A Beneficial Effect of Orthography on Native Spanish Speakers' Ability to Distinguish Non-Native Phonemic Contrasts

Brooklyn College, The City University of New York
QUEENS COLLEGE
HUNTER, The City University of New York
Australian National University
UNIVERSITY OF CALIFORNIA UC RIVERSIDE

Katharine Pace Miles[1], Eve Higby[2], Seamus Donnelly[3], Andrea Monge[4], Desiret Nuesi[5]
[1]Brooklyn College, [2]Univeristy of California, Riverside, [3]The Australian National University, [4]Queens College, CUNY, [5]Hunter College

Background

- Perceptual difficulties for non-native phonemes are caused by the lack of representation of certain sounds in the native language (Raynolds, Uhry, & Brunner, 2012). Novel phonemes may be assimilated to the closest available native phonemes.
- Some English consonants and digraph sounds are allophonic in Spanish, making them difficult for English learners to distinguish (Honig, Diamond, Gutlohn, & CORE, 2008; Cardenas-Hagan, 2011; Bear et al., 2003).
- Some allophones in Spanish are realized differently according to the phonemic context and word position.
- Native Spanish speakers who learn to speak English must learn to map letters onto sounds that do not exist in their native language (Raynolds, Uhry, and Brunner, 2012).
- Five graphemes represent each of the five vowel sounds in Spanish, but 14 vowel sounds in English.
- Unlike Spanish, English lacks transparency, meaning that letters correspond to multiple sounds, and sounds may correspond to multiple letters.
- Research has demonstrated that seeing orthography supports learning pronunciations of unfamiliar words (Rosenthal & Ehri, 2008; Ricketts, Bishop, & Nation, 2009).

Purpose & Hypotheses

- We investigated native Spanish speakers' ability to use orthographic information to more accurately distinguish English phonemic contrasts.
- We predicted that adding orthographic information during perception would aid participants in perceiving non-native phonemic distinctions.
- We expected to see an effect of word position due to saliency effects and/or allophonic distributions.
- Based on the theory of the Matthew Effect, we also predicted that better English decoding ability and higher English proficiency would result in better utilization of orthography.

Method

Subjects

- 20 native speakers of Spanish aged 21 - 45 (mean age = 31)
- Began acquiring English between ages 7 - 32

Stimuli

- Four experimental contrasts were tested (/v/-/b/, /ð/-/d/, /ɪ/-/i/ and /ʌ/-/a/) within CVCVC pseudo-word minimal pairs, with two control pairs created for each experimental pair, resulting in a total of 72 pseudo-word pairs.
- The contrasts were placed in different positions (3 for consonants, 2 for vowels) within the minimal pairs.

Examples

Experimental Contrasts	Control pair 1	Control pair 2
/v/ - /b/: /ˈvɛsɪt/ - /ˈbɛsɪt/	/ˈvɛsɪt/ - /ˈzəsɪt/	/ˈbəsɪt/ - /ˈđəsɪt/
/ð/ - /đ/: /ˈðæsəl/ - /ˈđæsəl/	/ˈðæsəl/ - /ˈvæsəl/	/ˈđæsəl/ - /ˈbæsəl/
/ɪ/ - /i/: /ˈpɪmɪk/ - /ˈpimɪk/	/ˈpɪmɪk/ - /ˈpɑmɪk/	/ˈpimɪk/ - /ˈpeɪmɪk/
/ʌ/ - /a/: /ˈbʌnɪf/ - /ˈbɑnɪf/	/ˈbʌnɪf/ - / ˈbeɪnɪf/	/ˈbɑnɪf/ - /ˈbonɪf/

Task

- The stimuli were presented in two blocks. The first block included only auditory presentation and the second block included both auditory and orthographic representations for the target stimulus. Half of the pairs were presented in the first block, in random order, and the other half appeared in the second block.

Block 1	Block 2
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- An AXB paradigm was used in which participants heard 3 pseudo-words in succession and had to match the target pseudo-word (in the middle) with the first or last pseudo-word.

Materials

- English decoding skills: Word Detective (WD) assessment
- English proficiency: Vocabulary Level Test (VLT)

Analysis

- Series of generalized linear mixed models with binomial errors and a logit link.
- Random intercepts by subject and by word set (A, B, C and D instances for a given stimulus). Models with random slopes generally would not converge.
- Performance on four trials at each crossing of contrast type, contrast position, experimental condition, word set and participant were aggregated and treated as unit of analysis. Analyses for each contrast type conducted separately.

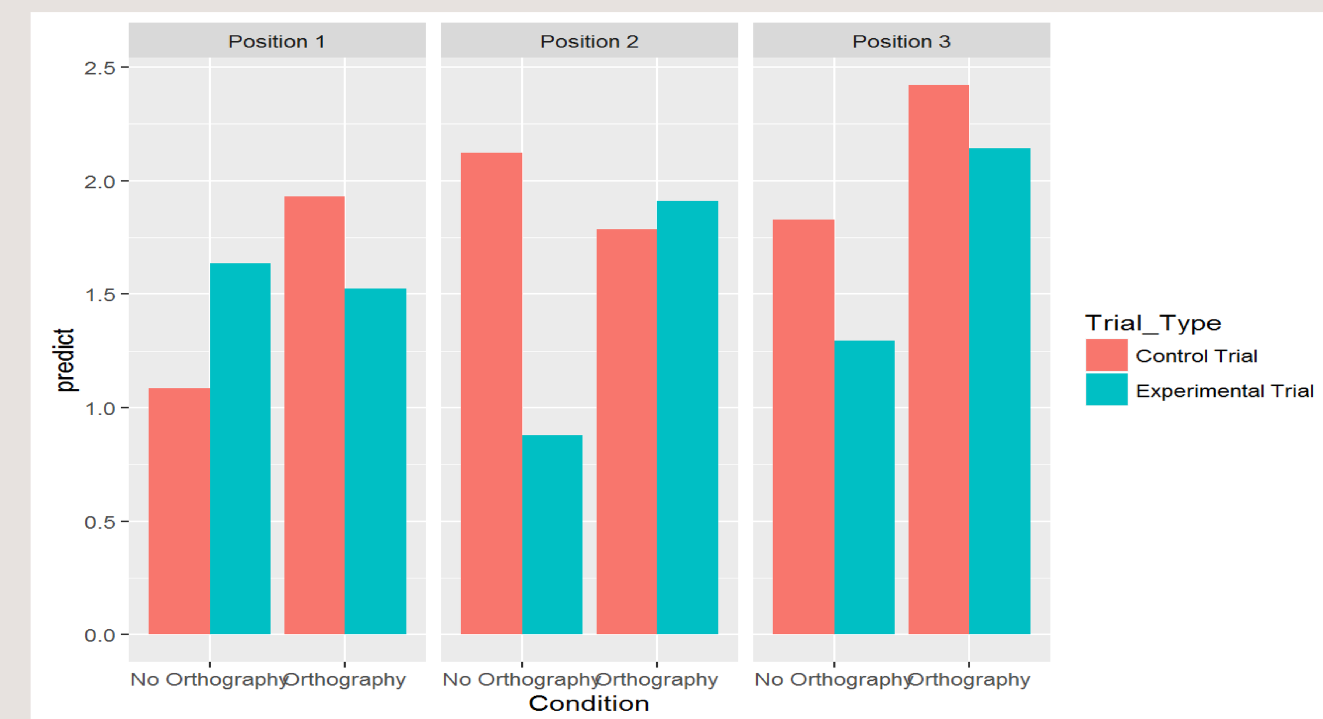
Results

Effect of orthography for entire sample

- To facilitate interpretation, models were parameterized so that baseline level of position was position where experimental contrast was hypothesized to show largest difference. Therefore, interaction between orthography and contrast type represents effect in this position.

/v/-/b/	/ð/-/đ/	/ɪ/-/i/	/ʌ/-/a/
B = -.39, p =.15	B = -.68, p =.01	B = -.01, p =.97	B = -.18, p =.64

Predictions, on logit scale, for the model for the /ð/-/d/ contrast



- Separate analyses conducted for participants with higher and lower English decoding scores on the /ð/-/d/ contrast:
  - High decoding scores: significant interaction between orthography condition and experimental condition (p = .01).
  - Low decoding scores: non-significant interaction between orthography condition and experimental condition (p = .36).
- Separate analyses conducted for participants with higher and lower English vocabulary (VLT) on the /ð/-/d/ contrast :
  - High vocabulary: non-significant interaction between orthography condition and experimental condition (p = .11).
  - Low vocabulary: significant interaction between orthography condition and experimental condition (p = .02).

Summary & Conclusions

- When the contrast is in the middle position, the presence of orthography has a significant effect for the /ð/-/d/ contrast (p = .01). This may be due to lower salience of the middle position phonemes compared to initial and final position phonemes. The orthographic information may boost the help to overcome weaker salience.
- Participants with better English decoding skills showed a benefit of orthography (p = .01).
  - Matthew Effects from research in reading science; "the rich get richer"; those with stronger decoding skills are better able to capitalize on the orthography; cyclical effect
- Participants with lower English proficiency showed a benefit of orthography for the /ð/-/d/ contrast (p = .02).
  - More room for improvement

References & Acknowledgments

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Contact: kpmiles@brooklyn.cuny.edu