





The role of between-language interaction in the diagnosis of phonological disorders in bilingual children

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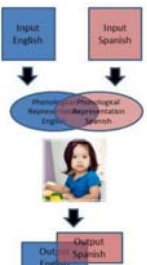
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Background

Bilingual Phonological Representation and Production

Processing Rich Information from Multidimensional Interactive Representations (PRIMIR)



Curtin, Byers-Heinlein, and Werker (2005);
Fabiano-Smith and Goldstein (2010a;
2010b); Fabiano-Smith and Barlow (2010);
Fabiano-Smith, Shuriff, Barlow, and
Goldstein (2014); Fabiano-Smith, Oglivie,
Maiefski, and Schertz (2015)

Bilingual Phonological Acquisition: Spanish and English

- Studies on typically-developing bilingual preschoolers have found:
 - Production differences by language
 - Production differences on gross vs. discrete measures
 - Variable production across children

Gildersleeve-Neumann, et al. (2008); Fabiano-Smith and Goldstein (2010a; 2010b); Fabiano-Smith and Barlow (2010); Goldstein, Fabiano, and Washington (2005)

Clinical Issues

- Bilingual children demonstrate lower levels of consonant accuracy at age 3;0 but catch up by age 5;0
- Mean age of referral for children with phonological disorders is 4;3
- 67% of clinicians have reported using informal measures of phonological assessment
 - Over half of SLPs report calculating phonological patterns for diagnostic purposes

Fabiano-Smith and Goldstein (2010b); Goldstein, Fabiano, and Washington (2005); Skahan, Watson, and Lof (2007)

Previous Work

- Inflation of frequency of *Stopping of Fricatives*
 - As compared to what is expected for English-speaking children on a standardized test
 - English speakers used fricatives as substitutes; Bilingual kids used stops in English
- Spanish stop-spirant alternation is not stable in bilingual children
- Influence of Spanish on English

Fabiano-Smith, Oglivie, Maiefski, and Schertz (2015); Fabiano-Smith (2010)

Research Questions

- Can we extend the PRIMIR model to account for production in bilingual children?
- Can we predict where between-language interaction will occur in production based on the structure of English and Spanish?
- Can we predict where and when between-language interaction will occur based on how the two systems are organized?

Sutherland & Gillon, 2005

Current Study

Initial Consonant Deletion

- The first sound in a word is perceived by listeners as its own, unique sound
- Initial sounds in words are easily identifiable visually
- Often simplistic sounds
- Therefore, children should quickly acquire initial consonants

Bauman-Wangler, 2000; Rieben & Perfetti, 1991; Fougeron & Keating, 1997; Barlow, 2005; Faingold, 1990

Past Studies and Clinical Observations

- Low, but consistent, occurrence of initial consonant deletion in the speech of Spanish-speakers
- Considered disordered if observed by SLPs
- Are we observing initial consonant deletion or initial syllable deletion? Cluster reduction?

Gildersleeve, Davis, and Stubbe (1996); Wing and Flipsen (2010); Goldstein (2001); Anderson (1987); Paden and Moss (1985)

Theoretical Possibilities

- **Prosodic structure account**
 - Productions will conform to one trochaic foot; variation in truncation
- **Trochaic constraint**
 - Initial weak syllable will be deleted
- **Perceptual salience**
 - Stressed, word-final syllables will be preserved

Fikkert (1994); Demuth and Fee (1995); Pater and Paradis, (1996); Gerken (1991; 1994a); Blasdel & Jensen (1970); DuPreez, (1974); Kehoe (2001)

Segmental Influence

- Word-internal unstressed syllables with sonorant onsets are vulnerable to deletion
 - /n/, /l/
- Word-internal unstressed syllables with an obstruent onset are likely to be preserved
 - /p/, /k/
- Does this hold for word-initial syllables as well?

Kehoe (1995)

Cross-Linguistic Considerations

- **Developmental differences** between English and Spanish
 - English speakers acquire stress earlier than Spanish speakers; avoid final syllable for stress placement
 - Spanish speakers progress to foot plus unfooted syllable structure sooner

Hochberg (1986; 1987a; 1987b; 1988); Pons and Bosch, (2010); Allen and Hawkins, (1980); Lleó and Demuth (2000)

Cross-Linguistic Considerations

- Spanish and English both have **trochaic stress**
 - Spanish is syllable-timed, while English is stressed-timed
 - In West Germanic languages, children's productions are faithful to the initial consonant in a syllable
- Spanish does **not** have **reduced** vowels
 - Unstressed syllables have non-reduced vowels
 - English-speaking children tend to delete initial syllables when they contain a reduced vowel
- Spanish has more **complex word shapes** than English
 - More multi-syllabic words

Kehoe (2001); Demuth (2000); Rose (2002); Goad and Rose (2002)
Gennari and Demuth (1997); Lleó and Demuth (1999); Roark and Demuth (2000)

Research Questions

- Do typical Spanish-speaking preschoolers omit initial consonants more often than bilingual Spanish-English speakers?
- Are children omitting initial consonants or initial syllables? Are we simply observing cluster reduction?

Methods

Participants

- 8 bilingual Spanish-English speaking children, mean age 4;0
 - Children were recorded in San Diego, CA and Tucson, AZ
 - Speakers of Mexican Spanish
 - At least 20% input in both Spanish and English
- 9 monolingual Spanish-speaking children, mean age 3;5
 - Recorded in Querétaro, Mexico
 - No input in any other language but Spanish
- Mann-Whitney U showed no significant difference between language groups on age ($p = .059$)

Pearson, Fernández, Lewedeg, and Oller (1997)

Data Collection

- Spanish single word speech samples were recorded using the *Assessment of Spanish Phonology (ASP)* and the *Bilingual English-Spanish Assessment (BESA)*
 - Target items reflect the type and frequency of sounds, syllable types, and clusters in Spanish and English, respectively
 - ASP: 25-60 items BESA: 30 items
- Previous work has not found a difference in child performance on the two probes, thus data were aggregated

ASP, Barlow (2003); BESA, Peña, Gutierrez-Clellen, Iglesias, Goldstein, & Bedore (2013); Redden & Fabiano-Smith (2012)

Analyses

- Speech samples were phonetically transcribed
 - Undergraduate and graduate students trained in narrow IPA
 - Native Spanish speakers
 - Inter- and intra-rater reliability greater than 90% for all samples
- Logical International Phonetics Program (LIPP)

Fabiano-Smith and Goldstein (2010b); Fabiano-Smith, Oglivie, Maiefski, & Schertz (2015); Oller and Delgado (2000)

Analyses

- Percent occurrence of initial consonant deletion
- Segmental vs. syllabic deletion
- Initial segment deletion vs. cluster reduction
- Stressed vs. unstressed syllable deletion
- Foot structure: Remaining syllable conform to one trochaic foot?
- Sonorant vs. obstruent onset in word-initial unstressed syllables

Statistical Analyses

- Mann-Whitney U test
 - Compared the percent occurrence of initial consonant deletion in the productions of monolingual Spanish speakers with the Spanish productions of bilingual children

SPSS v. 20 (2014)

Results

Initial Consonant Deletion: Group Comparison

- Monolingual Spanish speaking children were omitting initial consonants at a higher frequency than bilingual children ($p = .046$)

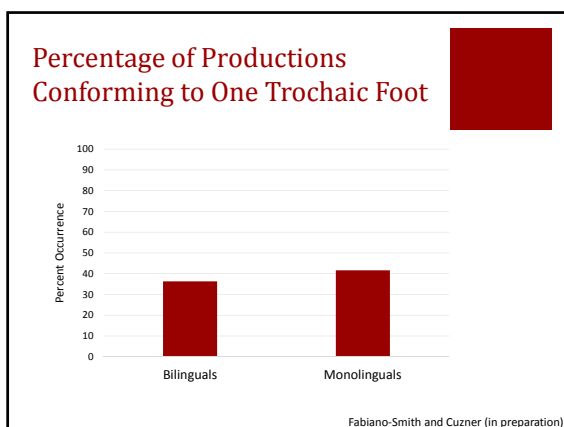
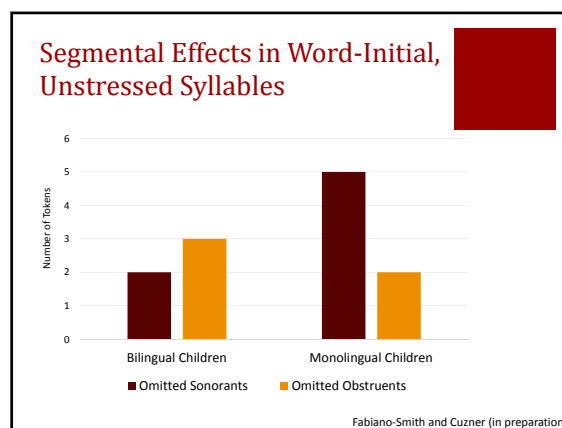
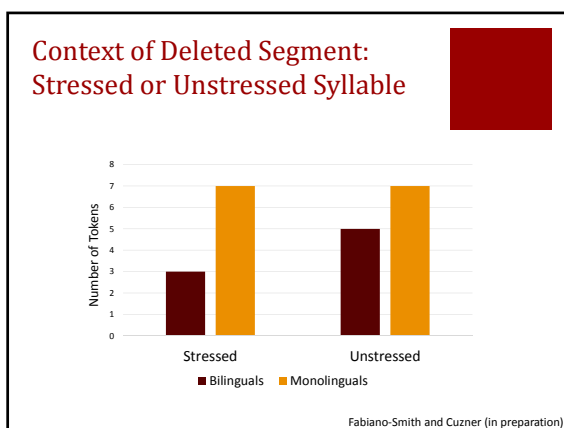
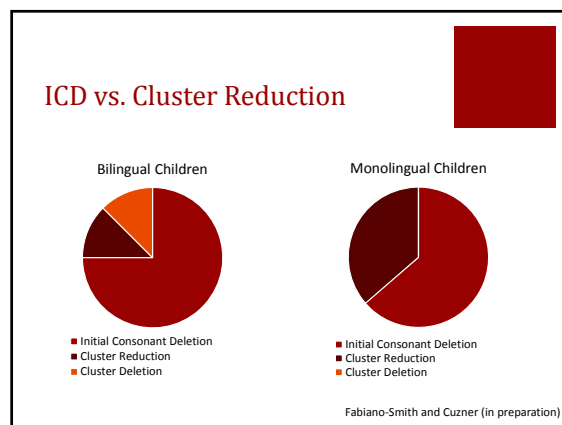
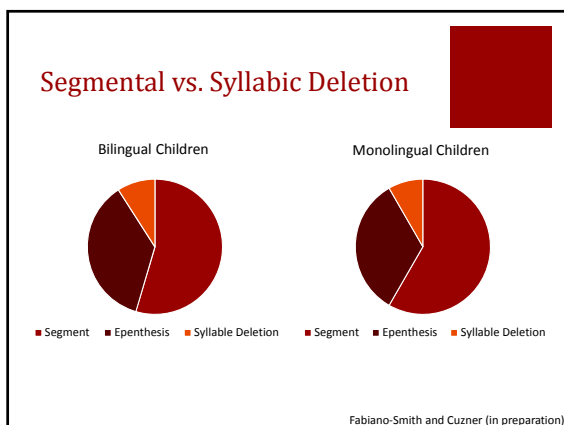
Group	Subject	Percent Occurrence
Bilingual Children	B01	~1
	B02	0
	B03	0
	B04	0
	B05	~1
	B06	0
	B07	0
	B08	0
Monolingual Children	M01	~4
	M02	0
	M03	~10
	M04	~4
	M05	~4
	M06	0
	M07	~4
	M08	0
	M09	~4

Fabiano-Smith and Cuzner (in preparation)

Types and Tokens of Errors

Error Type	Bilinguals (Tokens)	Monolinguals (Tokens)
ICD	~6	~7
Epenthesis	~2	~2
ISO	~1	~1
Syllable Addition	~2	~2
Cluster Reduction	~1	~4
Overall	~12	~16

Fabiano-Smith and Cuzner (in preparation)



Common Target Word Triggers

Gloss	Production	Language Status
rompcabezas /rompekaβesas/ (puzzle)	[obekaβesas]	Monolingual
bruja /bruxa/ (witch)	[pekaβesas]	Monolingual
	[uxa]	Bilingual
rodilla /rođija/ (knee)	[uruha]	Monolingual
	[ođija] (2)	Monolingual
pintura /pintura/ (painting/picture)	[intura]	Bilingual
guitara /gitara/ (guitar)	[itara]	Monolingual

Interesting Patterns

- One bilingual child inserted the glottal stop in initial position across words
 - e.g., humo, sombrero, llueve, castillo
- Initial cluster reduction was common
 - "clavo" (nail) /klaβo/ [laβo]
 - "flor" (flower) /flor/ [ho:], [lor]
- M03 demonstrated a higher percent occurrence of ICD than any other child in the group
 - Reducing clusters and omitting initial consonants

Summary

	Bilinguals	Monolinguals
Percent Occurrence ICD		↑
Initial Segment Deletion		
Cluster Reduction		↑
Initial Syllable Deletion	↑	
Initial Cluster Deletion		
Unstressed Context		≡
Sonorant/Obstruent Rule?	No	Yes
Reduced to Trochee?	No	No

Discussion

Discussion: Similarities

- Both groups followed some typical developmental patterns for Spanish speakers:
 - Produced tri-syllabic words without truncation
 - Reduced 4-5 syllabic words to 3 syllabic words
 - Both used epenthesis
 - "girafa" /xirafa/ [ariafa] (bilingual)
 - "bruja" /bruxa/ [abuxa] (monolingual)
- All children were well beyond the 1-foot developmental level

Leó and Demuth (1996)

Discussion: Differences

- Initial consonant deletion was more widespread in the monolingual group
- Monolinguals reduced more initial clusters than bilinguals
- Monolinguals followed the sonorant/obstruent rule
- Bilinguals reduced segments in unstressed syllable contexts

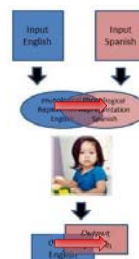
Discussion: Differences

- Bilinguals are omitting less initial segments and cluster members
- Bilinguals are demonstrating knowledge of stress and omission rules
- Bilinguals are maintaining the production of multi-syllabic words
- Bilinguals are not demonstrating the same error pattern on obstruent/sonorant omission

Discussion

- On this particular measure, we could be observing a possible acceleration effect, interference, *and* transfer (PRIMIR 2)
- English speakers acquire stress earlier than Spanish speakers
 - Facilitative
- English speakers tend to delete initial syllables when they contain a reduced vowel
 - Transfer/Interference
- Bilinguals still producing multisyllabic words
 - No effect

Between-Language Interaction



Conclusion

- Between-language interaction at the representational level presents itself at the production level in a bi-directional fashion
 - Facilitation, interference, or no effect are all possibilities
 - Result is *difference*, not evidence of *disorder*
- Structural knowledge of the two languages aids in predicting the type and frequency of between-language interaction
 - Aids in accurate diagnosis of phonological disorders

Future Directions

- Acoustic analysis for initial glottal stop
- Analysis of English for cross-linguistic comparison
- Large-scale normative data for bilingual children are essential for bilingual children; larger, more inclusive set of phonological error patterns

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