



**HAL**  
open science

# Like a Square Peg in a Round Hole: Why Contour Shape Matters for Learning New Intonation Patterns

Mariapaola d'Imperio, James Sneed German

► **To cite this version:**

Mariapaola d'Imperio, James Sneed German. Like a Square Peg in a Round Hole: Why Contour Shape Matters for Learning New Intonation Patterns. *Laboratory Phonology 15*, Jul 2016, Ithaca, New York, United States. hal-01703271

**HAL Id: hal-01703271**

**<https://hal.science/hal-01703271>**

Submitted on 7 Feb 2018

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



# Like a Square Peg in a Round Hole: Why Contour Shape Matters for Learning New Intonation Patterns

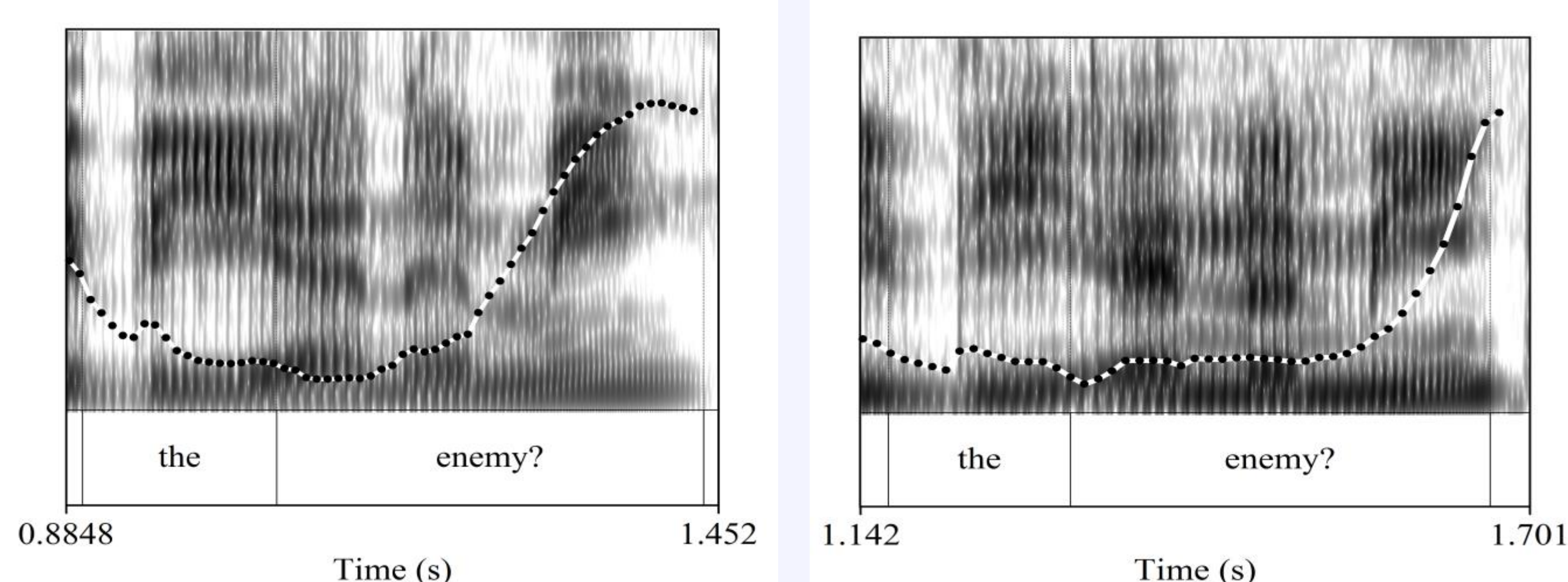
Mariapaola D'Imperio<sup>1,2</sup> & James Sneed German<sup>1</sup>

<sup>1</sup> Aix-Marseille Université, CNRS, LPL, Aix-en-Provence, France

<sup>2</sup> Institut Universitaire de France, Paris, France

## Introduction

- Imitation across **typologically distinct dialects**
  - Requires approximating phonetic details of phonological structures not in the D1 system
  - D1-D2 imitation is not limited by strong category assimilation as in D1-D1 [1] or high cognitive demand as in L1-L2 [2]
  - Reveals the type and granularity of phonetic detail that can be accessed/implemented by the production system from recently experienced speech events
- D'Imperio & German (2015) [3]:
  - Singapore English (SgE) speakers imitated early F0 peak timing of stress-initial American English (AmE) target words utterance-initially in declaratives
  - No phonetically similar pattern in SgE inventory
- Contour shape marks intonational contrasts in some varieties (Neapolitan Italian [4], German [5],)
- Y/N questions in Singapore English vs. Am. English
  - **Phonetic similarity**: Final rising pattern
  - **Contour shape**: SgE has later rise with no dip (lacks L\*), no inflection (i.e, concave versus s-shape)



**Figure 1:** F0 traces for the utterance-final portion of the sentence “*Did the soldiers see the enemy?*” as produced by an American English speaker (left) and a Singapore English speaker (right).

## Issues

- **Contour shape**: Can the contour shape of recently experienced tokens be accessed/implemented by the production system?
- **Perceptual assimilation**: Compared to peak timing, does phonetic similarity of Y/N contours limit speakers’ ability to match phonetic detail of AmE targets?

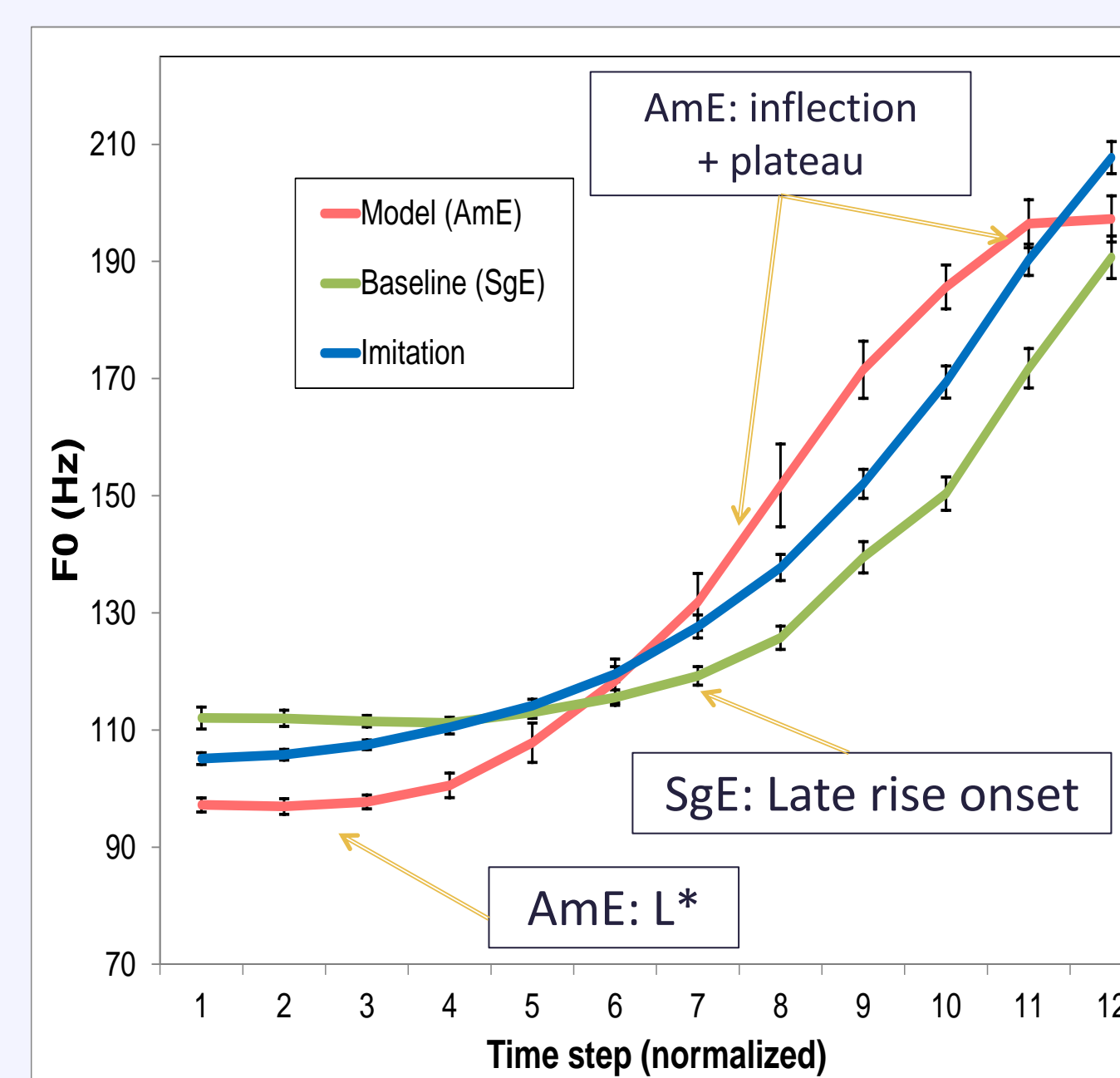
## Methods

- Tasks: Baseline reading (D1) + Imitation of AmE speaker
- Target words: trisyllabic, initial stress, sentence-final
- Participants: 18 males, bilingual in SgE/Mandarin
- Measures: Mean F0 of 12 intervals within each target word
- Comparison 1: F0 at timestep X condition
- Comparison 2: Curvature (deg. of inflection) - 3<sup>rd</sup> coefficient of a 3<sup>rd</sup> order polynomial regression-fitted to F0 timeseries

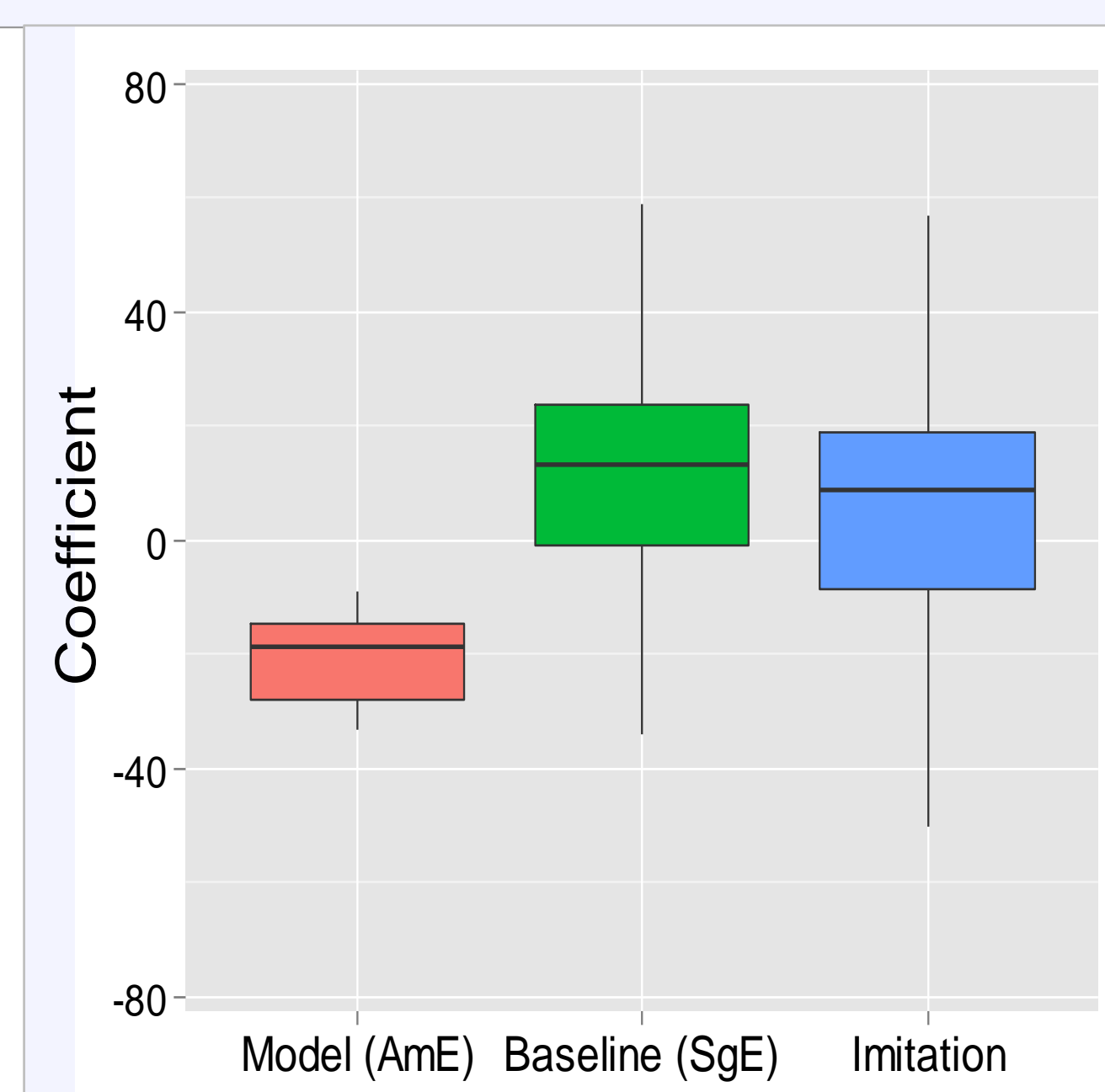
## References

[1] Cole, J., & Shattuck-Hufnagel, S. (2011). The phonology and phonetics of perceived prosody: What do listeners imitate? *Proceedings of Interspeech 2011* (pp. 969-972). [2] Mennen, I. (2004). Bi-directional interference in the intonation of Dutch speakers of Greek. *Journal of phonetics*, 32(4), 543-563. [3] D'Imperio, M. & German, J. S. (2015). Phonetic detail and the role of exposure in dialect imitation. *Proceedings of ICPhS XVIII*. [4] D'Imperio, M. & Cangemi, F. (2009). The interplay between tonal alignment and rise shape in the perception of two Neapolitan rising accents. *Phonetics and Phonology in Iberia (PaPI) 2009*. [5] Niebuhr, O., D'Imperio, M., Gili-Fivela, B. and Cangemi, F. (2011). Are there “shapers” and “aligners”? Individual differences in signaling pitch accent category. *Proceedings of ICPhS XVII*.

## Results

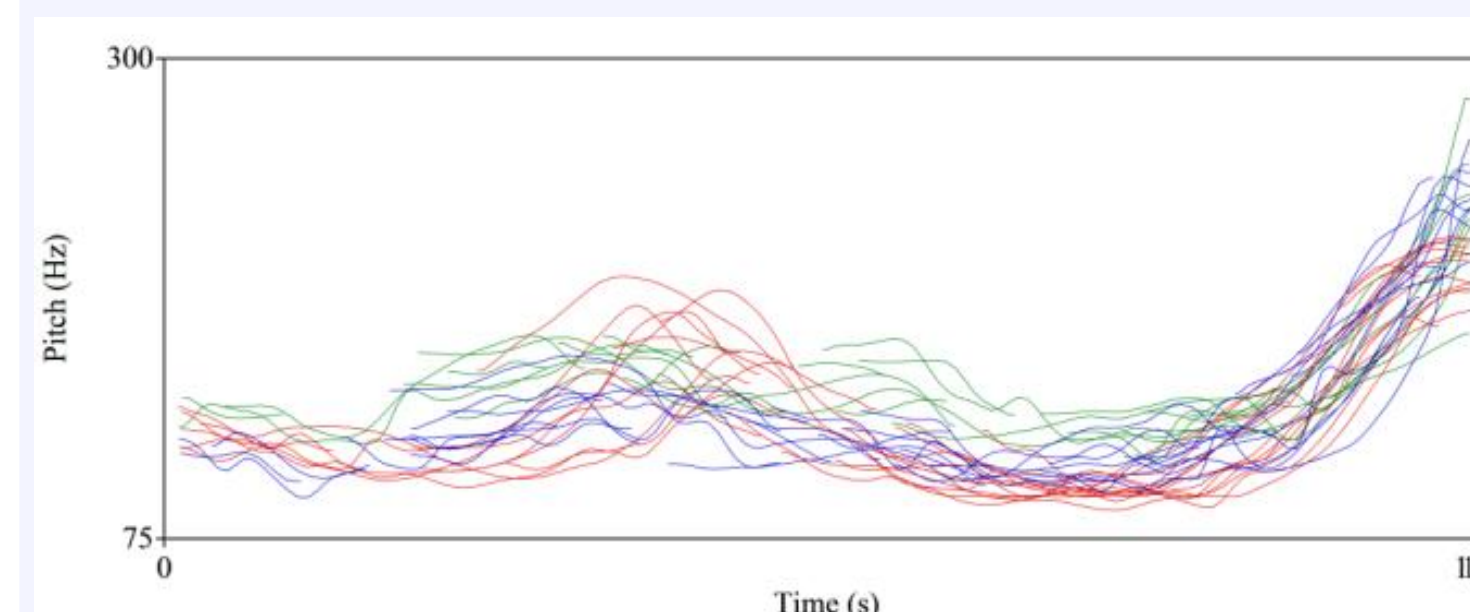


**Figure 2:** Average F0 by time-normalized

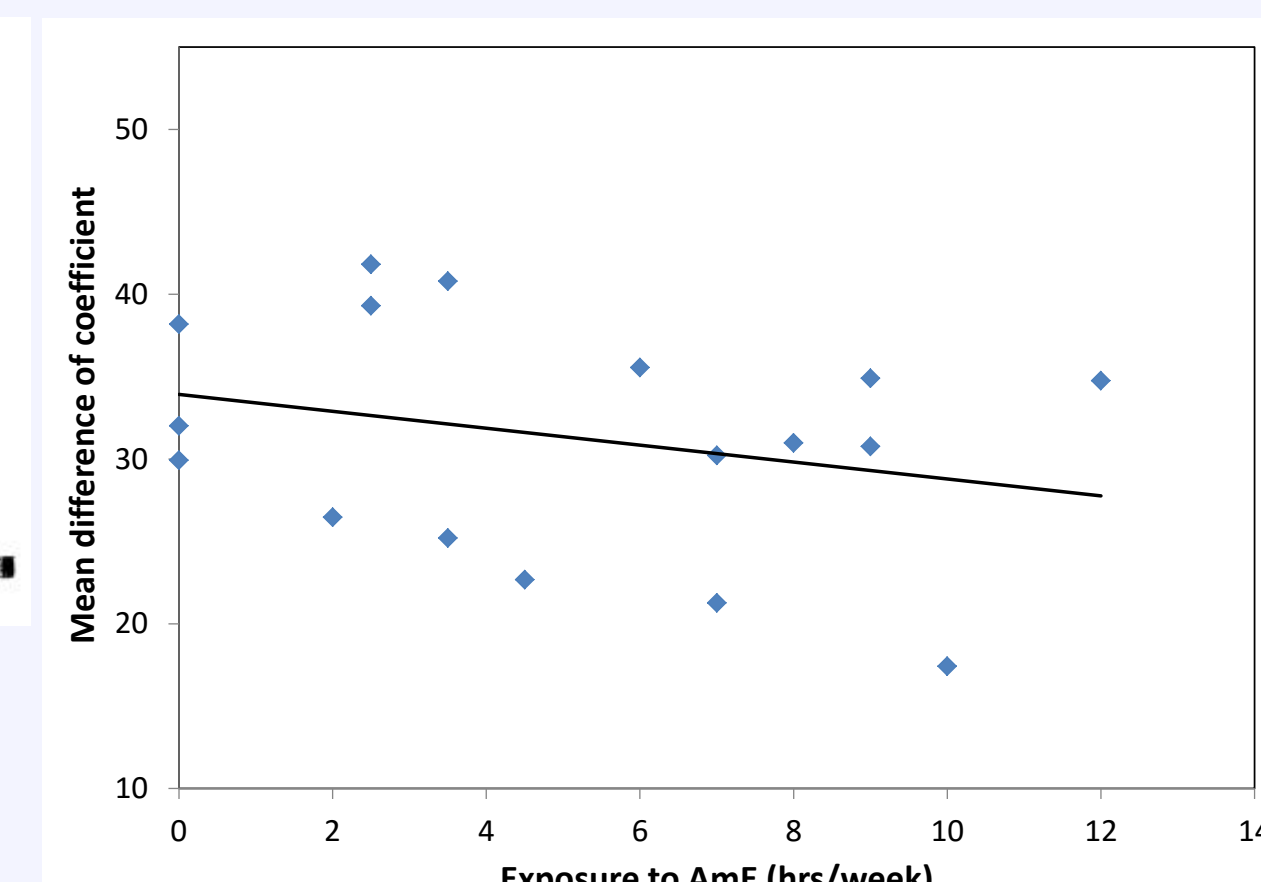


**Figure 3:** Coefficient of third term of regression-fitted polynomial by task (model, baseline, imitation)

- **F0 scaling** (Comparison 1): At each timestep, speakers modified F0 towards the AmE targets (*task x time interaction*: est.max=26.1, tmax=7.83, p<0.0001)
- **Curvature** (Comparison 2): Speakers produced more highly inflected contours during imitation (est.=−4.52, t=2.35, p<0.05), high degree of overlap with baseline
- **Item-by-item accuracy** of curvature depends on self-reported exposure to AmE ( $r^2=0.0755$ ,  $p=0.14$ )



**Figure 4:** F0 plots of target items for the AmE speaker (red) and one SgE speaker (ID122) in the Baseline (green) and Imitation (blue) tasks



**Figure 5:** Average by-item difference in coefficient (Imitation-Model) by self-reported weekly exposure to AmE.

## Discussion

- **Perceptual assimilation**: Speakers imitated phonetic details of F0 scaling in different regions despite superficial phonetic similarity between D1/D2 contours
- **Contour shape** is not immediately accessible by the production system
  - Speakers may not perceive differences in shape due to effects of perceptual assimilation
  - Producing complex contours may require articulatory practice
- Suggests that imitated tokens are variants of a D1 category whose scaling parameters have been adjusted to provide a better phonetic match to the AmE targets
- Recruitment of native categories does not preclude the imitation of phonetic details as suggested by [1]