At which processing level does extrinsic speaker information influence vowel perception?

4pSC16

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Introduction

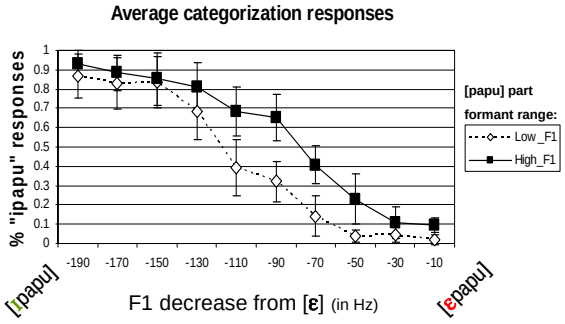
• Listeners categorize sounds from an [ɪ] to [ɛ] continuum (a first formant (F1) vowel contrast) relative to a specific speaker's F1 range

• If this normalization is an early process, speaker context should influence not only categorization but also auditory discrimination, and effects should be detected early in the EEG record

• If compensation occurs later, context should influence categorization but not discrimination, and effects should appear later in the EEG record

Experiment 1: Categorization

• Participants categorized stimuli on a 10-step [ɪ] to [ɛ] continuum. These vowels were spliced onto [papu] with high or low F1. Stimuli were thus short enough to be used in auditory discrimination

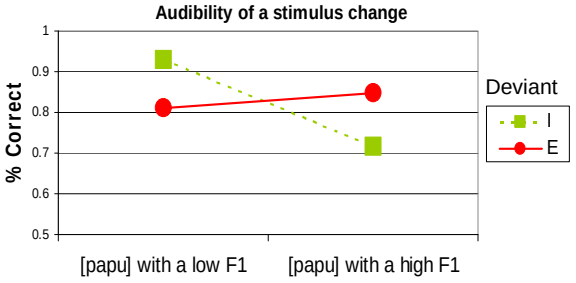


• Categorization of the [ɪ] - [ɛ] continuum depends on the F1 range in the subsequent [papu]

Experiment 2: Discrimination

• In a **4I-oddity task** participants heard stimuli of the type **standard-standard-deviant-standard** and judged the deviant's position (2nd vs. 3rd)

- Standard: a word with an ambiguous first vowel
- Deviant: either one of the endpoint-vowel words ([ɪpapu] or [ɛpapu]).



• Speaker context not only causes a shift in category boundaries, it can also make a more audible stimulus change become less audible, and vice versa

• Listeners were thus unable to access unnormalized auditory space

• This suggests that vowel normalization takes place at an early processing level

Conclusion

Vowel normalization is the result of an early compensation mechanism that operates at an auditory processing level

Experiment 3: EEG recordings

• In an oddball task, participants were asked to press a button when they heard a deviant

• Same standard and deviants as Experiment 2

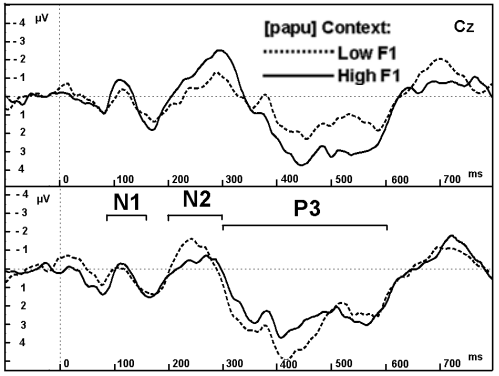
Analyzed time domains:

N1: 80 - 160ms/ **N2**: 200 -300 ms/ **P3**: 300 - 600ms

Oddball Vowel:

[ɛpapu]

[ɪpapu]



• Behaviorally, listeners more often detected [ɛpapu] as a deviant in a High F1 [papu] context than in a Low F1 context, and vice versa for the detection of [ɪpapu] (as in Expt. 2)

• These findings were reflected in EEG measures as targets that were detected more often gave rise to:

- Larger amplitudes on the **P3** ($p = 0.023$) and on the **N2** (at posterior sites, $p = 0.036$)

- Earlier peaks in the **N1** time domain: $p = 0.044$