The Effect of Structural Context and Predictability on Phonetic Accommodation

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Background: Listening for sound or meaning?
Past research in speech perception (Cole & Jakimik 1980, etc.) has shown that words are recognized through the interaction of meaning and sound.

More recent work has indicated different modes of listening (Lindblom 1995, Hickok and Poeppel 2004, 2007). ‘listening for sound’ (how mode) or listening for meaning (what mode).

Experiment #1: Structural Context

Does structural context – whether a word is in a sentence or in isolation – affect phonetic attention?

Hypothesis: Subjects will show more Phonetic accommodation when hearing words in isolation, rather than in context.

Method – Stimuli:
- Target words all began with the phoneme /k/, two syllables, initial stress. These words occur in sentences that are either predictable: “The pioneers made log _____” or “Pennies are made of _____.”
- VOT: The VOT of /k/ was lengthened to twice as long, minimally 100 ms.

Procedure and Subject Groups: 3 blocks. Subjects read sentences in blocks 1 and 3. In block 2, they heard the model and repeated what they heard. Only difference in groups: Group A hears target word in sentence. Group B hears target word in isolated phrase.

Results: Subjects showed more imitation when hearing isolated phrases than sentences during immediate shadowing.
- No significant difference from baseline to post-exposure (p = 1.09, df = 1, p = 0.2958).

- Right: Mean VOT difference from baseline
- Model by subject: Two outliers
- Smoothing from model: put mean VOT difference down.

Discussion and Conclusion
- The two experiments in this study show that higher level information modulates the degree of phonetic attention, and in turn phonetic accommodation.
- Experiment #1: Marginally significant effects for higher accommodation for target words in sentences vs. in isolation.
- Experiment #2: Strong effects showing more attention and accommodation to unpredictable words when not told to imitate.

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Experiment #2: Contextual Predictability

Does contextual predictability of target words affect a listener’s attention to phonetic details? First experiment did not separate syntactic from semantic.

Hypothesis: Subjects will attend to phonetic details more for contextually unpredictable than predictable words and thus will show more accommodation.

Method – Stimuli:
- Target words all began with phoneme /k/, two syllables, initial stress. These words occur in sentences that are either predictable: “The pioneers made log _____” or “Pennies are made of _____.”
- VOT: The VOT of /k/ was lengthened to twice as long, minimally 100 ms.

Procedure and Subject Groups: Single block of 100 sentences—30 predictable, 30 unpredictable, 40 fillers.
- Subjects listened and shadowed.
- Two counterbalanced groups: each word heard only once, in predictable or unpredictable context (to avoid priming)
- Two versions of experiment: Subjects were given no instruction to imitate vs. told explicitly to imitate 20 subjects in each group.

Results: When given no instruction to imitate, subjects show significantly closer VOT and pitch to the model for unpredictable words. When told to imitate, there are stronger order effects, and differences in predictability only emerge by the end of the experiment.

VOT: VOT difference from the model — Mixed-effects model with subject and word as random effects. Significant gender differences, but overall similar pattern to VOT. MEM results below.

Pitch: Pitch normalized as ratio of target syllable to reference pitch. Significant gender differences, but overall similar pattern to VOT. MEM results below.

References

- Past research in speech perception (Cole & Jakimik 1980, etc.) has shown that words are recognized through the interaction of meaning and sound.
- More recent work has indicated different modes of listening (Lindblom 1995, Hickok and Poeppel 2004, 2007). ‘listening for sound’ (how mode) or listening for meaning (what mode).
- Experiment #1: Marginally significant effects for higher accommodation for target words in sentences vs. in isolation.
- Experiment #2: Strong effects showing more attention and accommodation to unpredictable words when not told to imitate.
- When told to imitate, the overall difference was smaller, with stronger order effects and predictability order interactions.
- Context modulating ‘what’ vs. ‘how’ mode? Or a more complicated story?

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