The Rhythmic and Intonational Properties of Spanish/English Bilinguals in California

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Introduction

• Multiple studies have concentrated on the prosodic properties in Spanish. (Navarro-Tomas, 1974; Quilis, 1987; Rasmus at al. 1999; Hualde 2002, 2005; Prieto et al. 2010 inter alia)
  ▫ Rhythm
  ▫ Intonation

• Less attention has been paid to these properties in bilingual speakers and language contact situations. (Elordieta, 2003; O’Rourke, 2005, 2008; Colantoni et al. 2004; Carter, 2005; Alvord 2006; Nava, 2010)

• No study has looked at both prosodic features in bilinguals simultaneously.

Study of the Spanish and English rhythm and intonation in the Mexican community in California.
Research questions

• Are the characteristics of Spanish rhythm and intonation modified by the contact with a language that has different prosodic properties (e.g. English)?

If there are modifications:

• Do they affect the whole Spanish speaking community homogeneously or do the time or the length of exposure to English make a difference?

• Are the prosodic features of rhythm and intonation equally affected?
Rhythm - Introduction

- Rhythm: systematic occurrence of strong/stressed/heavy and weak/unstressed/light speech elements over time.


- **English**
  - more stressed-timed
  - foot as the rhythmic unit
  - avoidance of stress clashes
  - stresses at regular intervals
  - vowel reduction

- **Spanish**
  - more syllable-timed
  - syllable as rhythmic unit
  - stress clashes are not avoided
  - stresses at irregular intervals
  - no vowel reduction
Rhythm - Participants

• 49 participants (in 5 groups) from Los Angeles County (CA):

  • **Control English**: 12 native speakers of English from the L.A. area.
    
    Current age: 28.6

  • **Adult Early Bilinguals**: 8 Mexican Spanish/English adult bilinguals who moved to L.A. early in their childhood and were raised there.
    
    Age on arrival: 3.3 & Current age: 34.3
    Spanish – Mother tongue but gradual loss in favor of English.
• **L.A.-born Bilinguals**: 11 Mexican Spanish/English young bilingual descendants of Mexican immigrants who were born and raised in L.A.
  
  Age on arrival: 0 & Current age: 16.6
  
  Spanish – Mother tongue with English.

• **Adult Late Bilinguals**: 7 Mexican Spanish/English bilinguals who moved to L.A. when they were adults.

  Age on arrival: 21.7 & Current age: 43.7
  
  Spanish – Mother tongue. General use of English.

• **Control Spanish**: 11 Mexican Spanish speakers who have never been to the U.S. or have stayed in L.A. for a short period of time.

  Time in L.A.: 0.9 & Current age: 35.7
  
  Spanish – Mother tongue. English at school.
Rhythm - Materials & Methodology

• “The North Wind and the Sun” & “El Viento Norte y el Sol” (Grabe and Low, 2002; Zubizarreta and Nava, 2009; Nava, 2010). To control for the words and sentences produced.

• Normalized Pairwise Variability Index
  nPVI (Low, Grabe and Nolan, 2000).
  Manual measurements of successive pairs of vowels:

  \[
  \text{nPVI} = \frac{\text{abs}(\text{Vowel A} - \text{Vowel B}) \times 100}{((\text{Vowel A} + \text{Vowel B}) / 2)}
  \]

  Controls for speech rate.
Rhythm - Results

- English-like rhythm in groups that had an early contact with the language.
- L1 influence in the adult late bilinguals and the control Spanish groups.
Spanish

- Spanish-like rhythm in groups that have had less contact with English.
- Language attrition in the adult early bilinguals.
- Systematic shift in rhythm of the L.A. born bilinguals.
Intonation - Introduction

• Intonation in Spanish and English: Use of pitch (F₀) to convey different pragmatic meanings (Hualde, 2005)


• Main characteristics:
  • English: H* in pre-nuclear pitch accents (Pierrehumbert 1980, 2000)
  • Mexican Spanish: Nuclear pitch accents with circumflex contours and sustained final tones (Matluck, 1951; Quilis, 1993; Sosa 1999; Martin Butragueño 2004, 2006)
• 31 participants belonging to the same 5 groups:
  • 8 Control English
  • 8 Adult Early Bilinguals
  • 7 L.A.-born Bilinguals
  • 4 Adult Late Bilinguals
  • 4 Control Spanish

• 10 neutral declarative sentences (6 Spanish / 4 English) in semi-spontaneous speech:
  • 100 pre-nuclear pitch accents in initial position in Spanish.
  • 92 pre-nuclear pitch accents in initial position in English.
  • 143 nuclear pitch accents in Spanish
  • 83 nuclear pitch accents in English
### Intonation - Results

- Three main tones and two variants in pre-nuclear position  
  (Spanish ToBI notations - Prieto and Roseano, 2010)

<table>
<thead>
<tr>
<th>Tone</th>
<th>Representation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L*+H</td>
<td><img src="image1" alt="L*+H" /></td>
<td>Fo valley on the accented syllable and a delayed Fo rise.</td>
</tr>
<tr>
<td>L*+H (int)</td>
<td><img src="image2" alt="L*+H (int)" /></td>
<td>Fo rise at the onset of the stressed syllable with a peak outside the limits of the stressed syllable.</td>
</tr>
<tr>
<td>H% L*+H</td>
<td><img src="image3" alt="H% L*+H" /></td>
<td>High Fo (plateau) throughout the stressed syllable.</td>
</tr>
</tbody>
</table>

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<tr>
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<tbody>
<tr>
<td>L+&gt;H*</td>
<td><img src="image4" alt="L+&gt;H*" /></td>
<td>Fo rise at the onset of the stressed syllable with a peak outside the limits of the stressed syllable.</td>
</tr>
</tbody>
</table>
- L+>H*

- H% L*+H

- L*+H

- H*
• Extended use of L+>H* and L*+H (int) in both languages.
• Use of H* in the first 3 groups vs. use of L*+H in the last 3 groups.
• Similar % of pitch-accents in English and Spanish within groups.
Six tonemes (nuclear pitch accent + boundary tone) (Butragueño, 2006 & Spanish ToBI notations - Prieto and Roseano, 2010)

<table>
<thead>
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<tbody>
<tr>
<td>H*L%</td>
<td><img src="image" alt="H*L%" /></td>
<td>Fo rise of 1.5 semitones or less in the accented syllable.</td>
</tr>
<tr>
<td>L+H* L%</td>
<td><img src="image" alt="L+H* L%" /></td>
<td>Fo rise between 1.5 and 3 semitones in the accented syllable.</td>
</tr>
<tr>
<td>L+iH* L%</td>
<td><img src="image" alt="L+iH* L%" /></td>
<td>Fo rise rise of more than 3 semitones in the accented syllable.</td>
</tr>
<tr>
<td>L* L%</td>
<td><img src="image" alt="L* L%" /></td>
<td>Lowering of semitones in the accented syllable.</td>
</tr>
<tr>
<td>LH%</td>
<td><img src="image" alt="LH%" /></td>
<td>Complex low-high boundary tone and sustained boundary tone</td>
</tr>
<tr>
<td>!H% (or M%)</td>
<td><img src="image" alt="!H% (or M%)" /></td>
<td></td>
</tr>
</tbody>
</table>

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- **H* L%**

- **L* L%**

- **L+IH* L%**

- **!H%**
Use of H*L% in the first 2 groups vs. L*L% in the last three groups.

L+¡H*L%, LH% and !H% not produced by the Control English group.
Summary

• Control English
  Stress-timed rhythm in both languages
  Use of H* and H*L% / No use of Spanish tones

• Adult early bilinguals
  Stress-timed rhythm in both languages
  Use of H* and H*L% / Use of L+iH*L% and !H%

• L.A. born bilinguals
  Stress-timed rhythm in English and syllable-timed in Spanish
  Use of H* / Use of L*+H, L*L% and L+iH*L%

• Adult late bilinguals
  Syllable-timed rhythm in both languages
  No use of H* / Use of L*+H, L*L%, !H%, LH% and L+iH*L%

• Control Spanish
  Syllable-timed rhythm in both languages
  No use of H* / Use of L*+H, L*L%, !H%, LH% and L+iH*L%
Answering the questions

• Are the characteristics of Spanish rhythm and intonation modified by the contact with a language that has different prosodic properties (e.g. English)?

Spanish prosody can be modified due to the exposure to English.

• Do they affect the whole Spanish speaking community homogeneously?

Speakers show different levels of modification in their prosody due to the different amounts of exposure.

• Are the prosodic features of rhythm and intonation equally affected?

Both prosodic features can be affected but the change rate may differ.
Future research and WIP

• Other pragmatic meanings.
• Modeling of tone alignments.
• Longitudinal study.
• Characteristics outside the domain of prosody.
• Other Spanish speaking communities.
References

- Carter, P. M. 2005. Quantifying rhythmic differences between Spanish, English, and Hispanic English. In R. S. Gess, & E. J. Rubin (Eds.), Theoretical and experimental approaches to romance linguistics: Selected papers from the 34th linguistic symposium on romance languages (Current issues in linguistic theory 272). Amsterdam, Philadelphia: John Benjamins, 63–75.