As our main variable of interest, we included dummy-coded variables to represent the spelling feature, with the most difficult feature serving as the reference group. An advantage of running a regression model is that we could include several controls simultaneously. At the student-level, we included student grade level and gender. At the word/response level, we included word length (i.e., number of letters in the word; *M* = 5.81, *SD* = 1.51, Range = 4-10) and word frequency (*M* = 57.94, *SD* = 6.63, Range =

43.65 – 72.80). Our measure of word frequency was the standard frequency index (SFI = 10 * [$\log_{10}$(U) + 4]), calculated using word frequency data from the *Corpus del español* (Davies, 2002), a 100 million-word corpus of Spanish words gathered from a variety of fiction and nonfiction sources. In addition, we included school dummy-codes (i.e., fixed effects) which accounted for any and all variability resulting from students nested within schools. School nesting was important to control for as the variability resulting from the school level was not ignorable as we computed a preliminary unconditional model per spelling level (i.e., ICC_{1st}=.21; ICC_{2nd}=.15; ICC_{3rd}=.28).

In addition to presenting ORs and reporting statistical significance (see Table 1), we also report a more easily interpretable predicted probability per word feature (see Figure 1). As each higher-order feature is expected to be more difficult, descending ORs and probability levels are expected, showing increasing feature difficulty.

Results and Significance of Study

For Level 1 spellers, the Set 1 word features all showed an increasing level of difficulty. All the spelling features were harder than the reference group (i.e., diphthongs). For example, the odds of correctly spelling an open syllable word compared to a word with a diphthong was higher by a factor of 7.65 (OR = 7.65, $p < .001$). While blends and nasals had a higher likelihood of being correctly spelled by Level 1 spellers, compared to diphthongs, the difference in probabilities between blends and nasals was not statistically significant (i.e., blends and nasals were not that much different). This is likely due to the fact that both features had relatively low ORs among Level 1 spellers.

For Level 2 spellers, the Set 2 words showed an increasing order of difficulty, and all the word features were easier to spell compared to the reference group (i.e., rule-based consonants).

Level 3 spellers also displayed a similar progression of difficulty with Set 3 words. While results can be interpreted using the ORs, Figure 1 presents the predicted probabilities of correctly identifying the features. As is evident by the graph, the probabilities of correctly spelling the feature decrease as the feature gets more difficult, regardless of the student's spelling ability. Nevertheless, the higher the spelling level of the student (i.e., Level 1, Level 2, or Level 3), the greater the probability of spelling any given feature correctly. We believe that these results are particularly robust in that we controlled for word frequency, word length, gender, grade-level, and school-level factors.

The results of the current study are consistent with previous research on Spanish spelling demonstrating that features that can be spelled relying on sound alone (i.e., what Diuk and colleagues refer to as "context-independent consistent correspondences") are the easiest to spell, followed by features that require an understanding of contextual restraints (Diuk et al., 2009; Defior et al., 2005/2006, 2008). Our results also support research showing that despite the transparency of the Spanish orthography, Spanish spellers do rely on morphological clues when phonological clues are not sufficient (Defior et al., 2007). Furthermore, our findings show that children in the U.S. who are learning to read and write in Spanish do, indeed, master spelling features in a definable, predictable order, suggesting that developmental spelling inventories in Spanish can provide teachers with useful information that will allow them to target instruction to children's individual needs.

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Table 1

Multilevel logistic regression results by maximum level reached (Levels 1, 2, and 3)

	Level 1 (*n* = 462 students)		Level 2 (*n* = 298 students)		Level 3 (*n* = 104 students)	
Variable	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Open syllable	**7.65**	(6.33-9.26)	**59.24**	(43.04-81.53)	**76.19**	(36.31-159.89)
Closed syllable	**4.39**	(3.64-5.29)	**67.65**	(48.19-94.98)	**139.09**	(54.00-358.27)
Blend	**2.57**	(2.16-3.06)	**40.04**	(30.36-52.80)	**69.21**	(33.65-142.36)
Nasal	**2.36**	(1.99-2.79)	**26.56**	(20.50-34.40)	**48.33**	(25.84-90.37)
Dipthong			**11.39**	(9.04-14.35)	**30.59**	(17.91-52.24)
Inconsistent consonant			**2.20**	(1.82-2.67)	**4.86**	(3.52-6.73)
Silent h			**0.78**	(0.61-0.98)	**4.74**	(3.28-6.86)
Rule-based consonant					**1.72**	(1.29-2.30)
Affix/root						
Word length	**0.68**	(0.61-0.76)	0.98	(0.93-1.04)	**1.10**	(1.01-1.20)
Word frequency	**1.02**	(1.01-1.03)	**1.02**	(1.01-1.03)	1.00	(0.98-1.02)
Grade level	**2.90**	(2.16-3.90)	**1.74**	(1.48-2.05)	**1.76**	(1.30-2.39)
Female	**1.33**	(1.02-1.75)	1.04	(0.86-1.27)	1.03	(0.80-1.34)

Note. OR = odds ratio. All models account for school-level nesting. Numbers in BOLD are statistically significant ($p < .05$). Features are dummy coded. Feature reference group for Level 1 = Diphthong. Feature reference group for Level 2 = Rule-based consonant. Feature reference group for Level 3 = Affix/root.

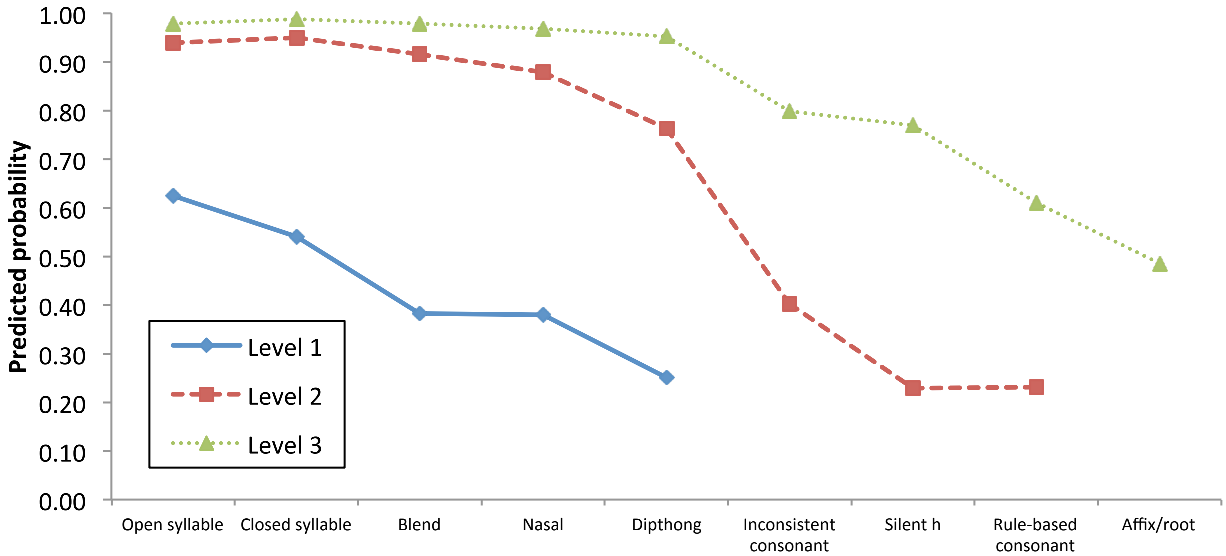

Figure 1. Predicted probabilities of correctly identifying the word feature by spelling level.