

Individual differences in the relation between perception and production and the mechanisms of phonetic imitation

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Introduction

How and to what extent are speech perception and production related for an individual language user?

Relation between speech perception and production

- Inherent link between speech perception and production in our use of spoken language
- Conflicting results and different speech perception and production tasks in previous studies

Phonetic imitation

- The process where individuals adjust acoustic-phonetic properties of their speech when exposed to the speech of another speaker
- More direct method to explore the relationship

Research Questions

1. Are individual listeners' perceptual cue weights related to their patterns of phonetic imitation?
2. What are the underlying mechanisms of phonetic imitation?

Methods

Participants

- 23 native speakers of North American English

Perception task (Cue weighting)

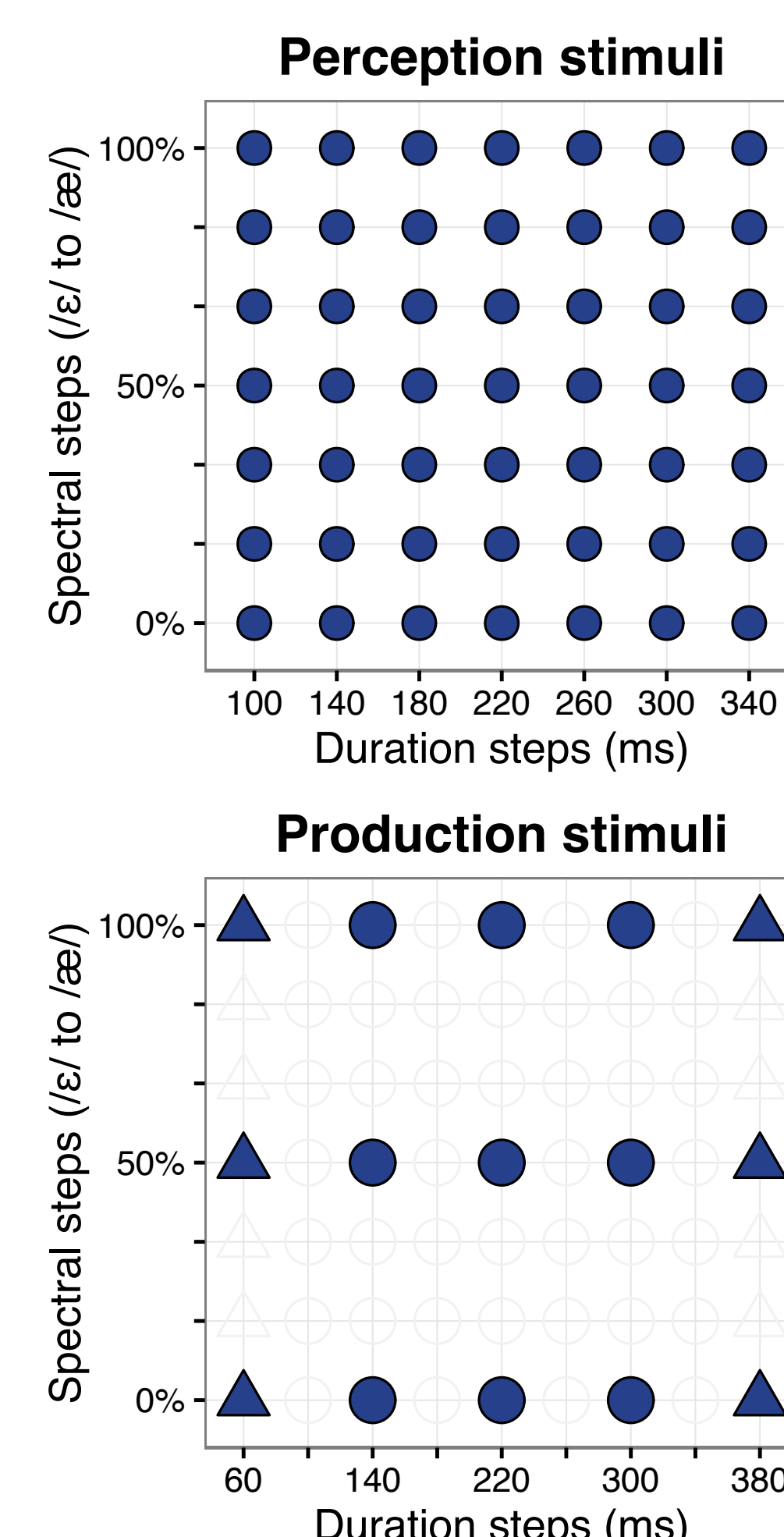
- 2AFC: *head* or *had*
- 7 spectral steps (TANDEM-STRAIGHT)
x 7 duration steps (PSOLA in Praat)

Production task (Imitation)

- Baseline word reading & Forced imitation
- A subset of stimuli from the perception task (●)
+ extended and shortened vowel durations (▲)

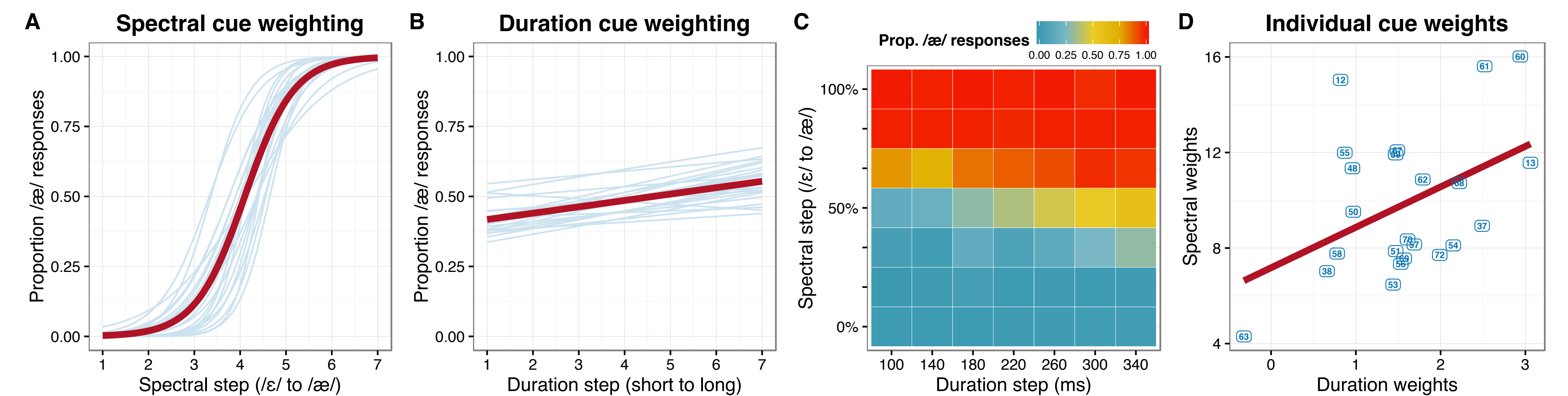
Imitation measures

- F1, F2 values (Hz), and duration (ms)
- Degree of imitation: $|X_{\text{target}} - X_{\text{baseline}}| - |X_{\text{target}} - X_{\text{imitation}}|$

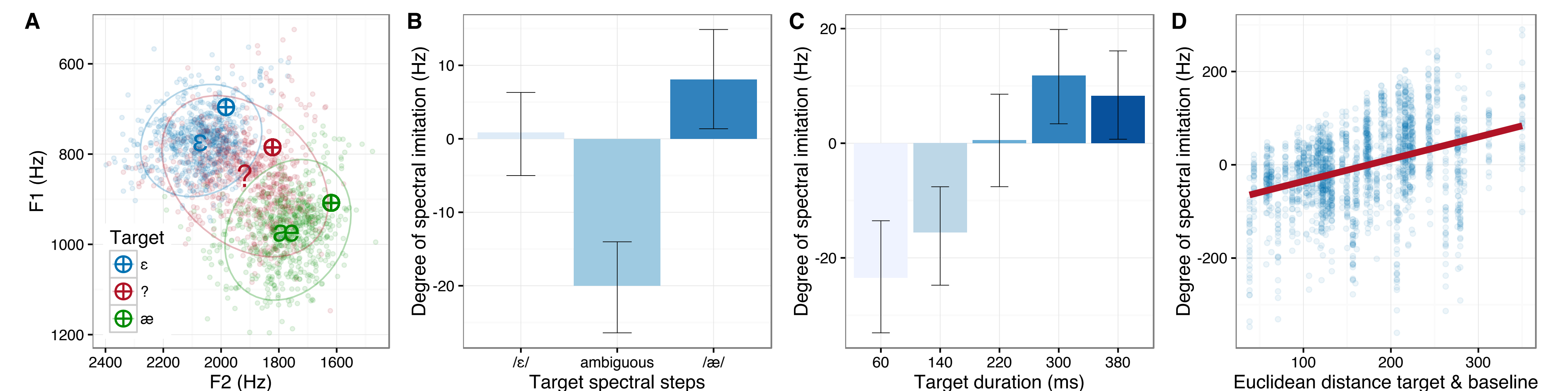


Results

Do listeners differ in their cue weighting strategies?

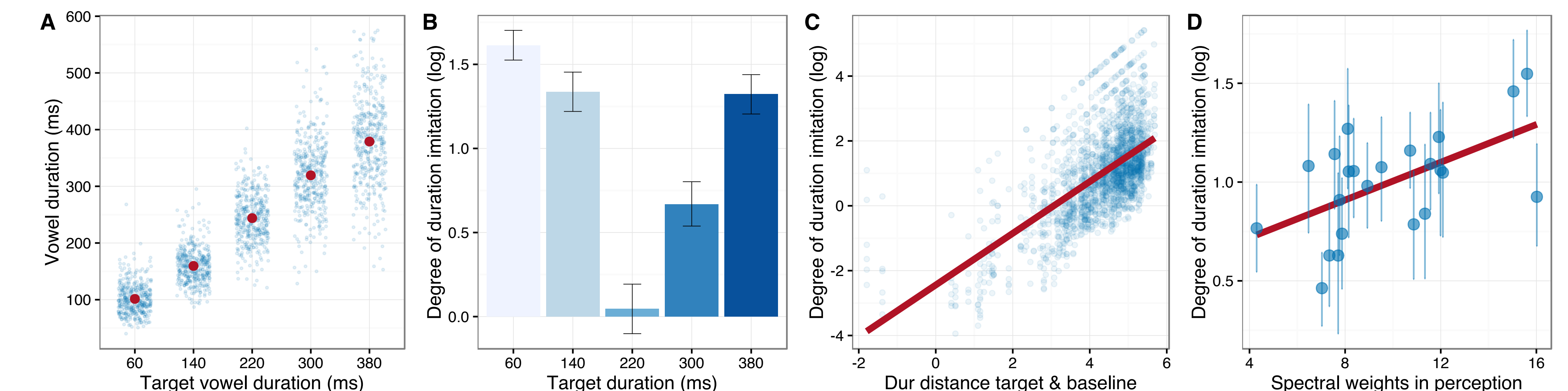


What underlies imitation of vowel quality?



A: poor imitation of ambiguous vowels, **B:** natural > ambiguous vowels & /æ/ > /ε/, **C:** ↑ target vowel duration ↑ spectral imitation, **D:** ↑ Euclidean distance between target and baseline production ↑ spectral imitation

What underlies imitation of vowel duration?



A: accurate imitation of varying vowel duration, **B:** shortened and extended vowels > normal vowels, **C:** ↑ duration distance between target and baseline production ↑ duration imitation, **D:** ↑ spectral weights in perception ↑ duration imitation

Discussion

1. Better perceptual abilities correlated with imitation of vowel duration.

- Strong link between perception and production when production is not constrained by phonological categorization.

2. Interplay between linguistic and cognitive processes

- Vowel formants are phonologically constrained and duration is perceptually salient.

