Frequency and complexity differences predict interaction in bilingual phonological acquisition

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Overview
Interaction (Paradis & Genesee 1996)
- Hypothesis: bilinguals’ acquisition of one language affects their acquisition of the other
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  - Frequency
  - Complexity
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    - Frequency
    - Complexity

- Acquisition of syllable structure
  - Spanish, English mono- and bilinguals
  - Singleton codas, Onset Clusters
What does interaction look like?

- Two separate systems that interact (Paradis and Genesee 1996)
  - Transfer
  - Deceleration
  - Acceleration
What does interaction look like?

- Two separate systems that interact (Paradis and Genesee 1996)
  - Transfer
  - Deceleration
  - Acceleration
Deceleration
Deceleration

- Lower production accuracy
  - Consonants and vowels, consonant clusters (Gildersleeve-Neumann et al. 2008)
  - Certain consonant classes (Fabiano-Smith & Goldstein 2010)
    - Spanish: trill, fricatives, glides
    - English: stops, fricatives
  - Vowels (length contrast in German, Kehoe 2002)
  - Prosodic structure (unfooted syllables in Spanish, Lleó 2002)
Deceleration

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Acceleration
Acceleration

- Higher production accuracy
  - Syllable types (singleton coda, in Lleó et al. 2003)

- Larger, more varied phonetic inventories
  - Singleton Coda (Lleó et al. 2003)
  - Generally, esp. unshared sounds (Johnson & Lancaster 1998)
Predicting where and how
Predicting where and how

- Frequency: Deceleration, acceleration
  - Acceleration: bilingual exposure > monolingual exposure
  - Deceleration: bilingual exposure < monolingual exposure

Complexity: Acceleration

In monolingual acquisition
- Syllable types (Levelt, Schiller, & Levelt 2000)
- Syntactic structure (Wexler 1982)
- Cluster types (Gierut 1999)

In bilingual acquisition
- Syntactic structure (Döpke, 2000)
Predicting where and how

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Testing effects of frequency and complexity in bilingual learners

- Spanish, English
  - Differences in frequency, complexity, restrictedness
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  - Differences in frequency, complexity, restrictedness
    - Complex onsets
      - Slightly more frequent in Spanish (13.8% > 10.5%)
    - Differently complex
      - English: 3 element clusters
      - Spanish: approximant-liquid clusters (Bakovic 1994, Barlow 2003a)
Testing effects of frequency and complexity in bilingual learners

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      - English: 3 element clusters
      - Spanish: approximant-liquid clusters (Bakovic 1994, Barlow 2003a)
  - Singleton codas
    - More frequent in English (48.7% > 30.8%)
    - More varied in English
    - Effect of complex codas?
Participants

- 15 participants
  - 5 monolingual Spanish speakers
    - (28.5-50.03 mo., Average: 39.1 mo.)
  - 5 monolingual English speakers
    - (29.47-51.6 mo., Average: 38.6 mo.)
  - 5 bilingual Spanish-English speakers
    - (25.23-55.47 mo., Average: 44.1 mo.)

- Bilingual Status
  - Early bilinguals (Flege et al. 1999, Hamers & Blanc 2000)
Materials

- Transcriptions of participant productions
  - Target words: onset clusters or singleton codas
  - Phonological probes (AEP, Barlow, 2003b; ASP, Barlow, 2003c)
    - Picture-naming task
    - Delayed imitation when necessary
  - Onset cluster opportunities
    - 77 English, 41 Spanish
  - Singleton coda opportunities
    - 187 English, 94 Spanish
Methods: Segmental Accuracy

- Only faithful productions counted as accurate
  - ‘leaf’ → [lif] = hit (faithful)
    → [lip] = miss (substitution)
    → [li] = miss (deletion)
  - ‘tigre’ → [tiɣre] = hit (faithful)
    → [tiɣle] = miss (substitution)
    → [tiɣe] = miss (deletion)
Methods: Structural Accuracy

- Consonant substitutions also counted as accurate
  - ‘leaf’ → [lif] = hit (faithful)
  - → [lip] = hit (substitution)
  - → [li] = miss (deletion)
  - ‘tigre’ → [tiɣre] = hit (faithful)
  - → [tiɣle] = hit (substitution)
  - → [tiɣe] = miss (deletion)
Predictions: Frequency

- Effects of frequency
  - Accelerated acquisition of singleton codas in Spanish relative to Spanish monolinguals
  - Decelerated acquisition of singleton codas in English relative to English monolinguals

Spanish Singleton Codas: Bilingual > Monolingual

English Singleton Codas: Monolingual > Bilingual
Predictions: Complexity

- Effects of complexity
  - Accelerated acquisition of onset clusters in both Spanish and English relative to monolinguals
  - Accelerated acquisition of singleton codas in Spanish relative to Spanish monolinguals

Spanish and English Onset Clusters:
Bilingual > Monolingual

Spanish Singleton Codas:
Bilingual > Monolingual
Accuracy Results
Singleton Codas: Spanish

**Spanish: Segmental Accuracy**

- **N.S.**

**Spanish: Structural Accuracy**

- **N.S.**

**Prediction:**

Bilingual > Monolingual

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Singleton Codas: English

**English: Segmental Accuracy**

**English: Structural Accuracy**

**Prediction:**

Monolingual > Bilingual
Onset Clusters: Spanish

**Prediction:** Bilingual > Monolingual
Onset Clusters: English

**English: Segmental Accuracy**

- **Monolingual**
- **Bilingual**

**English: Structural Accuracy**

- **Monolingual**
- **Bilingual**

**Prediction:**

Bilingual > Monolingual

[Green check symbol]
Conclusions

- Did frequency and complexity predict when and how interaction would occur?
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  - Yes!
  - Frequency: Decelerated acquisition of singleton codas in English
  - Complexity: Accelerated acquisition of onset clusters in both languages
Conclusions

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    - Frequency: Decelerated acquisition of singleton codas in English
    - Complexity: Accelerated acquisition of onset clusters in both languages
  - Need more data:
    - Frequency, Complexity: Accelerated acquisition of codas in Spanish suggested by a numerical trend, but not significant
Spanish Singleton Codas

Monolingual Spanish Singleton Coda Productions

Bilingual Spanish Singleton Coda Productions

Participant

Percentage of Total Attempts

- deletions
- substitutions
- accurate productions

Participant

Percentage of Total Attempts

- deletions
- substitutions
- accurate productions
Ongoing work

- More participants, smaller age range (3-4 y.o.)
- Phonetic inventories
- Accuracy for particular segments
- Complex codas in English
Thanks!

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- Thank you!
References


References, cont.


## Participant Ages

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<th>SPANISH MONOLINGUAL</th>
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<td>E04 51.6</td>
<td>S04 50.03</td>
<td>B05 55.47</td>
</tr>
</tbody>
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General Error Patterns

Spanish Singleton Coda Error Patterns

Percent of Total Errors

- Deletions
- Substitutions

Monolinguals

Bilinguals
General Error Patterns

English Singleton Coda Error Patterns

Percent of Total Errors

- Monolinguals
- Bilinguals

- deletions
- substitutions
General Error Patterns

Spanish Onset Cluster Error Patterns

- Monolinguals
- Bilinguals

Percent of Total Errors

- deletions
- reductions
- substitutions
General Error Patterns

English Onset Cluster Error Patterns

- Percent of Total Errors
- Monolinguals vs. Bilinguals
- Error patterns: deletions, reductions, substitutions
English Onset Clusters

Monolingual English Onset Cluster Productions

Bilingual English Onset Cluster Productions

Participant

Participant
Spanish Onset Clusters

Monolingual Spanish Onset Cluster Productions

Bilingual Spanish Onset Cluster Productions

Participant

Participant

Percentage of Total Attempts

Percentage of Total Attempts

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

S01 S02 S03 S04 S05 Group Average

B01 B02 B03 B04 B05 Group Average

deletions reductions substitutions accurate productions deletions reductions substitutions accurate productions
English Singleton Codas

Monolingual English Singleton Coda Productions

Bilingual English Singleton Coda Productions

Participant

Percentage of Total Attempts

deletions
substitutions
accurate productions

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Percentage of Total Attempts

deletions
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