

## Main Point

VOT produced during a listen-and-repeat task was longer in low-frequency words, but only in the voiceless series and only when embedded in a rich linguistic context.

## Background

Evidence suggests pervasive influence of linguistic experience in language storage, speech production, and speech perception.

Experiences affect linguistic memory representations or lexical storage (Pierrehumbert, 2001, Goldinger, 1996, 1998, Shockley, Sabadini, & Fowler, 2004, Bybee 2001, 2006)

Perceptual learning has shown recent exposure to specific words can affect representations (Norris, McQueen, & Cutler, 2003; Kraljic & Samuel, 2005).

Ganong (1980) showed perceptual bias toward real words over non-words. Category boundaries shifted to include more actual words over non-words.

Talkers' speech production is affected by ambient language (Sancier & Fowler, 1997) and can be affected by familiarity with specific words in conversational context (Pardo, 2006).

## Research Question

Do lexical usage frequency and immediate linguistic context influence the production of voice-onset time?

## Method

### Design and Procedure

Design: 56 target words with alveolar and velar stops in initial position, balanced by

- frequency: high, low
- lexical status: word, non-word (no voiceless non-words)

	low freq [g]	high freq [g]	non-word [g]
low freq [k]	caulk - gawk ooo - goo	cot - got curl - girl	killn - g:iln kith - g:ith
high freq [k]	call - gall car - gar	could - good came - game	keep - geep can - gan

c(i). impoverished linguistic context

*could*  
*say "could" very clearly*

c(ii). rich linguistic context:

*Barry could shave in under 20 minutes*  
*...before they could start to dine freely...*

Task: Produce target words from orthographic cue.

Participants: 2 men, 4 women, 27.4 years old, monolingual American English talkers, normal hearing/vision, no speech or language deficits, white, right-handed.

Data: Each of 6 participants produced about 700 forms, yielding about 4200 total VOTs.

Analysis: means and 95% confidence intervals are reported in the figure. The data were treated as repeated-measures analysis using non-parametric bootstrap resampling.

## Results

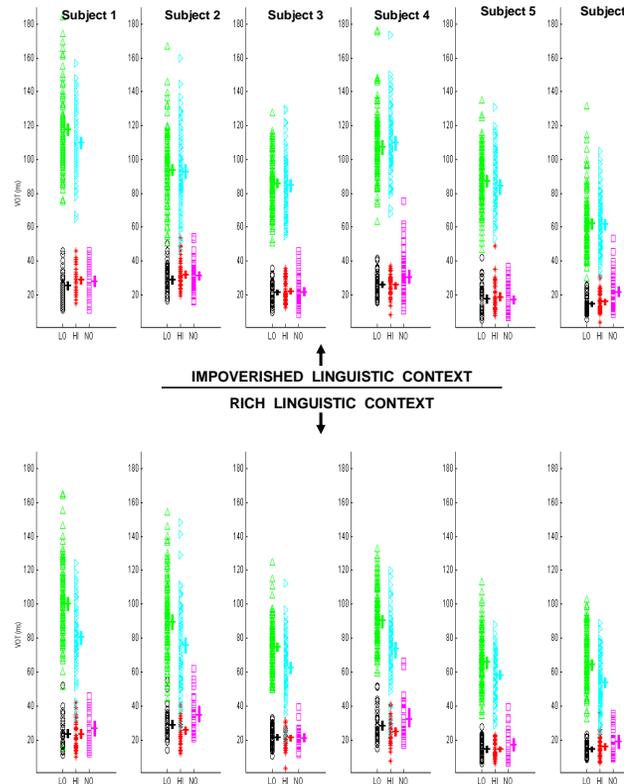


Figure 1. VOT in target words. The top row of 6 subjects shows target words' VOT produced in 'impoverished' linguistic context and the bottom row shows the words' VOT in 'rich' linguistic context. Lexical frequency (high and low) and lexical status (non-words and real words) are shown on the abscissa. Voiced and voiceless categories are distinguished by marker variation. Means and 95% confidence intervals are shown by the bars shifted slightly to the right of the scattered data.

Differences are observed only in the voiceless series for words in context: VOT is longer in low-frequency words than in high-frequency words.

## Conclusions

- VOT production within the voiceless series was affected by usage frequency only when target words were embedded in a supporting linguistic context.
- VOT within the voiced series was not affected by usage-frequency, lexical status, or linguistic context.
- The voiceless series is the locus of differentiation in production. This accords with previous work on fine-grained VOT production (Miller, Green, & Reeves, 1986, Volaitis & Miller, 1992). Our previous *perception* work has shown differentiation in the voiced series with no concurrent effect in the voiceless series (VanDam, 2007; VanDam & Port, 2009).
- Ganong (1980) showed voicing category boundaries shifted to favor perceptual categorization biasing real words. A similar production effect would be (a) a difference between words and non-words (b) in the direction of category centers shifted toward more extremes (i.e., shorter for voiced and longer for voiceless). The present results fail to show a non-word production effect in either direction, suggesting the possibility of evidence against a production-based Ganong-effect.

- Fine-grained detail of temporal speech features reveal a complex asymmetry in speech production: detailed structure in the voiceless series but not in the voiced.