The extent of variation in the production of coronals in English infant-directed speech

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I. Introduction

- Casual adult-directed speech (ADS) has copious phonetic variation [e.g., 4]

- In contrast, infant-directed speech (IDS) has been previously argued to be more canonical (faithful to dictionary pronunciation) [5][6]

- However, recent studies find IDS and ADS to be equally variable [2]

- Typically, IDS variation examined word-finally

- But cross-linguistically in adult grammars, onset positions are more phonologically stable and salient [1]

Does the extent of phonetic variation in IDS differ based on segment position in a word?

II. Methods

- IDS from Providence Corpus (longitudinal) [3]
  - 6 monolingual English-speaking 1- to 3-year-olds interacting with parents (usually mothers) at home during everyday activities
  - Data from two age ranges, 16-18 and 22-24-mo-old
- Utterances with coronal stops and fricatives (/t/, /d/, /n/, /s/, /z/) identified using orthography
- Utterances were forced-aligned [7]
- Alignment check, phonetic transcription of allophonic variants by 3 phonetically-trained native speakers of English,
- Automated data extraction, problematic tokens (alignment/transcription error) rechecked by 4 new phonetically-trained native speakers of English
- Examples of phonetic coding of segments

Target sound	Phonetic realization	Position in word	Preceding segment	Following segment	Word	Part of speech
t	ʔ	final	'V	n	cat [now]	content
s	s	medial	p	t	upstairs	content

- Final corpus: 28,775 segments
- Currently processed: 25,296 segments

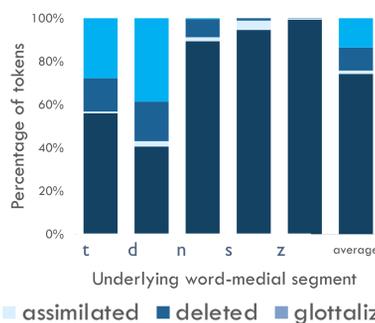## III. Results – Variants by position

Initial (7,054 tokens)

- Canonical variant [released stop/fricative] was **the most frequent** variant for every segment
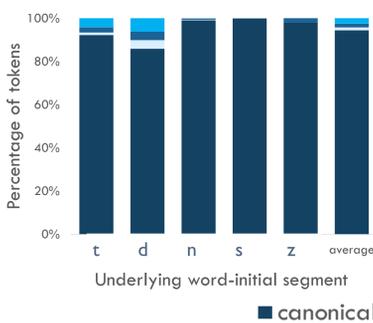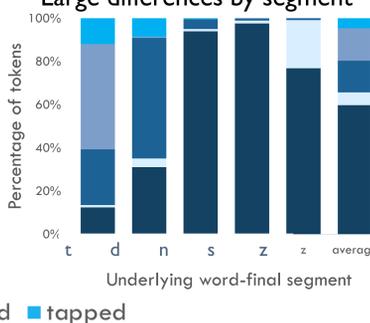
Medial (7,095 tokens)

- Canonical variant was still **the most frequent** variant for every segment, but to a lesser degree

Final (11,147 tokens)

- Canonical variant is **not the most frequent variant** for either /t/ (13%) or /d/ (31%)
- Large differences by segment

Legend: canonical, assimilated, deleted, glottalized, tapped

IV. Results – Duration variation by position

- How variable is the production of canonical tokens in different positions?
- Even among canonical tokens, duration of /t/ varies most word-finally; in contrast, there are no differences in duration of canonical /n/ & /s/ across positions.

Duration of canonical productions of /t/
Duration of canonical productions of /n/
Duration of canonical productions of /s/

Legend: initial, medial, final

V. Results - Comparison to ADS

- Comparing a subset of our IDS data in assimilation contexts (word-final /d/, /t/ and /n/, 725 tokens) directly to the ADS study by [4] (4349 tokens)
- Less canonical in current IDS study:
  - /t/ (χ^2(2,323, N = 2,324) = 56,77, $p < .001$)
  - /d/ (χ^2(1,308, N = 1,309) = 33.33, $p < .001$)
- Similarly variable in current IDS study: /n/ (χ^2(1,117, N = 1,118) = 0.03, $p = 0.86$)

ADS (Dilley & Pitt, 2007)
IDS (Current study)

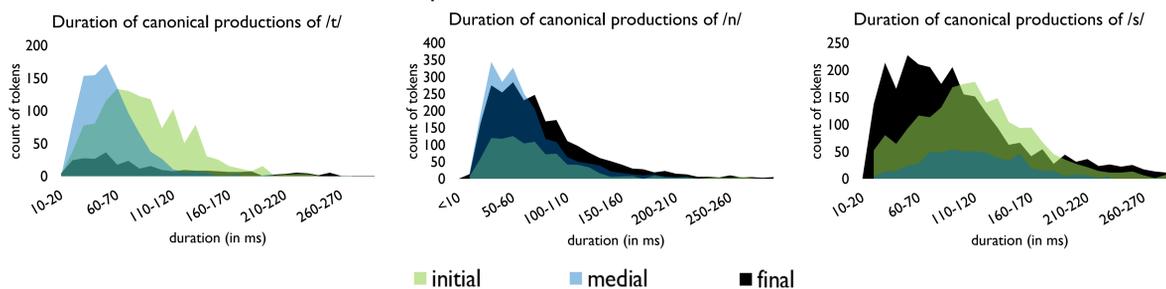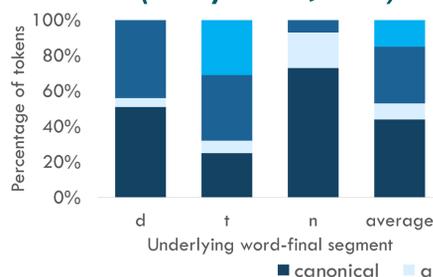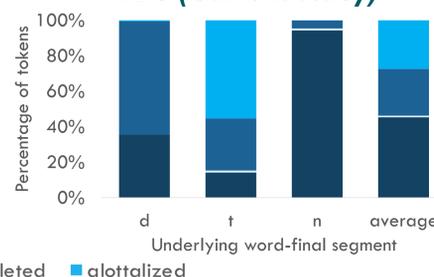Legend: canonical, assimilated, deleted, glottalized

VI. Summary

- We replicate [2]'s results that IDS is **not** more canonical than ADS
- Not all segments are equally variable - /n/ and /s/ are produced mostly canonically, /t/ has many more variants
- Variation is mostly limited to coda positions
  - In onsets, the canonical variant is always the most frequent
  - This is not true for codas
- This **positional difference** could be beneficial for category learning:
  - Word-initial segments: acquire canonical forms, support word segmentation
  - Word-final segments: variation, learn allophonic variants in connected speech
- Future work: more on acoustic properties of phonetic variants

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