Phoneme categorization gradience is advantageous for coping with ambiguities: Evidence from individual differences

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Theoretical motivation

- Classic views of speech perception (motivated by categorical perception) suggest it is more efficient to discard within-category variation when categorizing speech sounds (e.g. /b/ versus /p/).
- However, listeners are sensitive to within-category differences.
- What is the role of gradience in phoneme categorization for speech perception? Does it reflect noise? Or is it helpful?
- We address this question with an individual differences approach.

Method

Design:

We assessed listeners’:
1) degree of gradience in categorizing phonemes, and
2) pattern of recovery from lexical garden-paths

Subjects: 67 adult monolingual English speakers

Assessing gradience in speech perception

Task: Visual Analogue Scaling (VAS) task

Stimuli: 7-step VOT × 5-step FO bin-pin continuum

To extract a measure of gradience, we calculated the steepness of the slope at the category boundary after adjusting for secondary cue use

Assessing recovery from lexical garden paths

Task: Visual World Paradigm (VWP) task (McMurray et al, 2009)

Results

Individual differences in gradience:

Looks to target and competitor items as a function of VOT

Individual differences in dealing with garden-paths:

a) Garden-path rate
Distances from target predicted whether a participant would garden-path, accounting for 32% of the variance (β=.57, p<.001).

b) Recovery rate
Distance from target predicted whether a participant would recover from garden paths, accounting for 36% of the variance (β=.60, p<.001).

VAs slope (i.e. categorization gradience) also predicted recovery, accounting for an additional 2.5% of the variance (β=.15, p<.001).

c) Recovery latency
Distance from target predicted how fast a participant would recover, accounting for 7% of the variance, (β=.27, p<.001).

Discussion

- Some listeners are more sensitive to within-category differences.
- Higher gradience predicts better recovery from initial misinterpretations of the input (lexical garden-paths; committing too strongly to one interpretation may make listeners less flexible). 
- Categorization gradience may play a positive role in speech perception in some contexts.


