

# *Speech rate effects on L2 vowel production*

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- Introduction
  - Speech rate effects on L1 speech production
  - Speech rate effects on L2 speech production
  - Spanish/Catalan vs. English vowels
    - L2 category formation
      - Intelligibility & robustness of the categories
  - Research question
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# *Introduction*



# Speech rate effects on L1 speech production

# Vowels in L1

## *careful-citation- fast speech*

- **Duration:** fast speed=shorter duration (Moon & Lindblom, 1989; Deterding, 1997)
- **Quality:**
  - Careful speech = dispersed vowels (e.g. Moon & Lindblom, 1989; Johnson et al. 1993; Frieda et al. 2000.)
  - Fast speech = centralized vowels (Deterding, 1997) as a result of overlapping articulatory gestures

# Speech rate effects on L2 vowels

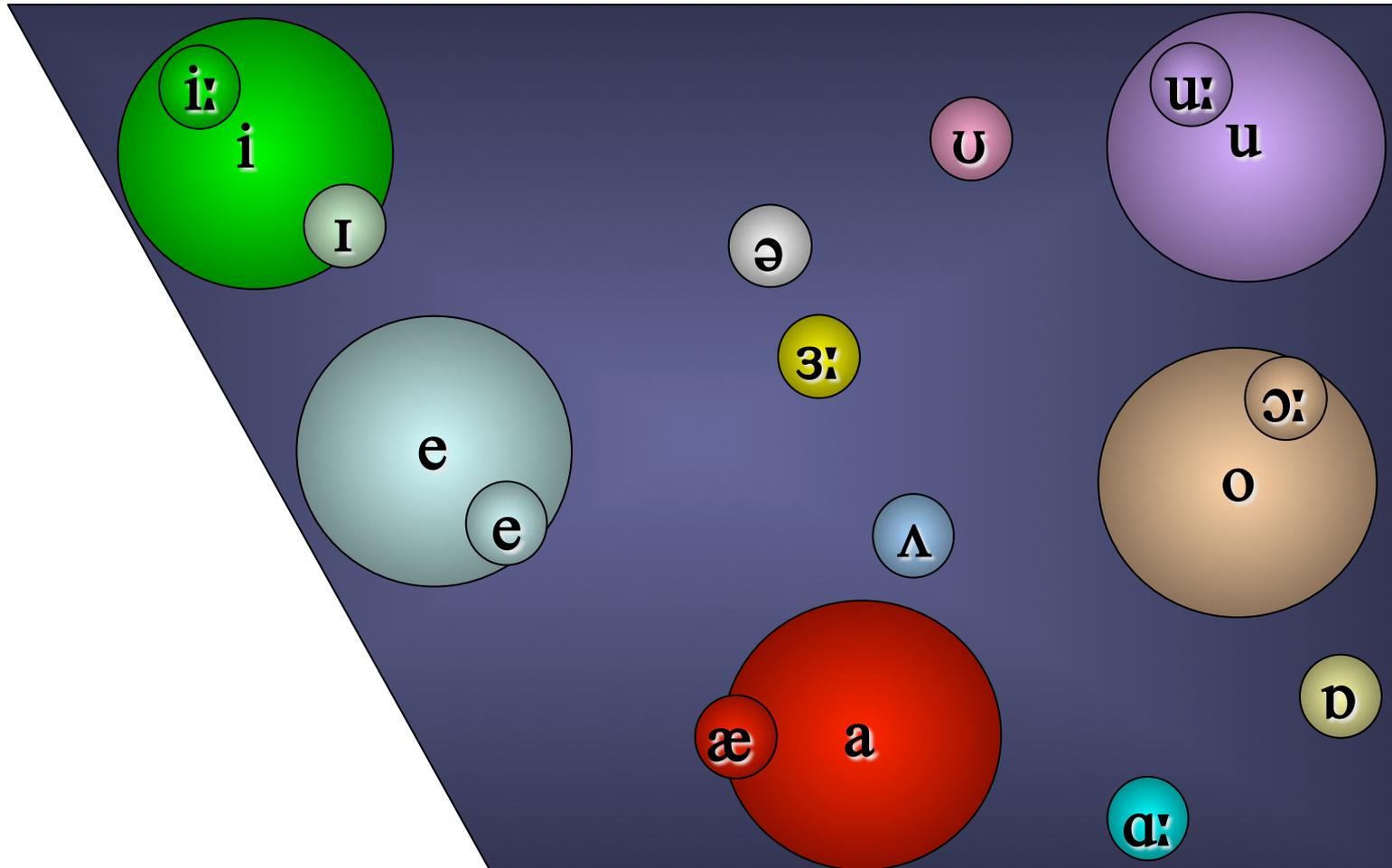
- Few studies with inconclusive findings
- Lack of automatization of articulatory gestures in L2 & developing L2 phonetic categories
- Fluency in L2 associated to speed of delivery-> slow speech= dysfluent -> fast speech =fluent



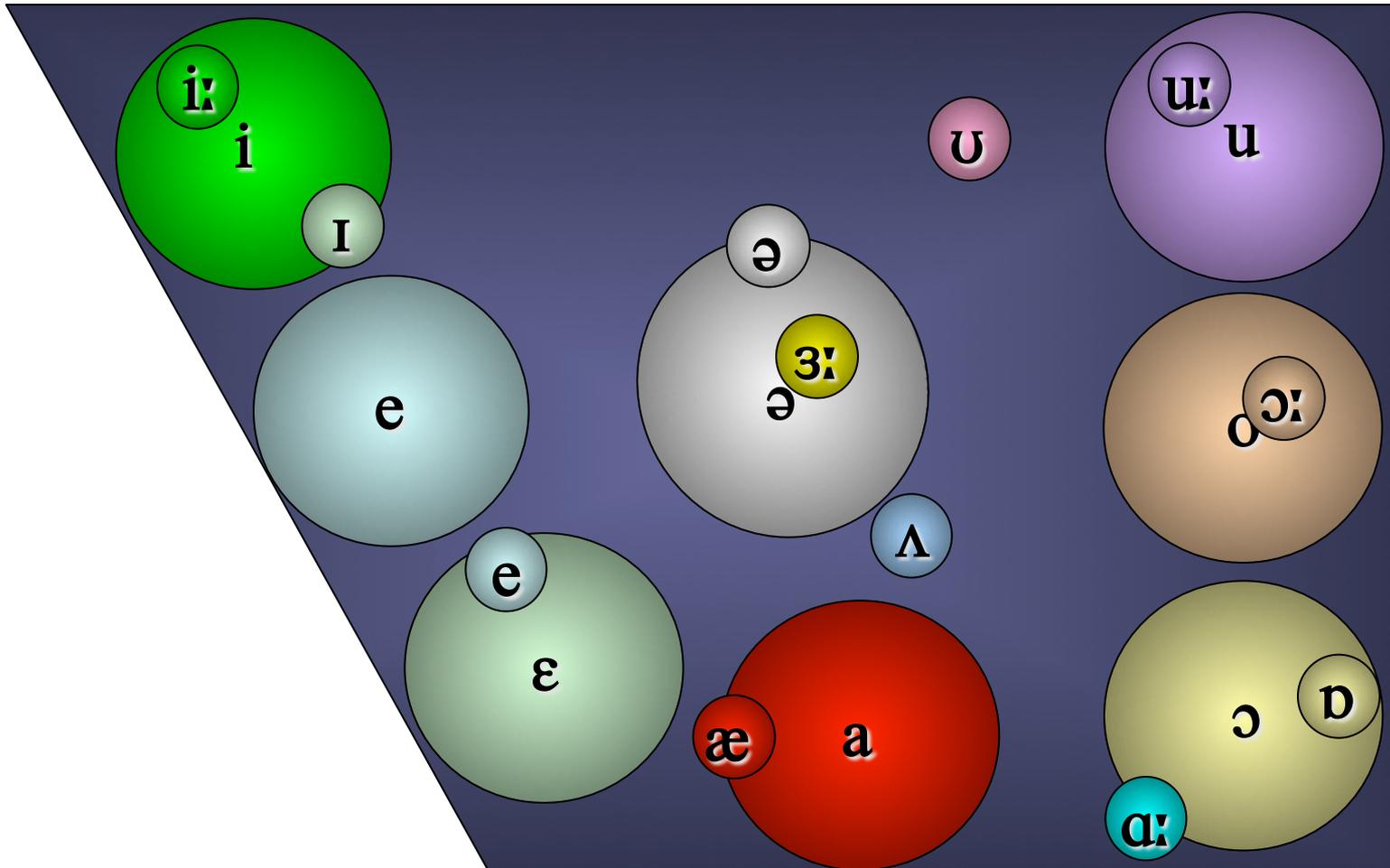
**L2 speakers benefit from being able to increase their speed of delivery in terms of fluency, but what about the accuracy?**

# Spanish & Catalan /English high front vowels

# Spanish (L2 English)



# Catalan (L2 English)



# Use of cues to discern between English /iː - ɪ/:

- Natives

- Spectral & Temporal

- Sp/Cat

- **Temporal** (Cebrian, 2006 & 2007; Escudero, 2006; Cerviño & Mora, 2009)
- **Duration not used distinctively in L1**
  - Bohn (1995), Escudero & Boersma (2004), Bohn & Flege (1990).

# Present study: the research question

- ① **Do changes in speech rate affect the accuracy of the production of English /i:/ and /ɪ/?**
- Duration: Based on previous studies, duration was expected to shorten in faster speech.
  - Quality: NS vowels were expected to be less affected by the speech rate due to robust L1 categories, whereas NNS vowels were expected to show more variation due to developing L2 categories.

# *Method*



# Participants

- The non-native experimental group:
  - N=20 L1 Catalan/Spanish EFL students
  - Age (m): 22.85 years
  - 90% bilingual Spanish/Catalan
  - 10% monolingual in Spanish
- The native control group:
  - N=7 English native controls
  - Age (m): 27.7 years
  - Native dialect: Southern British (3), American (4)
    - -> No significant differences in performance

# Materials

- Delayed Sentence Repetition Task (Flege, 1995)
- 12 minimal pairs (24 target words) embedded in a carrier sentence
- Three speech styles
  - Citation
  - Careful
  - Fast

# Delayed Sentence Repetition tasks

## • 1 Task/speech style:

- Citation
- Careful
- Fast

Speed of delivery=  
segments/sec

### 1. Citation form

*What is the next word?*

Heat is the next word.

*What is the next word?*

**-Heat is the next word.**

Speed of delivery :

Model :9.06

Non-natives: 10.62

### 2. Careful speech

*What did you say?*

I didn't say hit, I said heat.

*What did you say?*

**-I didn't say hit, I said heat.**

Speed of delivery :

Model: 6.15

Non-natives: 6.82

### 3. Fast speech

*What is the next word?*

I would say heat is the next word.

*What is the next word?*

**-I would say heat is the next word.**

Speed of delivery :

Model: 16.34

Non-natives: 16.41

# Procedure

- 1. Language background questionnaire
- 2. Practice and familiarization with the target words (Mora, 2005).
- 3. Delayed Sentence Repetition Tasks:
  - 1) citation
  - 2) careful
  - 3) fast

# *Results*



# Data Analysis

- Vowel quality (F0, F1, F2) and duration measures
  - Frequencies -> barks
  - Normalized for speaker characteristics (Syrdal & Gopal, 1986)
  - The Euclidean distance for /i:/- /ɪ/ over speech styles.



Means for the vowel duration, height and frontness for the two vowels in the three speech styles for every participant

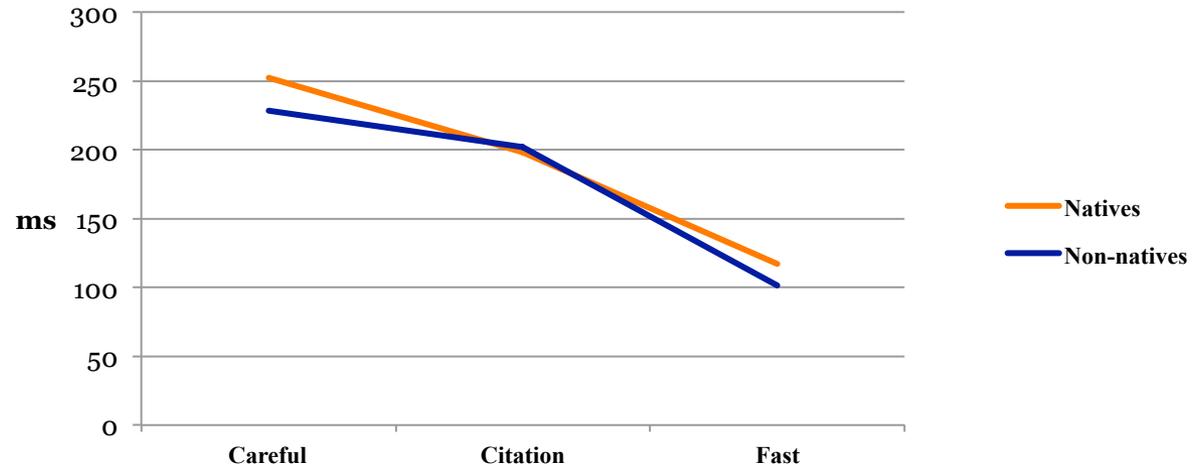


Do changes in speech rate affect the accuracy of the production of English /iː/ and /ɪ/?

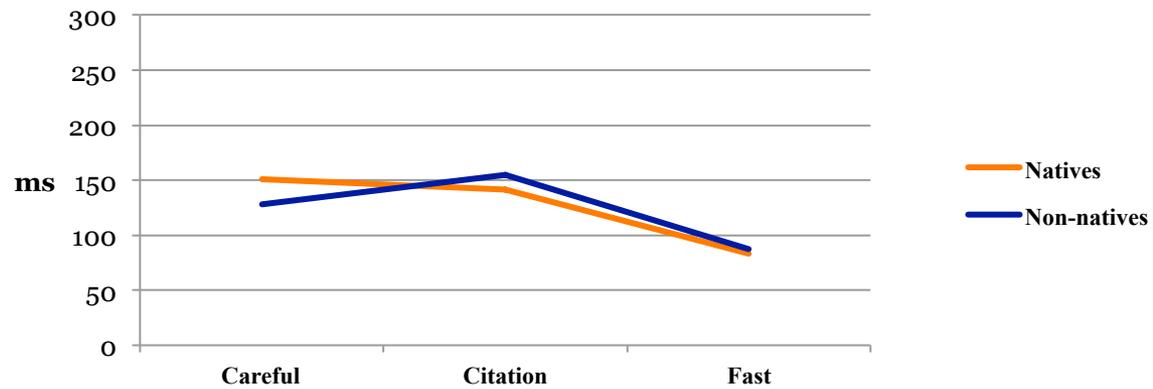
- A mixed between-within subjects analysis of variance with Bonferroni adjustment
  - speech style (careful/citation/fast) as within subjects factor
  - L1 (native/non-native) as between subjects factor.
- In addition, paired samples t-tests to further explore the differences in the spectral dimension

# Vowel duration

**/i:/ duration**

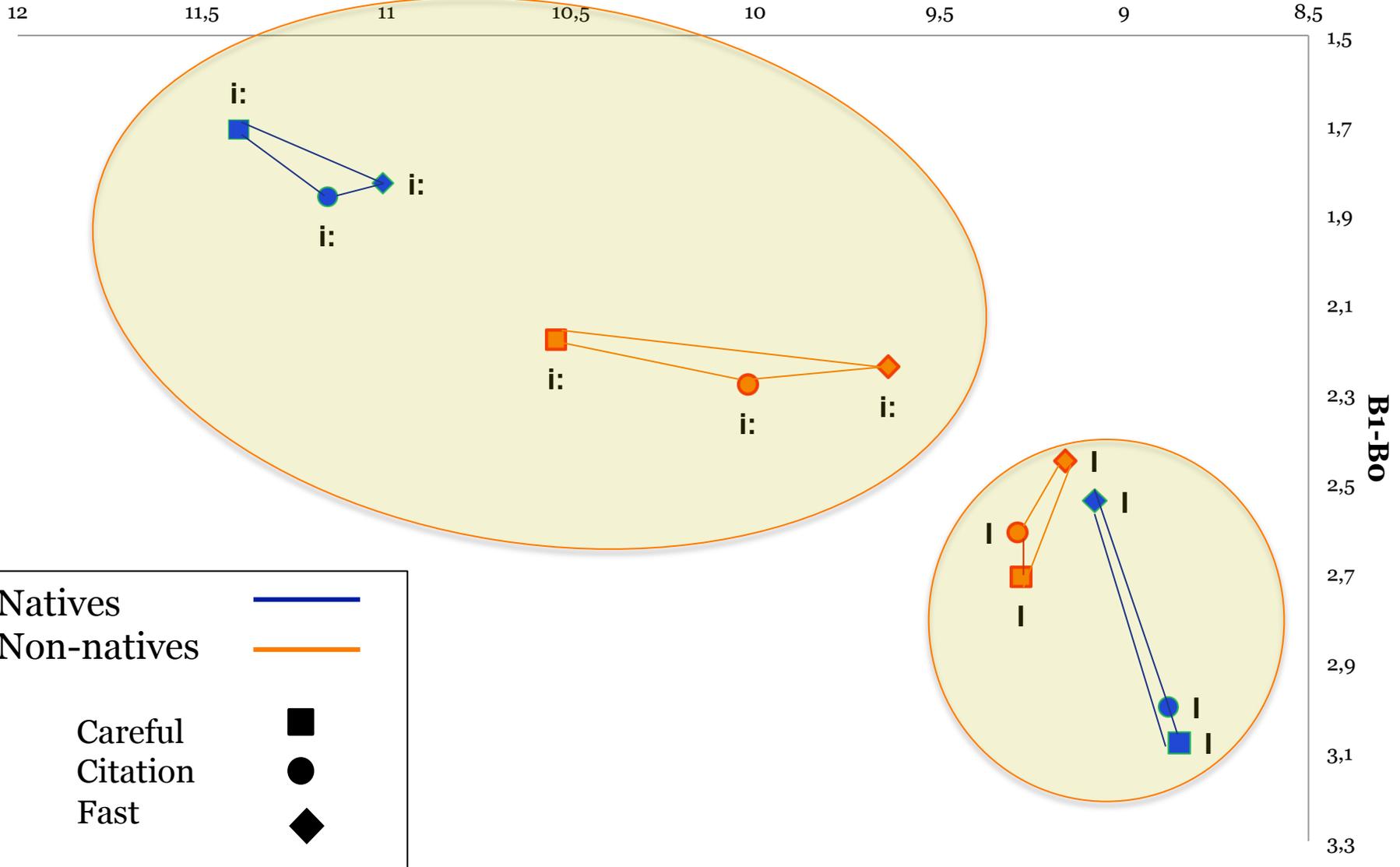


**/ɪ/ duration**



# Vowel height and frontness

B2-B1



Natives



Non-natives



Careful



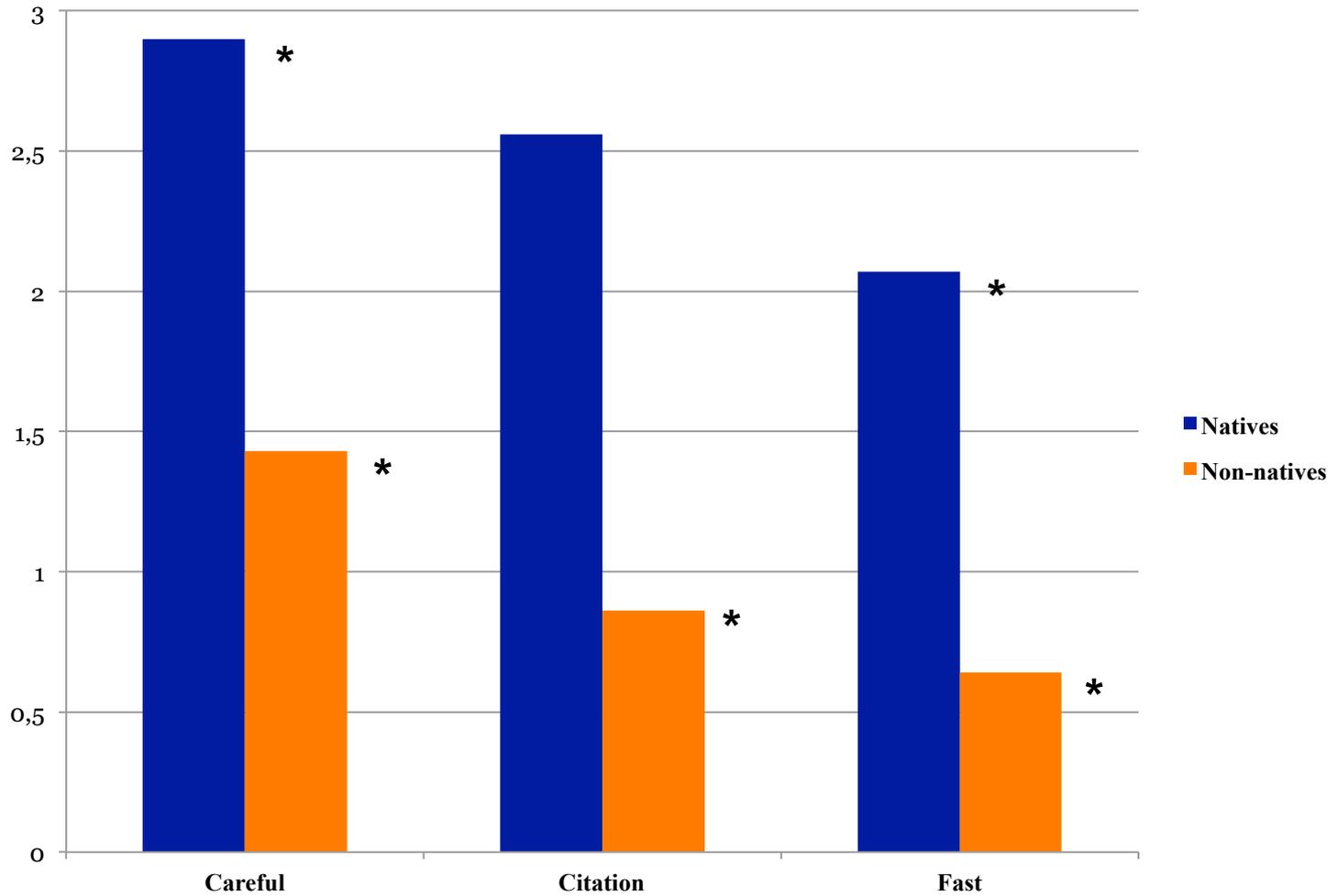
Citation



Fast



## Spectral distance over speech styles



# *Discussion and conclusions*



- **Discussion**

- Trend in both NNS and NS indicating inherent articulatory differences in the speech styles
- But: speech rate changes affected natives and non-natives differently
  - -> developing non-native categories

- **Limitations**

- One vowel pair
- Elicitation method

- **Applications**

- L2 speech training

# Further research

- Reliance on duration in perception -> reliance on duration in production
  - Do NNS transfer reliance on duration in perception into production?
- Changes of speech rate in perception tasks
  - Is the accuracy of the identification affected by the speech rate?

Thank you for your attention!

