



The influence of language background on the relative perception of vowels

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Introduction

- Listeners categorize a sound halfway between [ε] and [i] more often as [i] in the context of a speakers with a high F1, and more often as [ε] in the context of a speakers with a low F1¹.
- Listeners compensate for the average spectral characteristics of a speakers voice².

Question:

- Is the amount of compensation dependent on a listener's native language and proficiency in a nonnative language?
- Spanish has only 5 vowels (and presumably little between-vowel overlap) which might reduce the need to normalize compared to languages that have more vowels (e.g. English and Dutch, which have 10+).

Participants

- Four groups of 18 listeners.
 - Native English
 - Native Spanish (low proficient in English)
 - Spanish - English bilinguals
 - Dutch (proficient in English)
- Listeners filled out a LEAP-Q questionnaire³.

Stimuli and procedure

- Stimuli were Spanish, English and Dutch.
- 7 step /sufu/ - /sofo/ continua were created, and spliced after sentences, manipulated to have high F1 or low F1's (ISI: 500ms).
- Participants categorized stimuli as sufu or sofo
- They also produced /i/, /e/, /a/, /o/, /u/, in their native language to determine vowel spread.

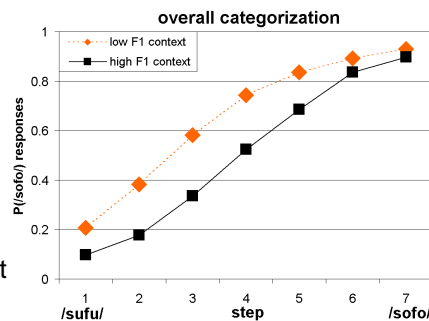
Results

Production data

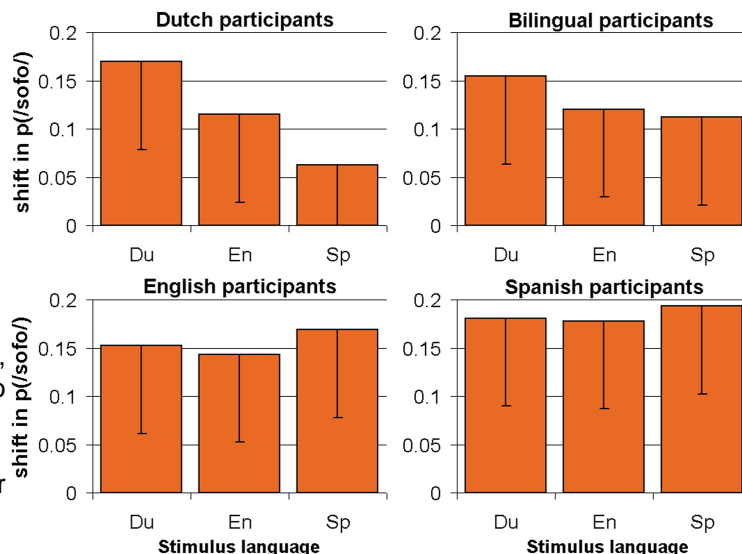
- Within category variance was similar across languages. In theory, the English and Dutch speakers could thus benefit more from compensation.

Perception data

- Categorization results showed that all listeners compensated for speaker characteristics: They gave more /sofo/ responses in a Low F1 than in a High F1 context
- Compensation effects were found across speakers of different languages and across stimulus languages.



Amount of contextual influence



- Spanish listeners compensated significantly more than the other groups.
- Differences in the size of the compensation effects per stimulus language, differed per language group.

- Correlations were found between the amount of compensation across different precursors. e.g., those listeners that compensated most for Spanish stimuli also compensated more for English stimuli.

Sp - En En - Du Du - Sp
 $r = 0.50/p < 0.001$ $r = 0.36/p = 0.002$ $r = 0.230/p = 0.060$

Conclusions

- Speakers of all tested languages compensate.
- Listeners also compensate in a second, or completely unfamiliar language.
- This suggests that most of normalization is the result of a language-general process.

- It seems to be not only acoustics however:
- The amount of normalization was adjusted by influences such as language background.
 - Spanish listeners compensated more than others.
- The amount of normalization depends on the particular combination of language background and stimulus language.
 - e.g. Dutch listeners show less compensation depending on familiarity with a language.

References

- ¹Ladefoged & Broadbent (1957). JASA, 29, 98 -104
- ²Watkins & Makin (1994). JASA, 96, 1263-1282
- ³Adapted from: Marian, et al., (2007). Journal of Speech, Language, and Hearing Research, 55 (4), 1-28.