

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

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Sergio Robles-Puente  
roblespu@usc.edu

*Department of Linguistics*



**USC** University of  
Southern California

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# Introduction

- Multiple studies have concentrated on the prosodic properties in Spanish. (Navarro-Tomas, 1974; Quilis, 1987; Rasmus et 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 and Spanish have different rhythms (Abercrombie 1967, Dauer 1983, Rasmus et al. 1999, Carter 2005, Dellwo et al. 2007, Nava 2010, inter alia).
- 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
    - Spanish – High School. English mother tongue.
  - 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.

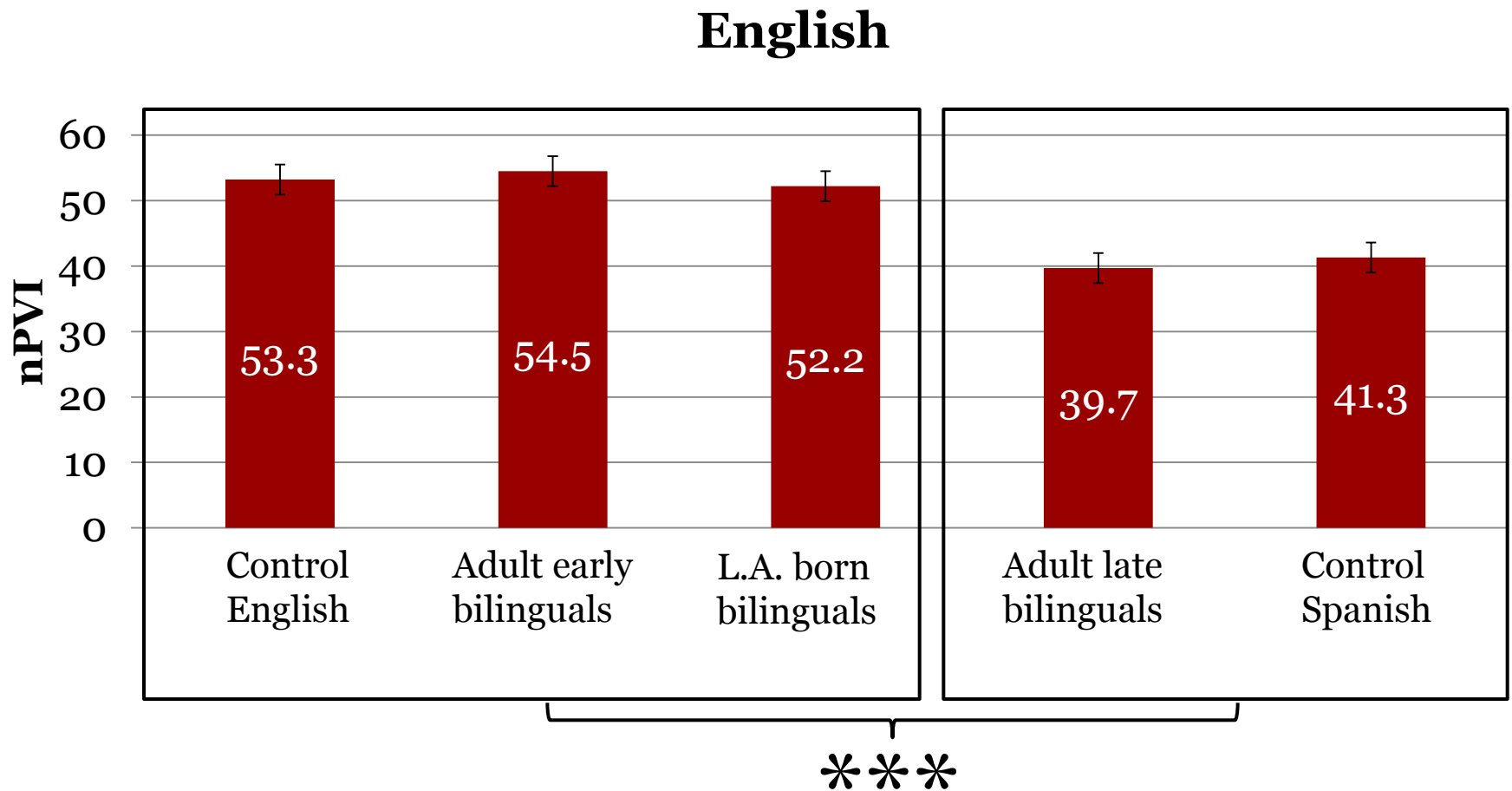
# Rhythm - Materials & Methodology

- “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:

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

Controls for speech rate.

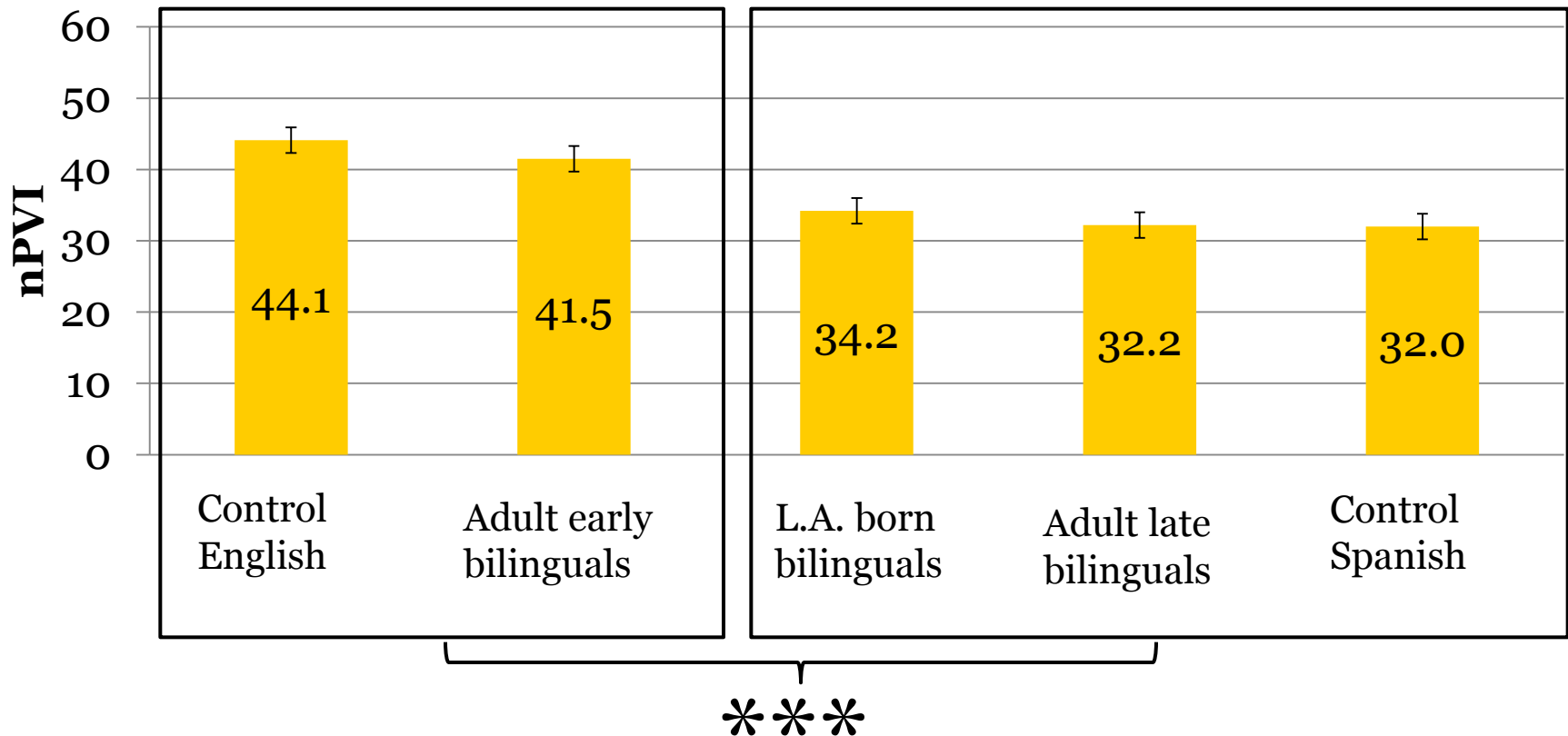
# Rhythm - Results



- 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

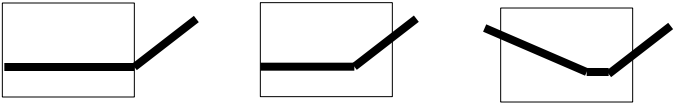
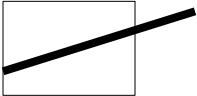

- Intonation in Spanish and English : Use of pitch (F<sub>0</sub>) to convey different pragmatic meanings (Hualde, 2005)
- Autosegmental-Metrical model of intonational phonology: Association of tones with stressed syllables (Pierrehumbert and Beckman 1988, Ladd 1996, Gussenhoven 2004, Beckman et al. 2005 inter alia)
- 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; Martín Butragueño 2004, 2006)

# Intonation - Participants & Materials

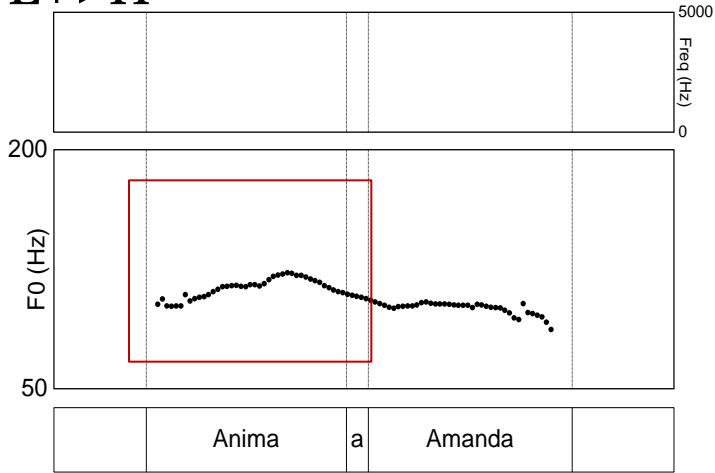
- 31 participants belonging to the same 5 groups:
  - 8 Control English
  - 8 Adult Early Bilinguals
  - 7 L.A.-born Bilinguals
  - 4 Adult Late Bilinguals
  - 4 Control Spanish
- 10 neutral declarative sentences (6 Spanish / 4 English) in semi-spontaneous speech:
  - 100 pre-nuclear pitch accents in 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

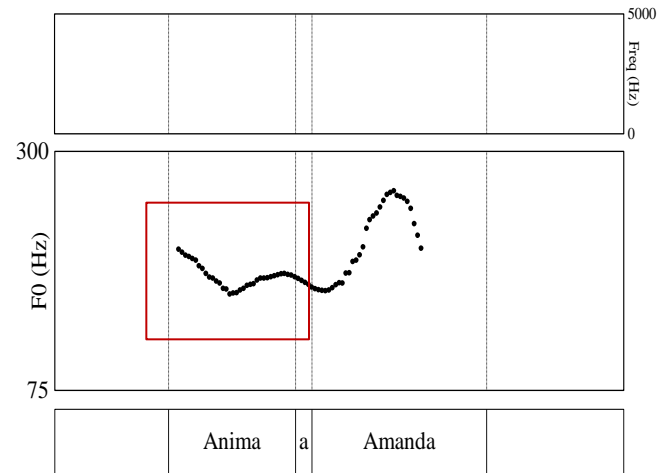
- Three main tones and two variants in pre-nuclear position (Spanish ToBI notations - Prieto and Roseano, 2010)

Tone	Representation	Description
$L^*+H$	 <p data-bbox="316 719 1016 765"><math>L^*+H</math>      <math>L^*+H</math> (int)      <math>H\% L^*+H</math></p>	Fo valley on the accented syllable and a delayed Fo rise.
$L+>H^*$		Fo rise at the onset of the stressed syllable with a peak outside the limits of the stressed syllable.
$H^*$		High Fo (plateau) throughout the stressed syllable.

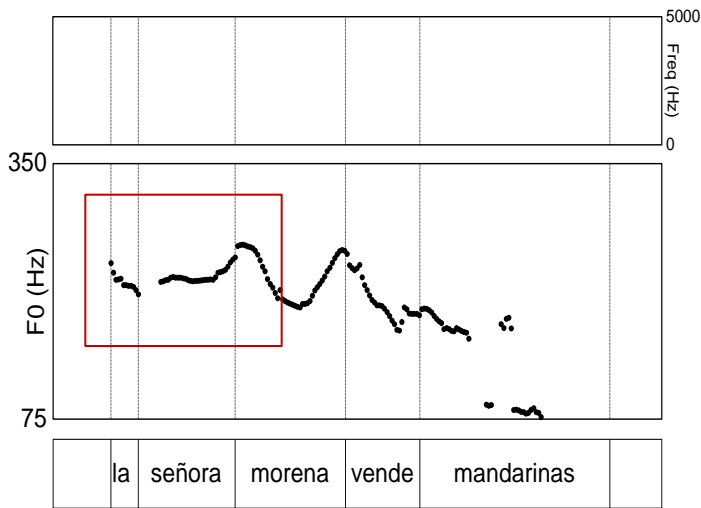
- $L+>H^*$



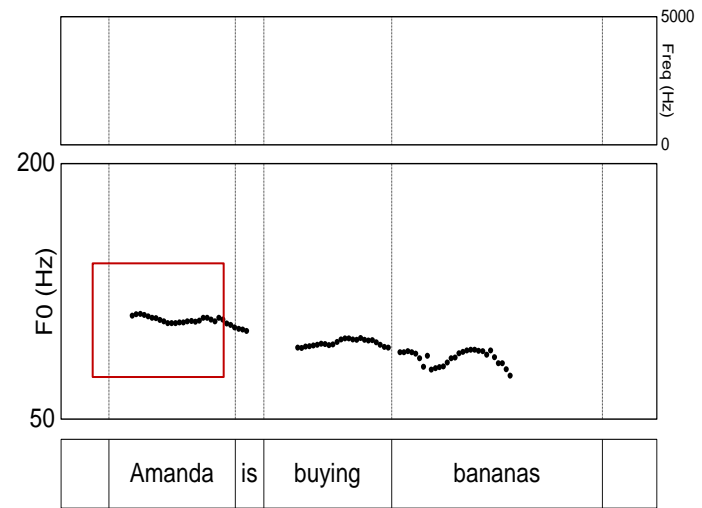
- $H\% L^*+H$



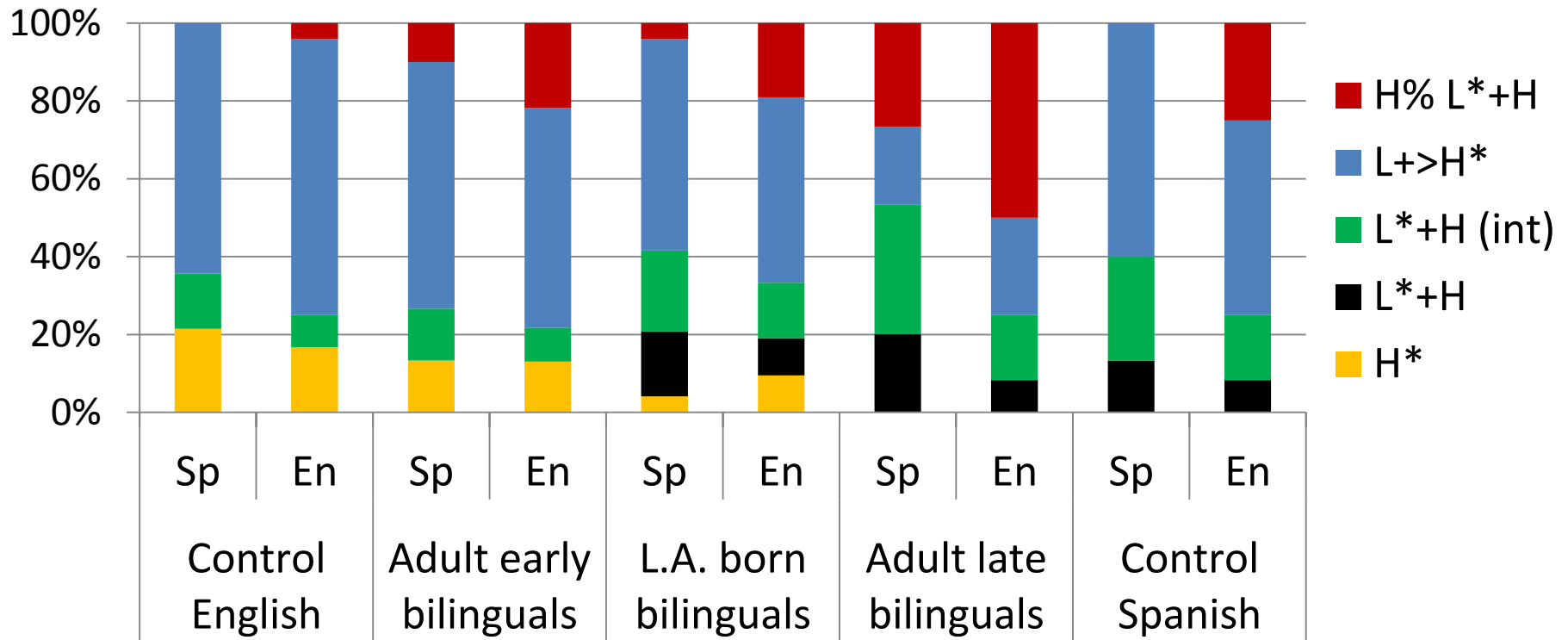
- $L^*+H$



- $H^*$

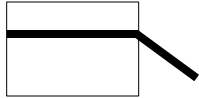
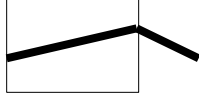


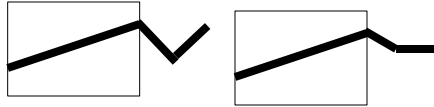


## Pre-nuclear Pitch-Accents

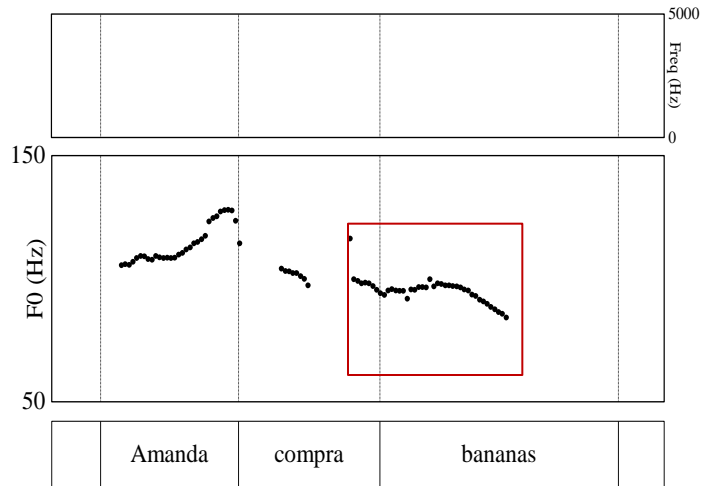


- Extended use of L+>H\* and L\*+H (int). in both languages.
- Use of H\* in the first 3 groups vs. use of L\*+H in the last 3 groups.
- Similar % of pitch-accents in English and Spanish within groups.

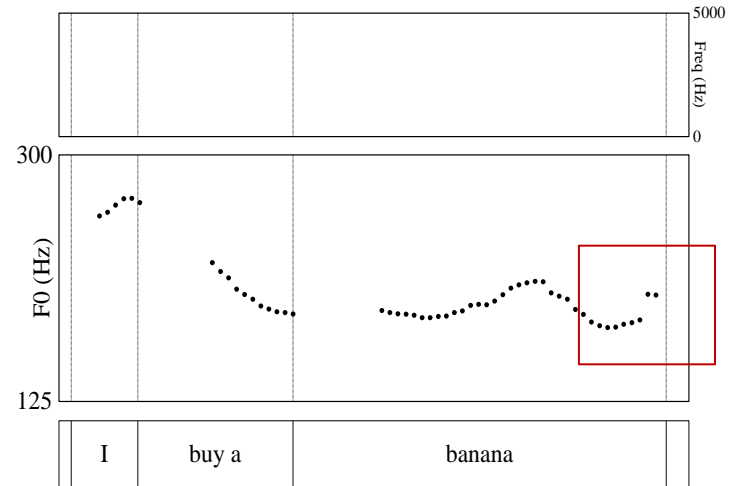
- Six tonemes (nuclear pitch accent + boundary tone)  
(Butragueño, 2006 & Spanish ToBI notations - Prieto and Roseano, 2010)

Tonemes	Representation	Description
H*L%		Fo rise of 1.5 semitones or less in the accented syllable.
L+H* L%		Fo rise between 1.5 and 3 semitones in the accented syllable.
L+iH* L%		Fo rise of more than 3 semitones in the accented syllable.
L* L%		Lowering of semitones in the accented syllable
LH% !H% (or M%)		Complex low-high boundary tone and sustained boundary tone

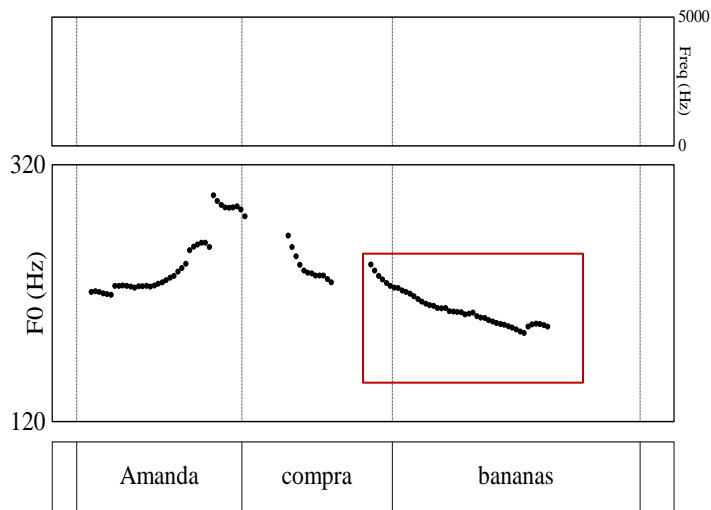
- **H\* L%**



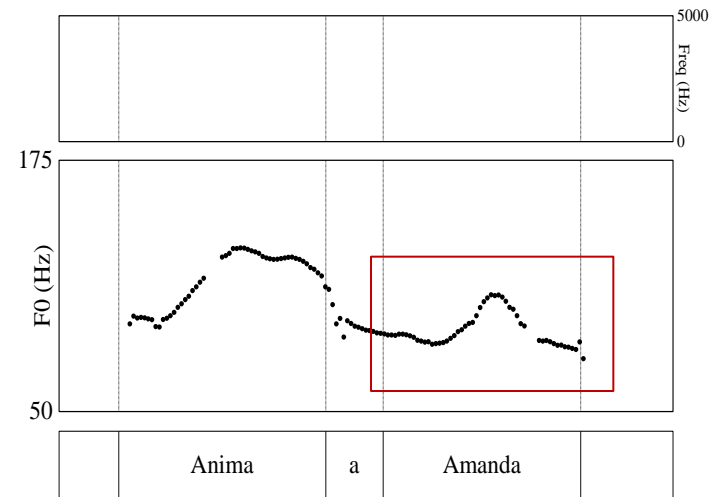
- **!H%**



- **L\* L%**

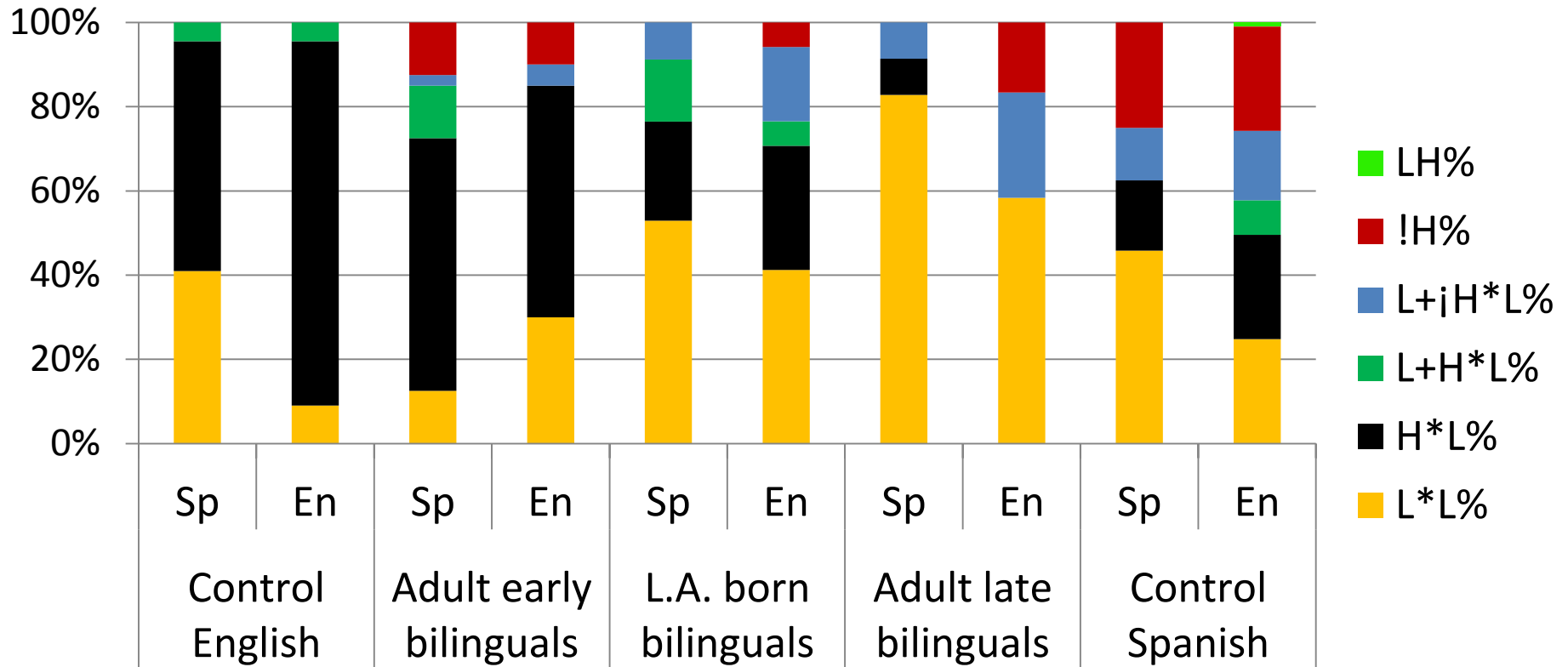


- **L+iH\* L%**





## Nuclear Pitch-Accents



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

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