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INTRODUCTION

Spectral contrast effects (SCEs) are context effects that bias speech perception. They occur when the auditory system perceptually magnifies spectral differences between sounds:

Precursor	More likely to hear
Sentence (unmodified)	/l/ or /el/ vowel target
Sentence with /el/-like (high F ₁) frequencies emphasized	/l/ (low F ₁)
Sentence with /l/-like (low F ₁) frequencies emphasized	/el/ (high F ₁)

These context effects were significantly smaller when precursor sentences were spoken by 200 different talkers compared to a single talker (Assgari & Stilp, 2015, *JASA*)

- The underlying mechanism was unclear because talker (gender) variability and acoustic (fundamental frequency (f₀), F₁) variability were confounded

We investigated whether f₀ variability and/or F₁ variability modulate the magnitude of spectral context effects in vowel categorization

METHODS

Sentences

- Bandpass filter added + 5 dB spectral peaks to select TIMIT sentences in the low-F₁ (100-400 Hz) or high-F₁ (550-850 Hz) region

Vowels

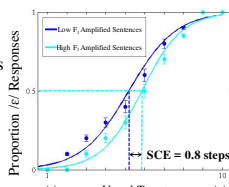
- Natural vowels interpolated from [i] to [ε] using PRAAT
- Same stimuli as used in Assgari & Stilp (2015)

Procedure

- Trial structure: see schematic in Introduction
- Practice*: 20 sentences from the AzBio corpus (Spahr et al., 2012 *Ear Hear*) paired with endpoint vowels; >80% accuracy needed to continue to test session
- Test*: 2 or 4 blocks of 160 trials (each talker repeated 4 times per block)

Analyses

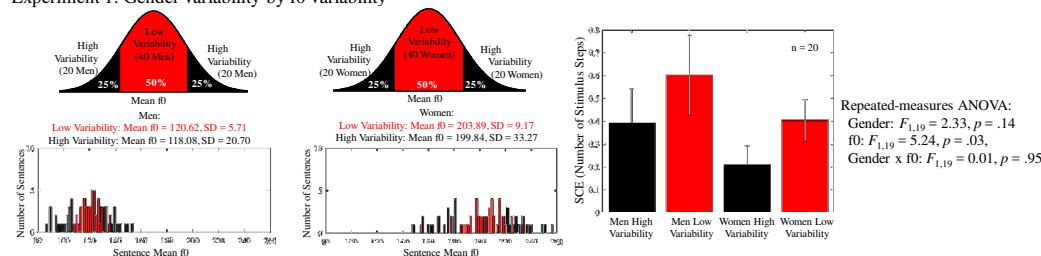
- SCE = # of stimulus steps between 50% points on Low-F₁ and High-F₁ response functions
- SCEs were calculated for each listener then averaged



ASSGARI, MOHIUDDIN, THEODORE & STILP, 2016, ASA

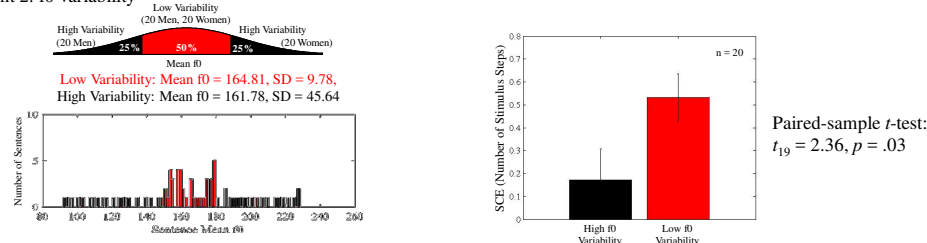
Motivation: Separating the individual contributions of f₀ and gender variability to decreased spectral context effects

Experiment 1: Gender variability by f₀ variability



Discussion: f₀ variability modulated the magnitude of spectral context effects, but talker gender did not

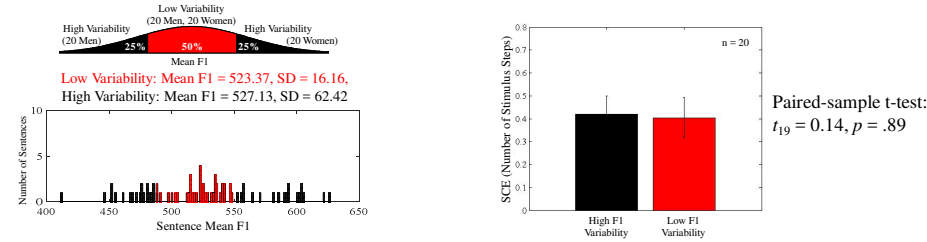
Experiment 2: f₀ variability



Discussion: High f₀ variability decreases the magnitude of spectral context effects, even when talker gender is mixed

CURRENT STUDY

Motivation: [i] and [ε] differ primarily on F₁. Could F₁ variability better explain the influence of acoustic variability on spectral context effects for these vowels? Sentences from Experiment 2 were rearranged into groups based on F₁

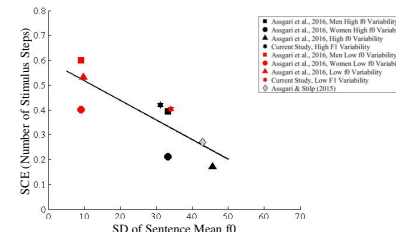


Discussion: F₁ variability does not modulate the magnitude of spectral context effects in vowel categorization

DISCUSSION

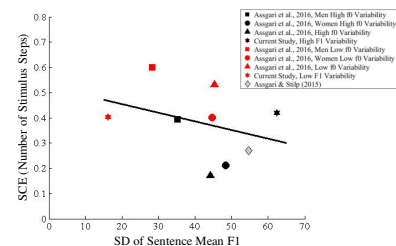
SCEs in vowel categorization are sensitive to variability in talker's mean f₀, but not mean F₁ or gender

- A strong negative relationship exists between SCE magnitude and f₀ variability ($r = -0.81, p < .01$)
- The current study sorted stimuli by F₁, but results are what would be expected based on previous studies when considering f₀ variability



Results parallel findings that f₀ variability influenced talker normalization effects (Goldinger, 1996, *JEP:LMC*)

SCEs in vowel perception are not affected by mean F₁ variability ($r = -0.33, p = 0.37$)



Future directions

In the current study, sentences were selected based on f₀ and rearranged based on F₁. This may not capture the full range of F₁ variability.

- Sentences should be selected based on F₁ to maximize differences between groups
- f₀ measures beyond its mean across a sentence:
 - What role does f₀ variability within a sentence play?

In conclusion, different types of acoustic variability have different influences on speech context effects