

4a SC13 Native-Language Influence on Phonetic Perception in Dutch-English Bilinguals

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INTRODUCTION

- Numerous studies have documented differences across languages in the perceptual mapping between the acoustic properties of speech and phonetic representations.
- For example, the number of phonetic categories and the location of perceptual boundaries between categories along the voice-onset-time (VOT) dimension are known to differ across languages (e.g. Lisker & Abramson, 1964; Lisker & Abramson, 1970).
- These cross-language differences raise questions about the influence of a bilingual's native language on the perceptual mapping between acoustic signal and phonetic category in a second language.

CURRENT STUDY

The current study focuses on how native Dutch listeners who learned English as a second language perceive the syllable-initial English voiceless stop consonant /p/. Dutch and English differ in that voiceless stop consonants are produced with shorter VOTs in Dutch than in English (e.g. Lisker & Abramson, 1964; Flege & Eefting, 1987).

Previous research:

Previous research has shown that the voiced-voiceless boundary for an English-based VOT series occurs at a shorter VOT for Dutch-English bilinguals than English monolinguals, consistent with the fact that voiceless stops are produced with shorter VOTs in Dutch than in English (Flege & Eefting, 1987).

Current research:

In the current study, we ask whether the influence of a Dutch-English bilingual's native language on the perception of an English voiceless stop is seen only in the region of the voiced-voiceless boundary, or whether it extends to stimuli well within the voiceless category.

Specifically, we ask to what extent having Dutch as a native language influences the range of stimuli considered to be reasonable exemplars of an English voiceless stop (see Flege, Schmidt, & Wharton, 1996, for a similar approach with Spanish-English bilinguals).

EXPERIMENT

- Bilingual Dutch-English listeners and monolingual English listeners were tested in a three-choice identification task with an English-based extended VOT series that ranged perceptually from /ba/ to /pa/ to an exaggerated, breathy /pa/, labeled as */pa/. The stimuli were randomly presented and listeners were asked to identify each English syllable as /ba/, /pa/, or */pa/.
- We compared the two groups of listeners on both the /ba/-/pa/ boundary location and the /pa/-*/pa/ boundary location.
 - On the basis of previous research, we expected that the /ba/-/pa/ boundary would be located at a shorter VOT for the Dutch-English bilinguals than the English monolinguals.
 - The main question was whether the /pa/-*/pa/ boundary would show a similar shift, indicating that having Dutch as a native language influenced the entire range of stimuli perceived as reasonable exemplars of English /p/.

Subjects

- 12 native speakers of American English tested in Boston, MA.
- 12 native speakers of Dutch who learned English as a second language tested in Nijmegen, the Netherlands.

Procedure

- Experiment was run in the same way in Boston and in Nijmegen, in each case by a native English speaker.
- Subjects identified each English syllable as /ba/, /pa/, or */pa/.

Stimuli

- LPC-based 28-step VOT series based on the syllable /ba/ produced by a female English speaker.
- Series ranged from -38ms to 110ms VOT in roughly 5ms steps.
- Syllable duration (216ms) remained constant throughout series, except for the 4 stimuli which included prevoicing. The syllable duration for these 4 tokens was longer by the duration of the prevoicing.
- 20 blocks of 28 stimuli, randomized within blocks.

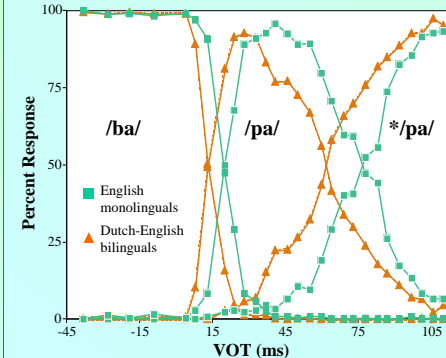
Results

Mean boundary values and category width in ms VOT (sd in parentheses)

	/ba/-/pa/	/pa/-*/pa/	/pa/ category width
English monolinguals	20.86 (3.78)	75.71 (9.49)	54.85 (7.12)
Dutch-English bilinguals	14.58 (4.27)	62.41 (14.47)	47.83 (13.24)

- For each subject, the percentages of /ba/, /pa/, and */pa/ responses were calculated and the /ba/-/pa/ and /pa/-*/pa/ boundaries were determined by fitting a linear regression line to the data in the respective boundary regions and taking the 50% crossover values as the boundary locations.
- The table above shows the mean /ba/-/pa/ and /pa/-*/pa/ boundaries in ms VOT for the two groups of listeners. The width of the /pa/ category (the distance between the two boundaries in ms VOT) is also shown. The figure on the left displays the percentage of times stimuli were identified as /ba/, /pa/, or */pa/ by each listener group.

- As can be seen in the figure, the identification functions for the two groups of listeners are displaced relative to one another, with the Dutch-English bilinguals showing a shift to shorter VOT values not only at the /ba/-/pa/ boundary, but also at the /pa/-*/pa/ boundary. This indicates that having Dutch as a native language influenced the entire range of stimuli perceived as reasonable exemplars of /p/ in English.
- A 2 (Language Group) x 2 (Boundary) ANOVA showed that both main effects were highly significant ($p < .01$). Although the effect of Language Group was somewhat larger for the /pa/-*/pa/ boundary than the /ba/-/pa/ boundary, leading to a somewhat narrower /pa/ category for the Dutch-English bilinguals compared to the English monolinguals (see the table above), this difference in width was not significant, as shown by the lack of a significant interaction between Language Group and Boundary ($p > .10$).



SUMMARY & CONCLUSIONS

- As expected, the voiced-voiceless boundary along an English VOT series was shifted toward shorter VOT values for bilingual Dutch-English listeners compared to monolingual English listeners.
- In addition, the location along the series at which voiceless stimuli were no longer heard as reasonable exemplars of the voiceless category, but instead as exaggerated, breathy exemplars, was also shifted toward shorter VOTs.
- These findings indicate that the influence of a bilingual's native language on the perception of a second language is not limited to the region of a phonetic category boundary, but extends to stimuli beyond the boundary region. Thus, the native language influence entails a comprehensive alteration in the mapping between acoustic signal and phonetic category.

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