



Learning to resyllabify across words: a training study

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Background

Previous phonetic training studies in Spanish have been only segmental (Arteaga 2000, Lord 2005), such as VOT, intervocalic lenition, etc. However, no improvement in production through explicit learning in a computer study (Kissling 2013)

Little attention paid to external sandhi processes by L2 speakers, despite its importance to producing and understanding fluent, connected speech. Rasmussen & Zampini (2005) measured the awareness of synaloepha (e.g. [la'miya] for *la amiga*) and found that L2 speakers transcribed less than 1% of these occurrences correctly.

A similar problematic process in Spanish is consonantal resyllabification across word boundaries (Hualde 2005):

las#a.las → la.s#a.las 'the wings'
(homophonous with *la salas* 'you salt it')

Additionally, <r> is resyllabified across word boundaries before vowels, but only as a tap (variable before consonants). Word initial <r> is always a trill:

ve rocas [r] 's/he sees rocks'
ver ocas [r] 'to see geese'

Tap and trill not orthographically distinguished, unlike word internally (*pero* / *perro*)

In English, resyllabification of this type is optional, but many speakers keep VC#V and V#CV sequences distinct by introducing a glottal stop or glottalization before a vowel-initial word. This tends to be speaker dependent, with rates of 25-100% by speaker (Umeda 1976, Scobbie & Pouplier 2010, Ladd et al 2003), but not well studied.

One previous study looked at resyllabification in Spanish by English speakers: Holt (2008) in a production experiment in which participants read sentences found that students who had phonetic training resyllabified word-final consonants in 60% of possible contexts, a 20% gain over their performance prior to training and compared to the 80% rate of native Spanish speakers. However, these ratings were made impressionistically; no further analysis is provided with regard to consonant identity or presence or type of glottalization in the non-resyllabified tokens.

Research Questions

- (1) How are V#CV and VC#V sequences realized by non-native speakers of Spanish? Are there differences in rates of glottalization when compared to native speakers?
- (2) Are there differences in the realization depending on the consonant that straddles the word boundary, such as with /n/, /s/, and /r/?
- (3) Can resyllabification be improved through explicit instruction?

Training

The L2 speakers took a semester long class on general Spanish Phonetics and Phonology (SPAN 303) at UIUC, following Terrell Morgan's *Sonidos en contexto* textbook: Resyllabification was taught in two basis stages:

(1) how to divide sentences into syllables (pp. 43-6), including production practice of phrases like *dos iguanas* (p44).

(2) later in the course, explicit mention of the difference between resyllabification of /r/ and other consonants, as well as the pronunciation of word-initial <r> (pp. 343-4). This was reinforced with visual inspection of spectrograms of phrases like *ver ocas* vs. *ve rocas*.

Methodology

Native Speakers: recruited in Querétaro, Mexico.

Task: At both Time 1 and Time 2 participants read a series of meaningful sentences containing /N#CV/, /VC#V/ for /n/, /s/, and /r/

[V#rV] - e.g. *ve ratas* vs. [Vr#V] e.g. *ver alas* x 32 (16 C-initial)

[V#nV] *si notas* vs. [Vn#V] *sin otros* x 24 (12 C-initial)

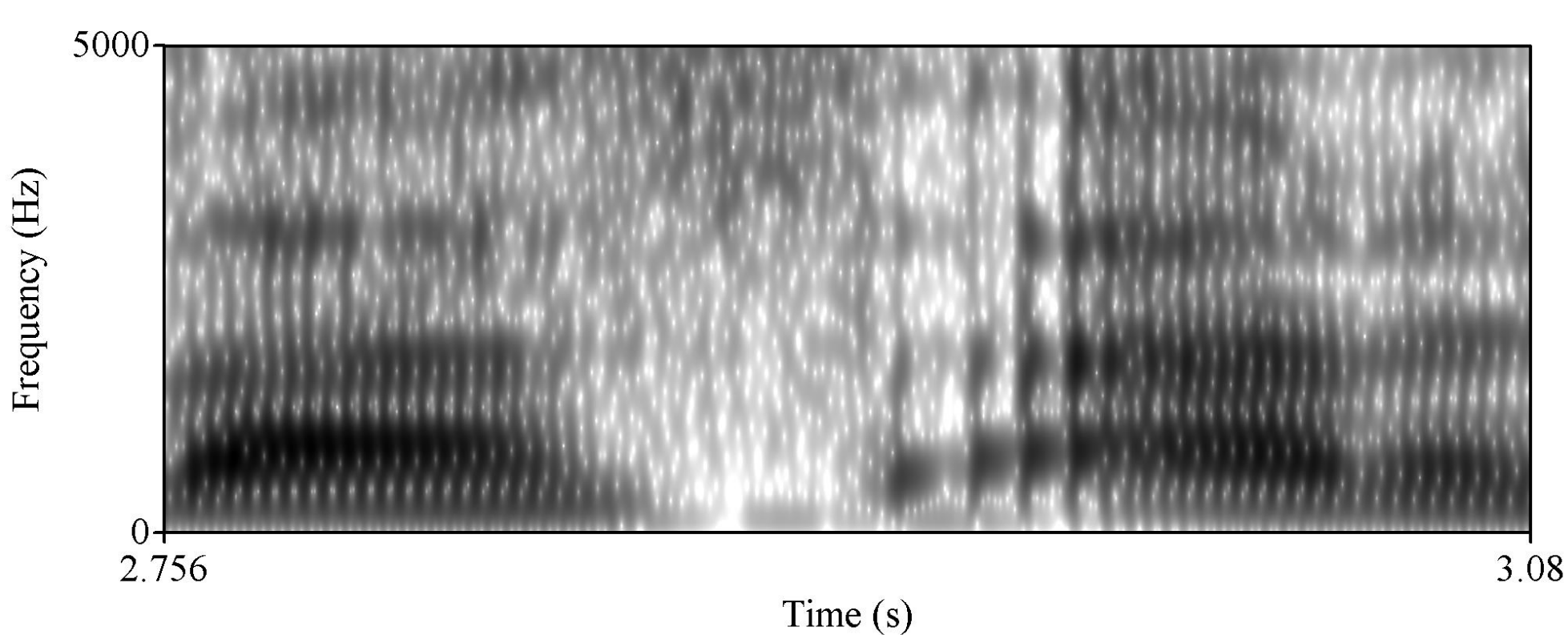
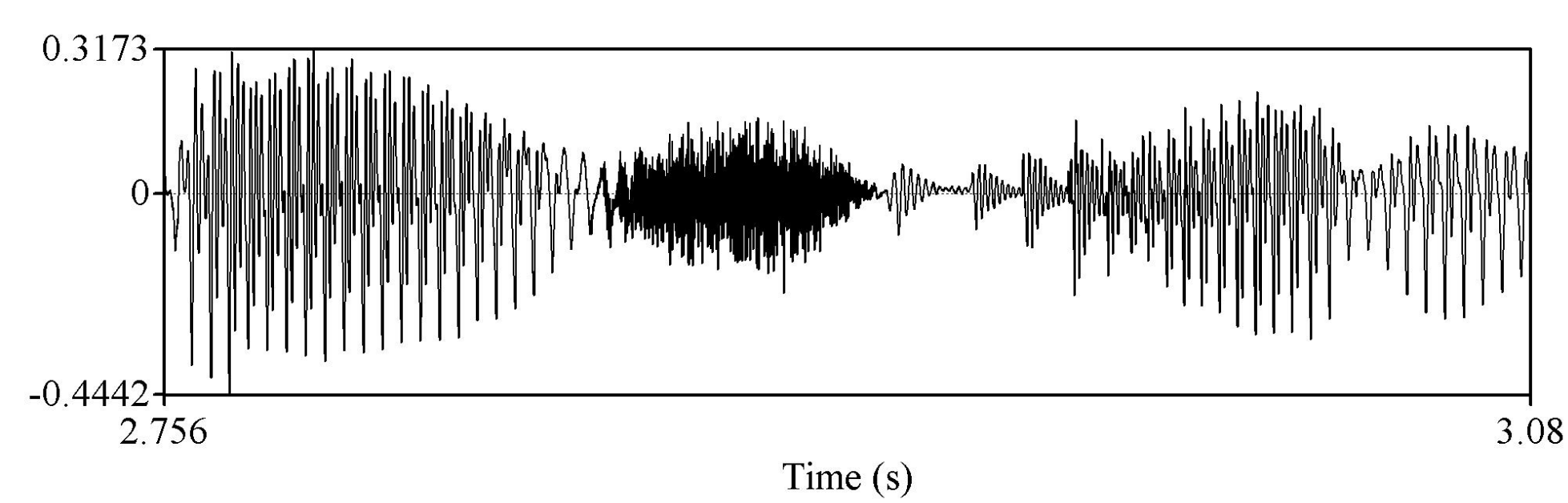
[V#sV] *la sardina* vs. [Vs#V] *las ardillas* x 24 (12 C-initial)

80 tokens x 6 NS = 480 NS tokens

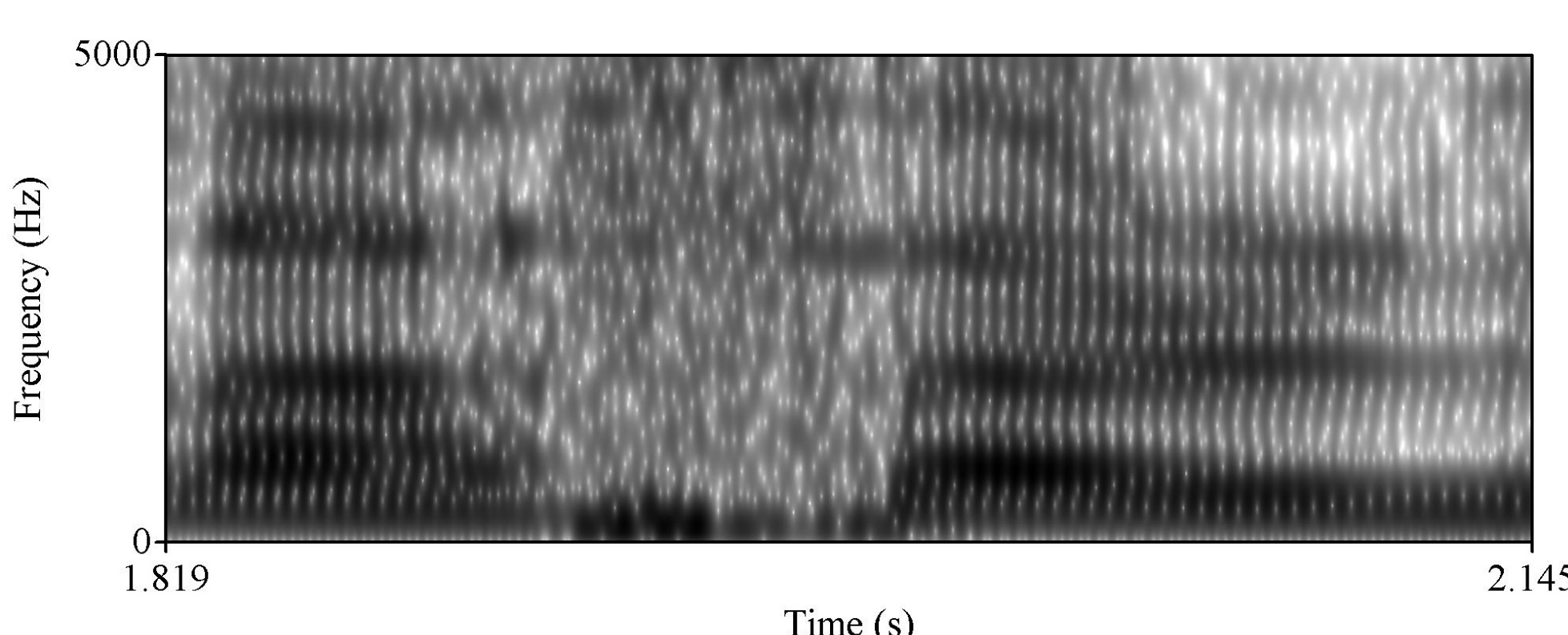
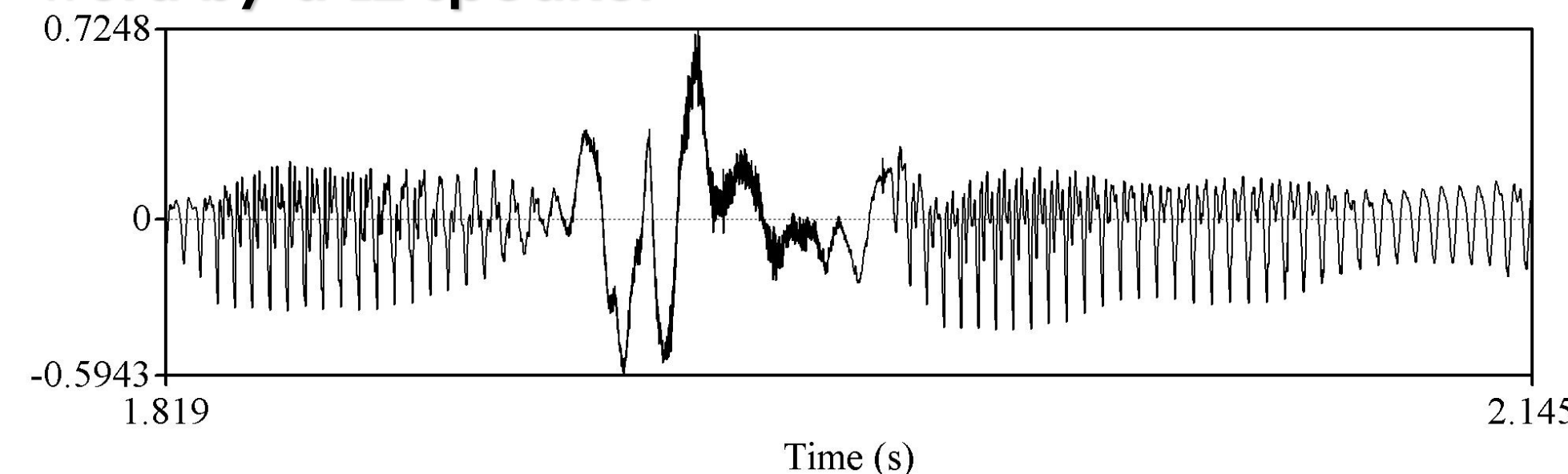
80 tokens x 6 L2 x 2 times = 960 L2 tokens

Data Analysis:

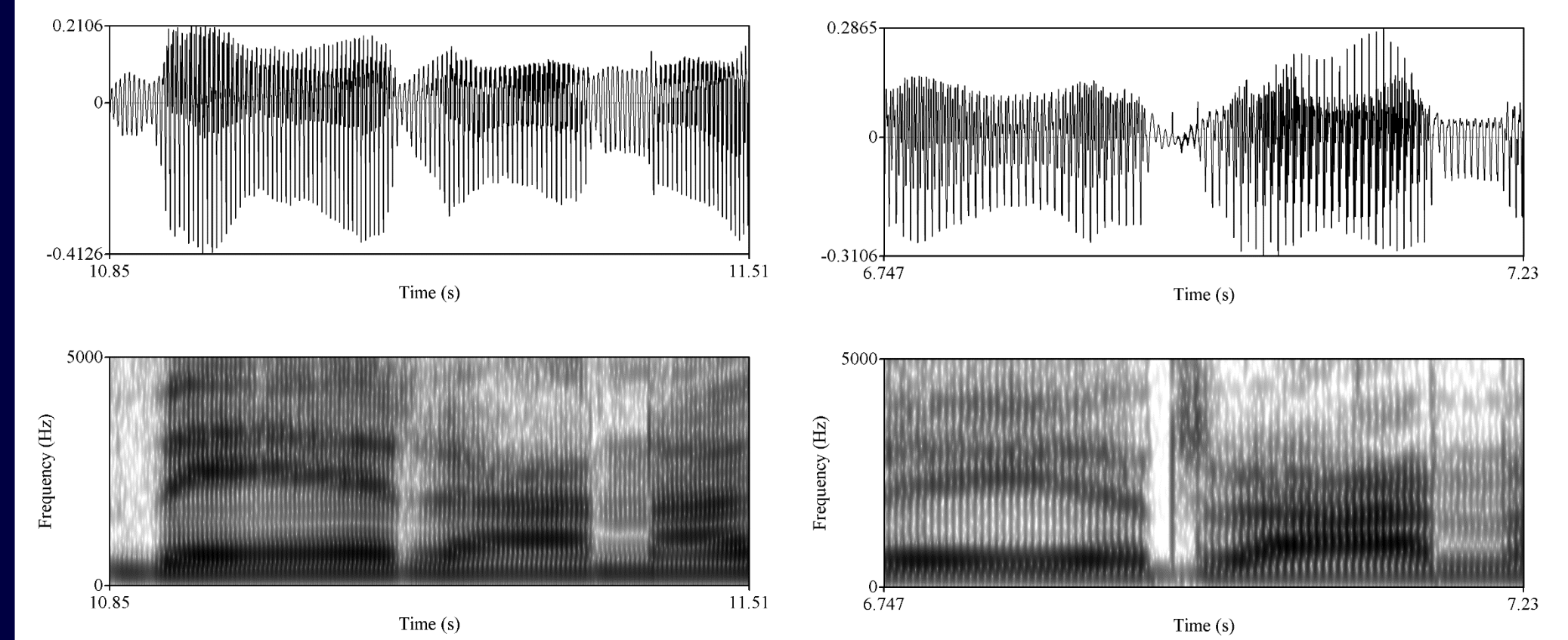
The duration of the target segment was measured in PRAAT. For all vowel-initial tokens, the presence or absence of a glottal stop or glottalization of the following vowel was recorded. Glottalization was determined by visual inspection of the waveform and spectrogram, looking for irregular pitch periods (Dilley et al 1996).



'las ardillas' produced with glottalization on vowel-initial word by a L2 speaker



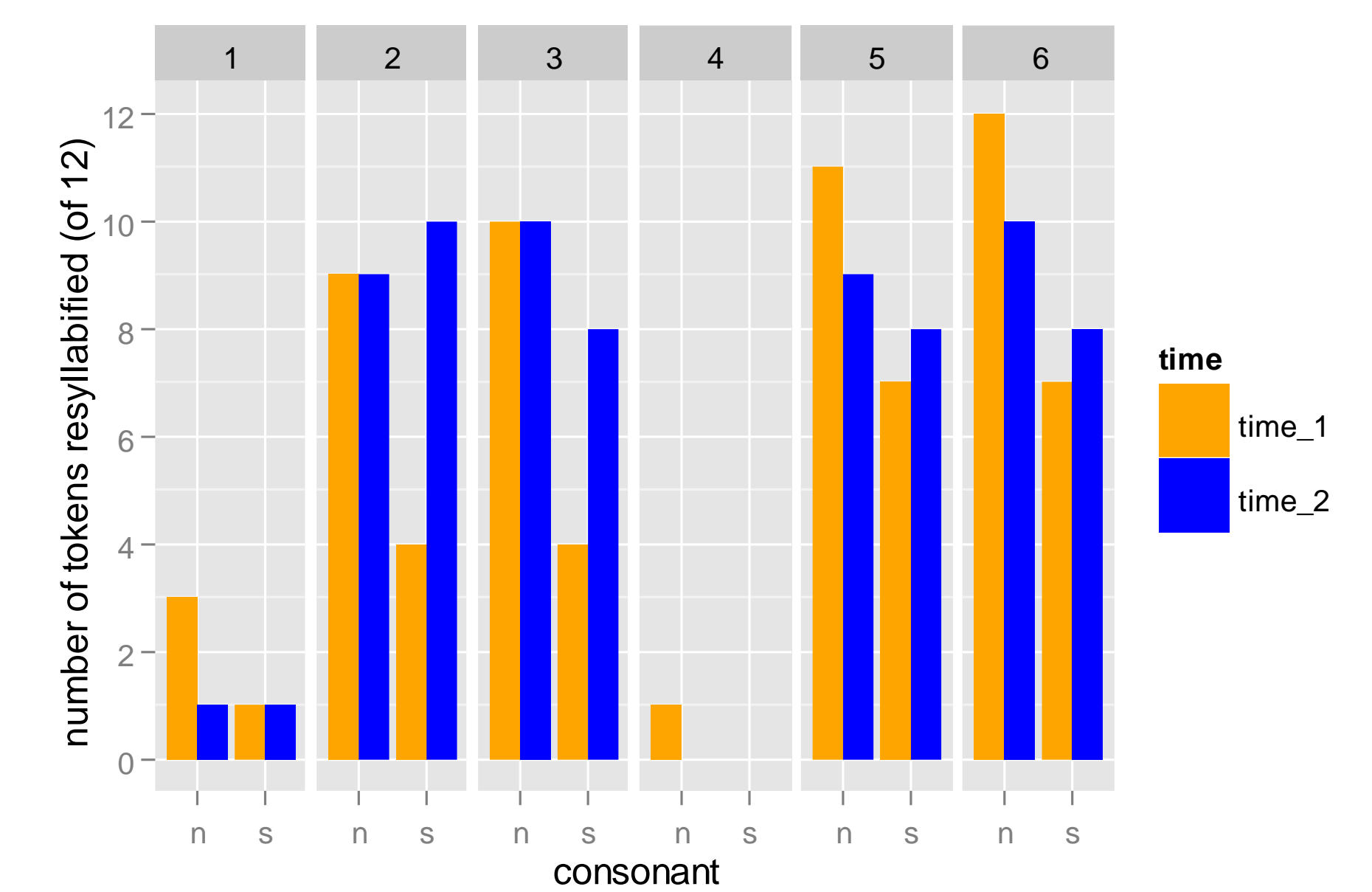
'las ardillas' produced without glottalization on vowel-initial word by L2 speaker



(a) *ve ranas*, <r> produced as a tap [r]
(b) *ve ranas*, <r> produced as a trill [r] (with some frication)

Results & Discussion

Numbers of glottalized tokens in the VC#V condition were counted (including tokens with full glottal stop – pauses disregarded).



- Native Speakers close to ceiling (95%)
- Learning is variable per speaker – some speakers still mark vowel-initial words with glottalization.
- Speakers are advanced: some already resyllabify often
- Production of <r> is variable: still many approximant (English) realizations (~40% accurate)
 - See also Rose 2010 for L2 production of word-internal /r/ and /r/
- Difference between /n/ and /s/ -- why?
- Lexical encoding of vowel-initial words?

Future Work

- More raters to improve reliability
- What are these speakers' English like?
- Duration/vowel quality of preceding vowel
- Comparison with non-trained group
- Use a more continuous measure of voice quality, e.g. H1-H2 VoiceSauce (Shue et al 2011, Garellek 2012)
- Non-reading task for more informal speech
- Does resyllabification improve the percept of fluency?

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