Speaker- vs. Listener-Based Explanations for Dispersion

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Background

Phonetic dispersion has been proposed as the driving force behind universal trends within phoneme inventories and a number of sound-change phenomena (e.g. vowel chain shifts).

Puzzle: *What is the mechanism driving dispersion?*

Speaker-based accounts of dispersion (e.g. Lindblom, 1986; McGuire and Padgett 2010) posit that speakers are sensitive to the communicative needs of listeners, and adjust their production based on these needs. There is evidence for a broad version of this claim, given that speakers hyperarticulate in "clear" speech settings (e.g. Moon and Lindblom, 1994). But do speakers have control over dispersion of individual vowels based on the listener's needs?

Listener-based accounts (e.g. Wedel, 2006; Denby 2013) posit that phonetically unambiguous productions will influence future productions of the listener more than ambiguous productions. The mechanism that drives this is a filter: not all ambiguous productions are stored to phonetic memory.

Speaker-Based Experiment

Hypothesis

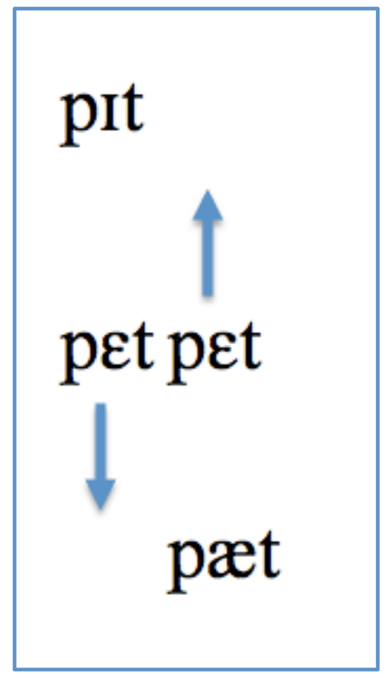
- Speakers alter productions of individual phonemes to aid listeners

Procedure

- Participants visually prompted for productions of monosyllabic words with one of 3 adjacent vowels, e.g. [ɪ,ɛ,æ]
- Participants told they were testing speech recognition software
- Computer "misheard" some productions, participants asked to repeat word up to 3 times

Predictions

- Participants will hyperarticulate productions
- Crucially, participants will **lower [ɛ] if it was misheard as [ɪ], raise it if it was misheard as [æ]**



Results

- Participants hyperarticulated vowel productions, as reflected by significantly longer durations
- **No effect of misheard vowel** on repeated productions, i.e. no online control over individual phoneme productions

Listener-Based Experiment

Hypothesis

- Listeners' storage of phonetically ambiguous tokens is degraded

Procedure

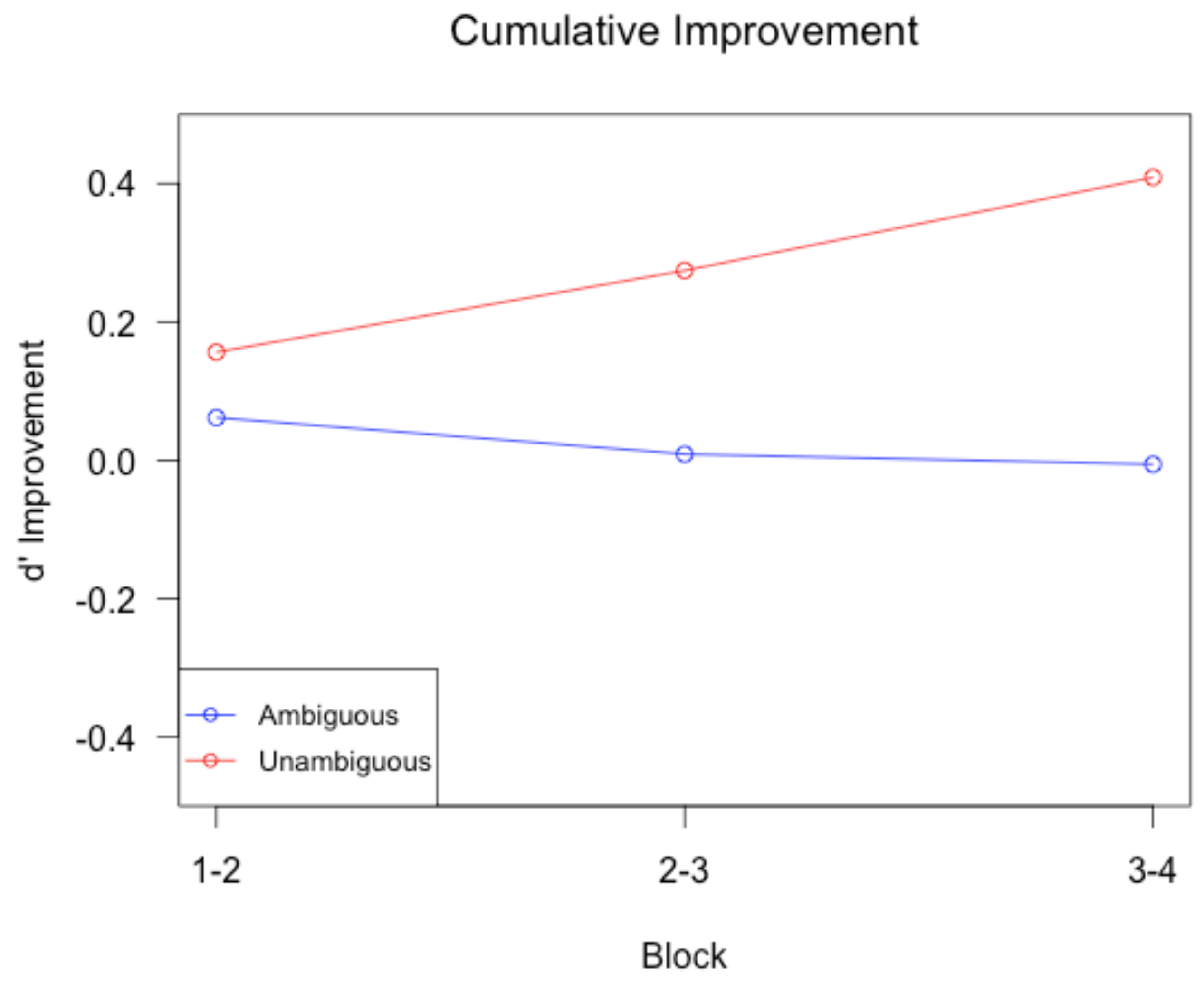
- Perceptual recognition task—listeners heard words in isolation, typed what they heard (n=28)
- All 72 stimuli were monosyllabic, stop-initial minimal pairs (e.g. *pat/bat*) presented in pink noise (SNR -5)
- 4 identical experimental blocks
- VOT of half the stimuli were manipulated to be somewhat ambiguous (as defined by a pilot study)

Predictions

- Accuracy will improve over course of experiment more for unambiguous condition than ambiguous condition

Results

- ANOVA reveals d' improves significantly more ($p < .05$) for unambiguous condition than ambiguous condition



Conclusion

Although the two theories are not mutually exclusive, **preliminary results support a listener-based explanation for dispersion** effects. A follow-up study is required, given possible confounds in the manipulation of stimuli.

References

Denby, Thomas (2013). The filtering listener: dispersion in exemplar theory. MA thesis, UC Santa Cruz. **Lindblom, Björn** (1986). Phonetic universals in vowel systems. In Ohala, J. J. & J. J. Jaeger (eds.) Experimental phonology. Orlando: Academic Press, 13-44**. McGuire, Grant, Jaye Padgett, Lillian V. Clark, Nathan P. Hinchey, Rachel McClellan, Kaitlyn Pavlina, Elan Samuel & Alex Wolfe** (2010). On the bases of vowel dispersion: an experiment. Slides of talk presented at the annual meeting of the LSA, Baltimore**. Moon, Seung Jae & Björn Lindblom** (1994). Interaction between duration, context, and speaking style in English stressed vowels. *Journal of the Acoustical Society of America* 96.1, 40-55.