Compensation for Altered Feedback in Vowels and Glides

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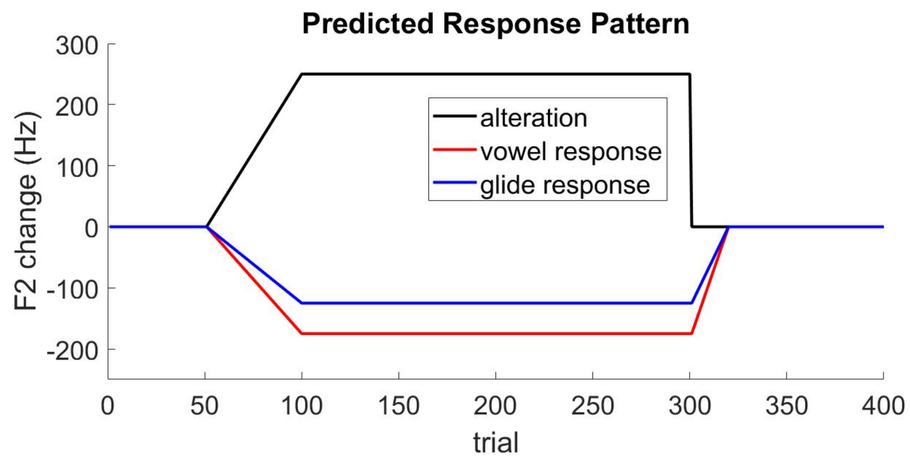
Overview

- In altered feedback paradigms (AFPs), participants hear a real-time playback of their voice which is, unknown to them, altered in some fashion, and their compensation for this change is measured.
- AFPs have been previously applied to glides (Ogane & Honda 2014) with temporal alteration and to vowels (e.g. Houde 2011) with formant alteration.
- This study compares the compensatory responses of English /i/ and /j/ under formant alteration.

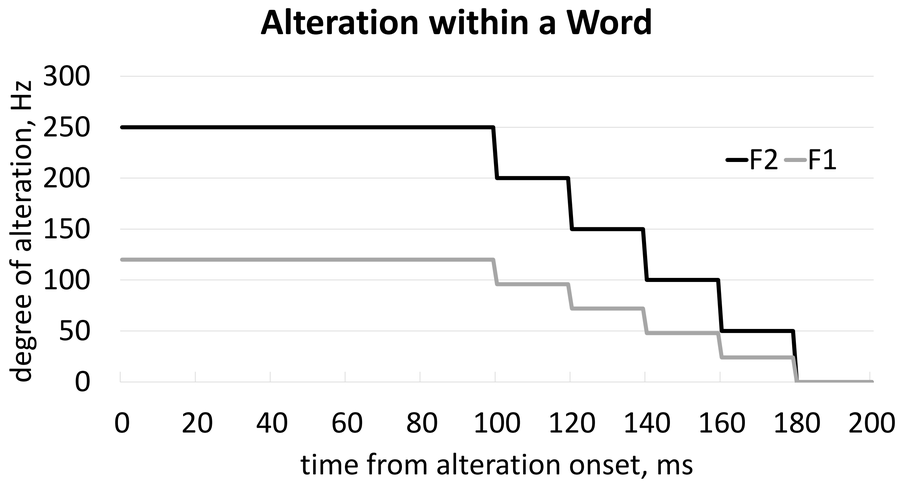
Hypothesis and prediction

Vowels are hypothesized to prioritize acoustic feedback more than glides; glides (consonants) would instead prioritize other (e.g. somatosensory) feedback.

⟹ More compensation for vowels than glides under purely acoustic alteration.

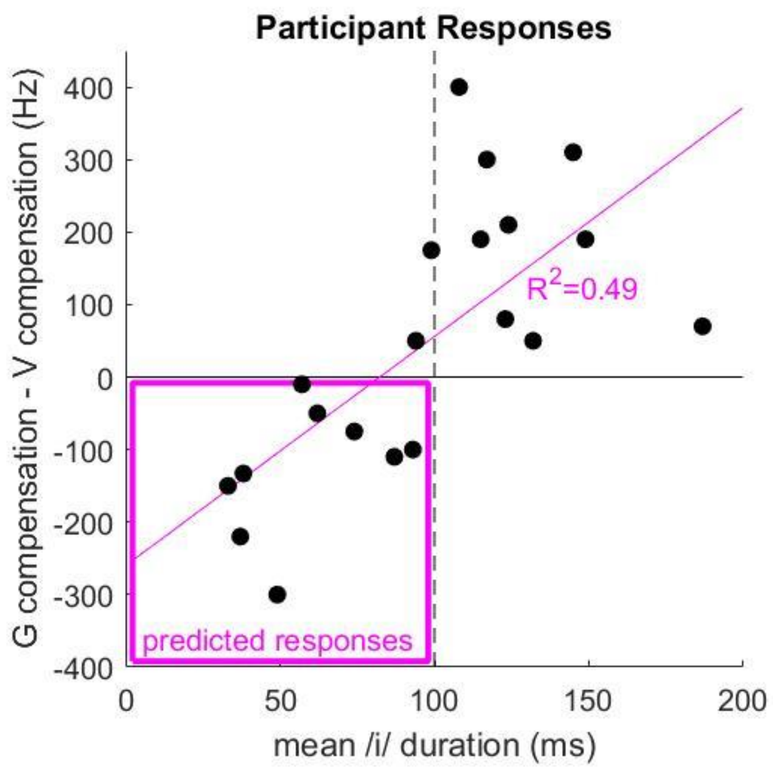


Methods



- 20 native English speakers were given auditory models of /biʌ/ ‹bia› and /bjʌ/ ‹bya›, then cued orthographically
- 400 trials per word
- Formants altered through Audapter up to +250Hz for F2 and -120Hz for F1 ⟹ vowel/glide sounds more high and front; formants in English /i/ and /j/ are similar or the same, so any difference in compensation can be attributed to vowel/glide status
- Alteration tapered off within each word as shown at left.

Results



- Participants varied: some compensated more for the vowel than the glide, as predicted; others did the reverse
- Participants with short /i/ duration behaved as predicted
- For /i/s longer than the 100ms alteration, the alteration produced something sounding like a diphthong rather than simply a higher, fronter monophthong, which may have made it harder for participants to compensate or may have reduced the impetus to compensate. These participants showed less compensation for the vowel than the glide.
- /i/ duration does not explain everything; some participants showed other unexpected responses

Discussion

- Support for the hypothesis among participants who got the intended alteration (those with short /i/s): vowels respond more to acoustic feedback than glides
- Variability of response patterns suggests compensation may be more complicated than expected
- Further directions: longer alteration; /u/ and /w/; altered somatosensory feedback; other sonorous consonants

References:

Houde, John F. and Srikantan S. Nagarajan. 2011. “Speech production as state feedback control.”

Ogane, Rintaro, and Masaaki Honda. 2014. “Speech Compensation for Time-Scale-Modified Auditory Feedback.”