

Incomplete neutralization in African American English: The role of vowel duration






Charlie Farrington, University of Oregon

NWAV 46, Madison

African American English

- We know a lot about a few consonantal features of AAE varieties (Thomas 2007; Thomas & Bailey 2015)
 - r-lessness
 - (ing)
 - consonant cluster reduction
 - stopping/labialization of interdental fricatives
- But several more have been underexamined
 - nasal deletion
 - /skr/ for /str/
 - devoicing/glottalization of final consonants

Final Consonants in AAE

- In some varieties of AAE, final obstruents can be replaced with a glottal stop or deleted...
- /t/, /d/
 - “Ever since then, I **had: transferred-** cause I was **at**, you remember I had went to Northern, I had transferred from Northern to **Riverside**, then from **Riverside** to **Hillside...**” (Durham, male, 21) 
- Glottal stop replacement of /k/, /g/
 - “take a check” (20, male, Durham) 
 - “that big” (19, male, rural Durham) 
- But also deletion of final obstruents
 - e.g., “you know when that **Above** The Rim came out” (19, male, Memphis) 
 - “my car was sitting right in front of my momma **house**” (22, male, Memphis) 

Final Consonants in AAE

- In the case of final stops...
- How are words like *bat*, *bad*, *back*, and *bag* distinguished?
- Today, I'm focusing on the first step, looking at the consonant realization of word final /t/ and /d/ in three varieties of AAE
- And whether vowel duration plays a role, specifically in glottal replaced stop contexts

Glottalization in AAE

- Glottal stop replacement of /d/
 - Unique to AAE (especially in stressed syllables) (Fasold 1981)
 - Several geographic settings
 - Detroit (Wolfram 1969; Kohl & Anderson 2000; Nguyen 2006); Houston (Koops & Niedzielski 2009, 2010); Durham, NC (Farrington 2011); Washington DC (Fasold 1972; Grieser 2014), NYC (Labov et al. 1968); Los Angeles (Legum et al. 1971), Minneapolis, MN (Pederson 1967)
 - Well studied in speech pathology literature (Moran 1993; Williams 1998; Stockman 2006)
- Glottal stop replacement of /t/
 - Common across regional varieties (Roberts 2006; Eddington & Taylor 2009; Eddington & Channer 2010)
 - Glottal variant is part of regular variation in American English /t/ (Sumner & Samuel 2005)
 - Acoustic characteristics (Garellek 2013, Garellek & Seyfarth 2016; Dilley & Pitt 2007)
 - Occurs in AAE (Thomas 2007; Koops & Niedzielski 2009; Farrington 2015)

Deletion in AAE

- Consonant cluster reduction
 - We know a lot about the constraints on CCR in AAE
- Final consonant singleton deletion (Thomas 2007)
 - Common as a result of connected speech processes (Temple 2014), especially when a consonant follows (Wolfram 1969)
 - But can also occur in pre-pausal environments
 - Some previous work in Atlanta AAE (Harrison 2007)

Word final neutralization in AAE

- The loss of place of articulation through debuccalization, and consonant deletion result in coda neutralization

Word final neutralization

- Common across languages, with devoicing being one of the classic examples of neutralization (Yu 2011; Myers 2012)
 - Investigated in many language varieties (Silverman 2012; Kharlamov 2012)
 - Incomplete neutralization (Kharlamov 2012)
 - Vernacular universal (Chambers 2000)
- Occurs in American English varieties (Wisconsin German English, Purnell et al. 2005; Iverson & Salmons 2012)

Phonologization

- The development of a phonetic feature into a phonemic one
- In the case of incomplete neutralization, there are often cue-trading relationships between what was a primary cue (e.g. consonant voicing) and a secondary cue (e.g. vowel duration) (Kirby 2010)
 - In Wisconsin German English, e.g. duration of preceding vowel, glottal pulsing (Purnell et al. 2005)
- Much has been said about the vowel length difference in English

Phonologization

- Solé (2007) shows that English duration varies by speech rate, which suggests a clearer phonological target when compared to other languages in the study (Arabic and Catalan)
- Partially phonologized consonant voicing in vowel duration (Yu 2011)
- Step in phonologization process, where a new distinction leads to the loss of another distinction (Hyman 1976)

AAE and Phonologization

- AAE exhibits glottal stop replacement for both word final /t/ and /d/, which presents a unique testing ground for the continued phonologization of vowel duration in an American English variety
- Vowel duration in AAE
 - Recent work by Holt, Fox & Jacewicz (2015, 2016) in North Carolina AAE

AAE Vowel Duration

- In a lab study, AAE speakers have longer vowels before canonical /d/ when compared to Mainstream American English speakers, while vowels before /t/ were not significantly different
- Holt et al. (2016) suggest extensive vowel duration lengthening might be a primary cue for consonant voicing distinctions in AAE

Vowel duration and phonologization

- In a lab setting, Holt et al. (2016), they found that AAE shows a large distinction between vowels before /d/ when compared to vowels before /t/
 - Is this distinction robust in conversational data?
- If we code for the phonetic realization of the consonant....
 - Are vowels before /d/ longer before glottal stops than coronal stops (neutralized vs non-neutralized situations)?

Methods – Data Sources

- Memphis, TN (N=12)
 - Collected in 2001 by Valerie Fridland (see Fridland 2001, 2003)
- Durham, NC (N=12)
 - Collected in 2012 for the Frank Porter Graham longitudinal study of AAE (see Van Hofwegen & Wolfram 2010)
- Washington, DC (N=12)
 - Collected in 2015-16 for the Corpus of Regional African American Language (CORAAL; Kendall & Farrington 2017)

Methods

- Analysis conducted in Praat using acoustic correlates
 - Coded word final /Vt/ and /Vd/ words for phonetic realization
 - Extracted duration of preceding vowel

Methods – Coding /t, d/

- Tokens were coded as a coronal stop, glottal replaced stop, glottal reinforced stop, or zero coda
- Without articulatory data, this study draws on acoustic and auditory observations, acknowledging that there are issues of articulations which aren't necessarily audible or observable from the acoustic signal (Temple 2014)

Methods – Coding /t, d/

	Code	Acoustic Correlates (Thomas 2011, Foulkes & Docherty 1999, Roberts 2006)
Coronal Stop	[d]	Full alveolar with voice bar, no evidence for glottalization
	[t]	Full alveolar without voice bar, no evidence for glottalization, released and unreleased
Reinforced Stop	[ʔd]/[ʔt]	Slowed glottal pulses leading up to oral closure; formant transitions evident (F1 decreases, F2 increases)
Glottal Stop	[ʔ]	No formant transitions, F0 drops
Zero Coda	∅	No evidence for oral closure; may trail off into breathiness

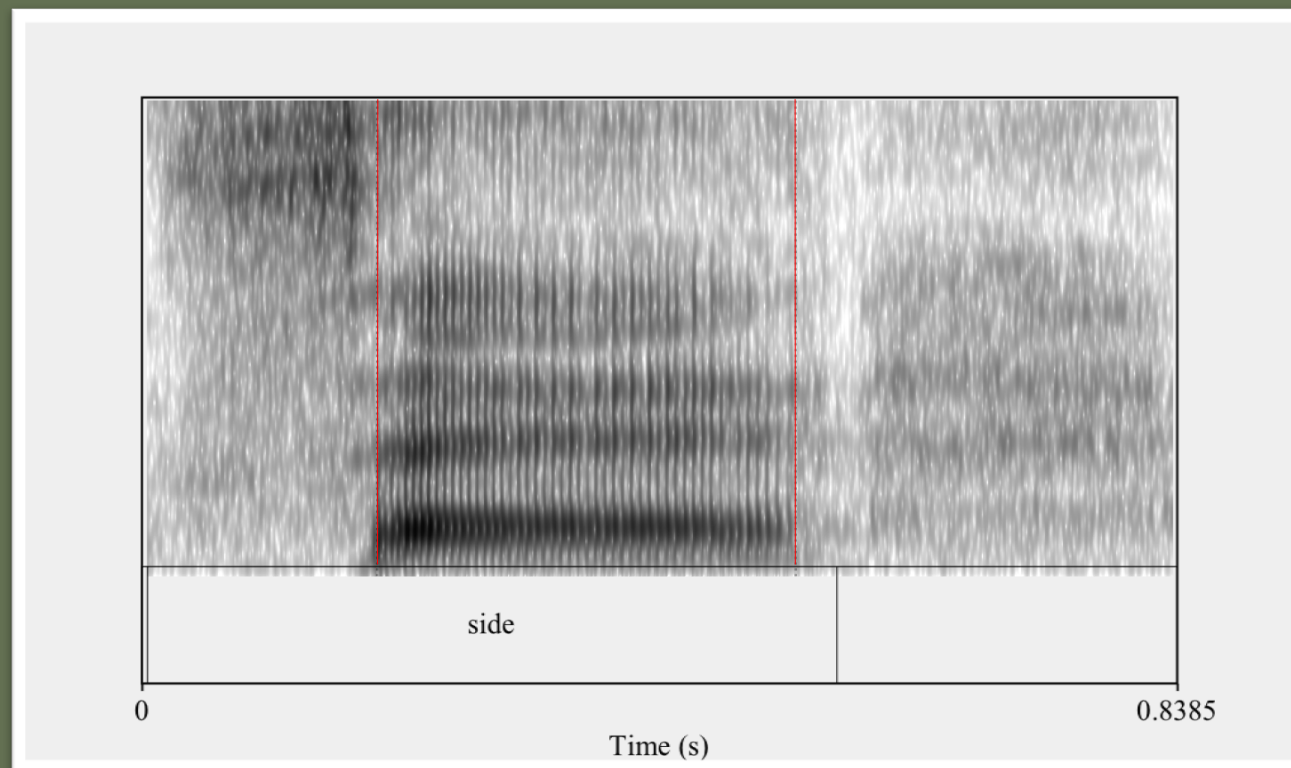
- Glottal reinforced stops accounted for four percent of the data, and for the current analysis were collapsed together with coronal stops due to lack of perceived neutralization.

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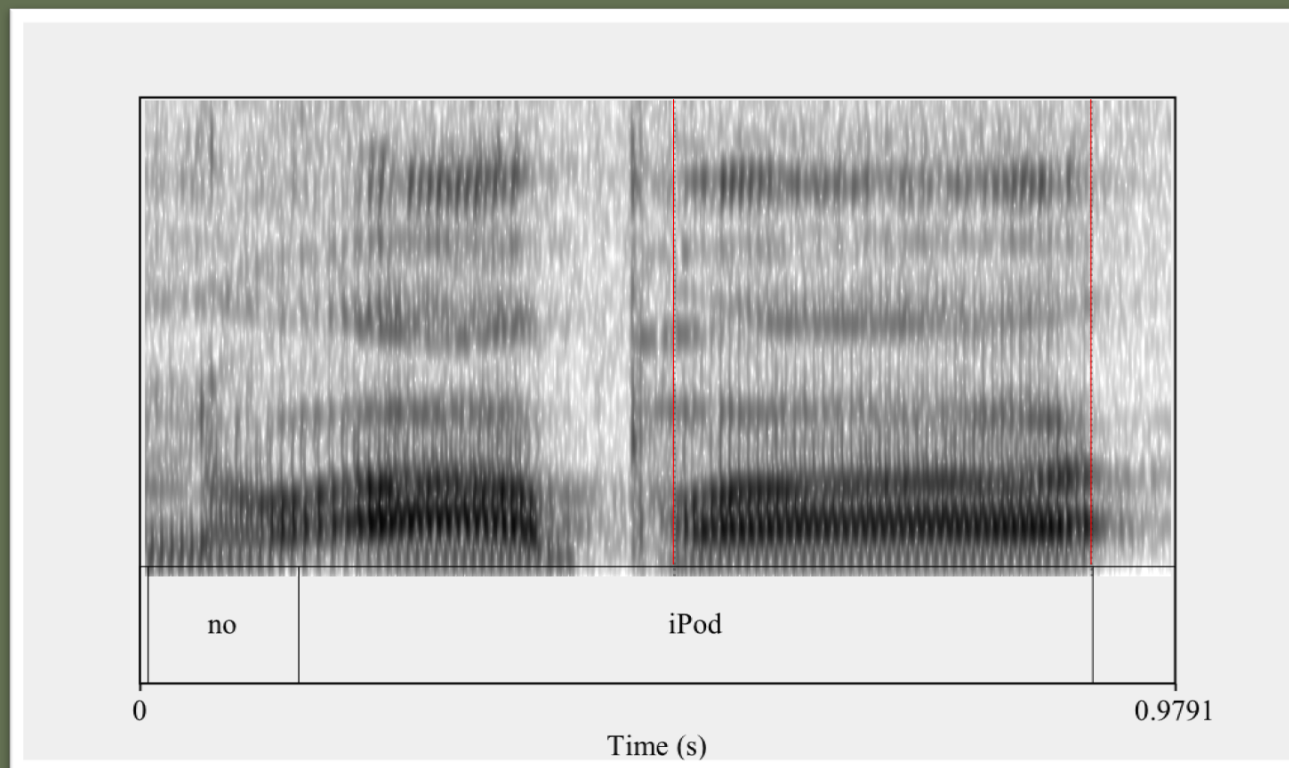
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Methods – Zero Coda /d/



Methods – Glottal stop for /d/



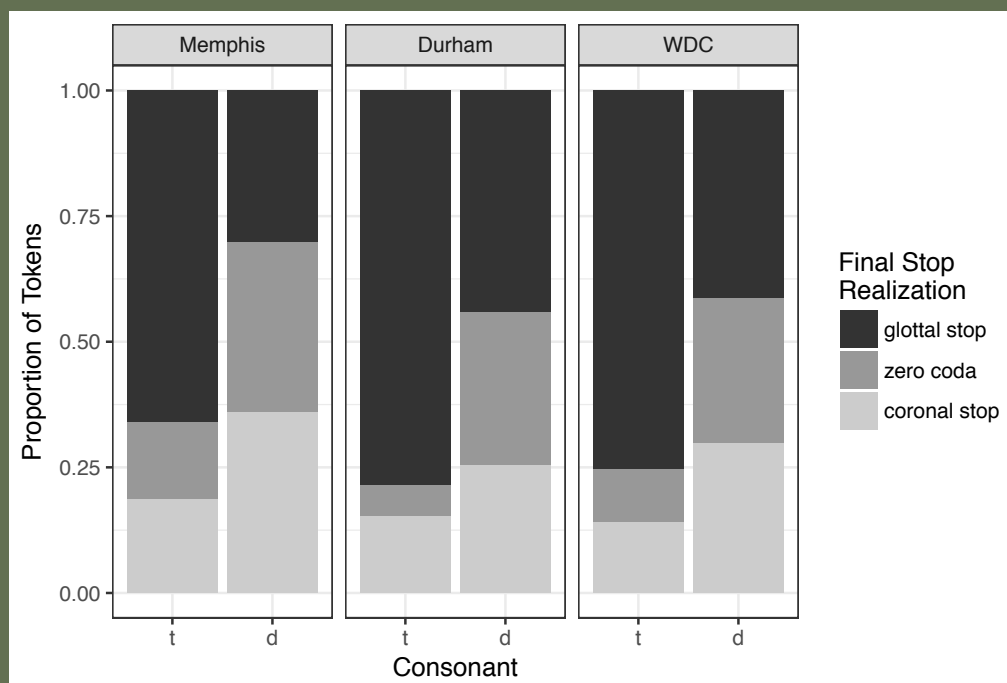
Methods

- Overall distribution of final stops by realization in the data
- Strikingly, /t/ glottalization accounts for 72% of /t/ realizations

	Realization			Totals
Consonant	Glottal	Zero Coda	Coronal	
/t/	1368 (72.8%)	205 (10.9%)	307 (16.3%)	1880
/d/	680 (38.6%)	544 (30.9%)	534 (30.4%)	1758
Totals	2048 (56.3%)	749 (20.6)	841 (23.1%)	3638

Methods

- If we look at the distribution by field site...
- Memphis deletes /t/ more than Durham and DC
- Memphis also has more coronal stop realizations of /d/
- Each of the variants (glottal stop, zero coda, and coronal stop) occurs in every speaker in the analysis



Analysis

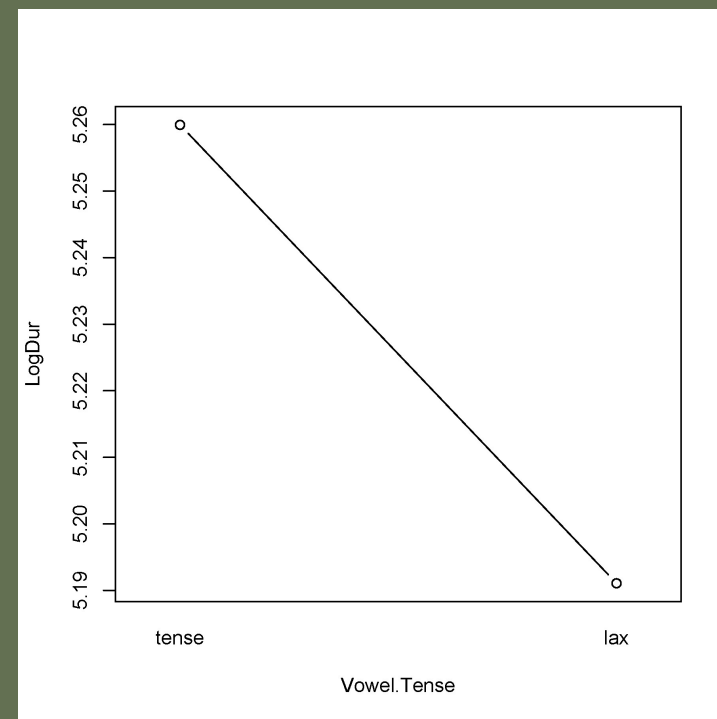
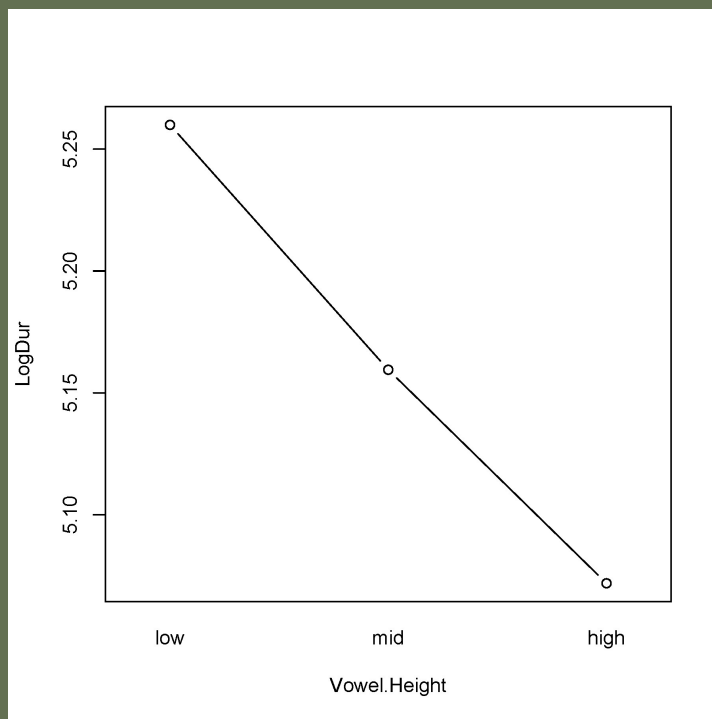
- How vowel duration interacts with consonant type and consonant realization
- Linear mixed effects regression with speaker and word as random effects in all models tested
 - DV: Log vowel duration (stressed tokens only)

Consonant	Realization	N	Mean Duration (ms)	SD
/t/	Glottal Stop	1290	176.96	0.066
	Zero Coda	178	145.11	0.069
	Coronal Stop	298	137.40	0.066
/d/	Glottal Stop	545	268.22	0.105
	Zero Coda	479	186.18	0.089
	Coronal Stop	468	206.19	0.101

What we expect

- There are several internal factors that we know affect the duration of the vowel (Peterson & Lehiste 1960; Jacewicz et al. 2007; Holt et al. 2016), including:
 - Vowel Tenseness: Tense > Lax
 - Vowel Height: Low > Mid > High
 - Vowel diphthongality: Diphthong > Monophthong
 - Utterance Position: Final > Medial
- Tenseness, height and utterance position were in the final model
 - Vowel diphthongality not included

Vowel Height and Tenseness

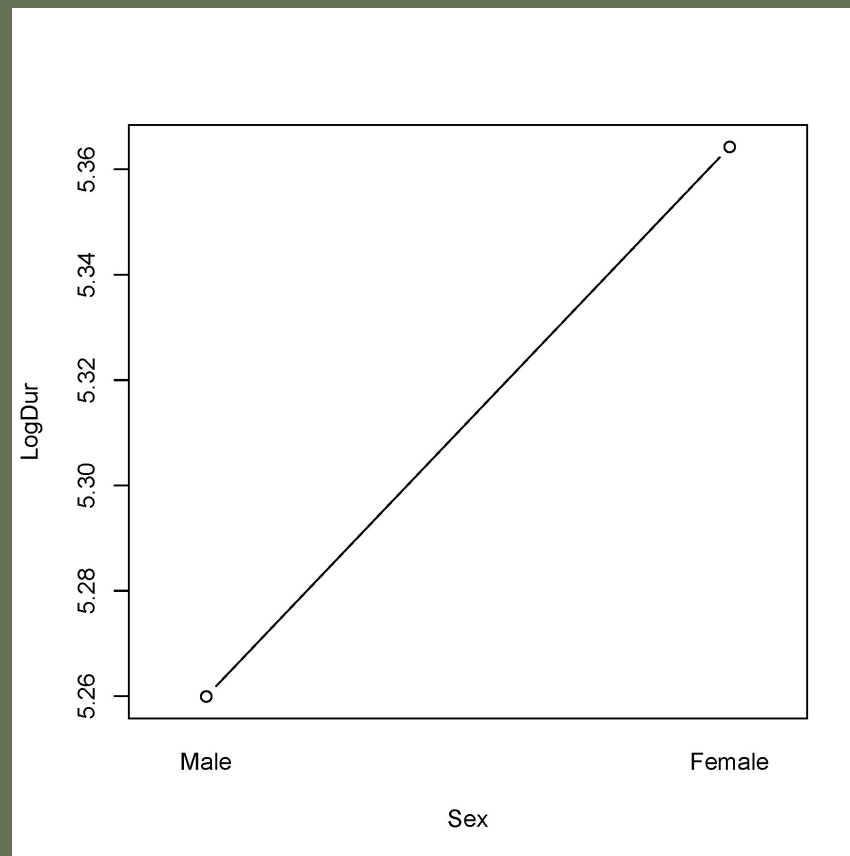


Variables

- In addition to those vowel quality factors, we included
 - Consonant type: t, d
 - Consonant realization: glottal, zero coda, coronal
 - Sex: female, male
 - Field Site: Memphis, Durham, DC

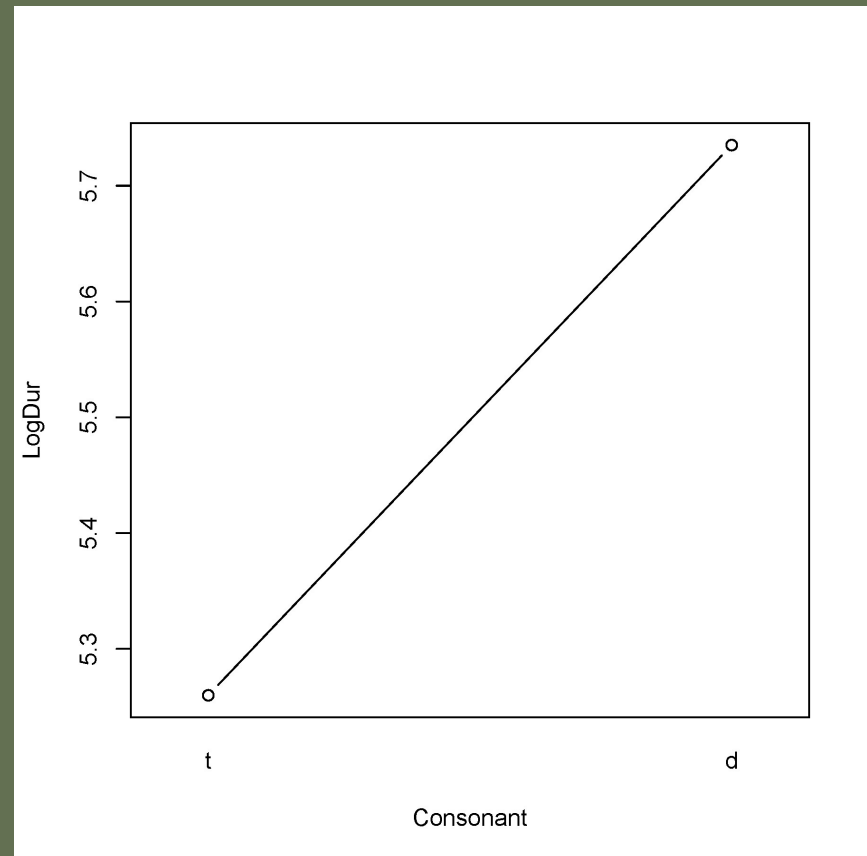
Sex

- Females have longer vowels than males
- In line with some previous work on AAE (Holt et al. 2016) and other varieties of American English (Jacewicz et al. 2007)
- But this is likely a speech rate effect (Kendall 2013)



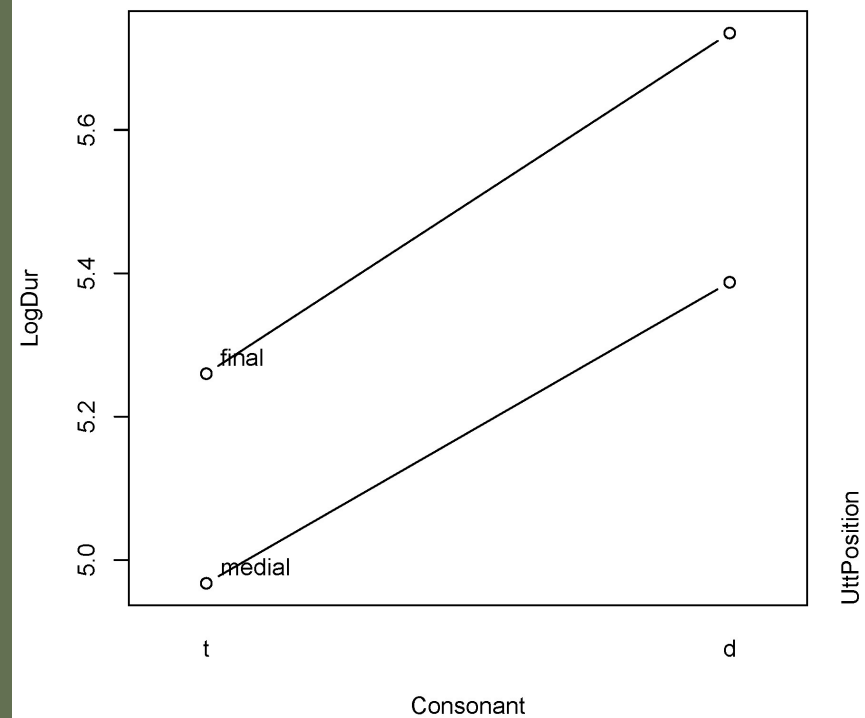
Consonant

- Significant main effect
- Vowels before /d/ are longer than vowels before /t/



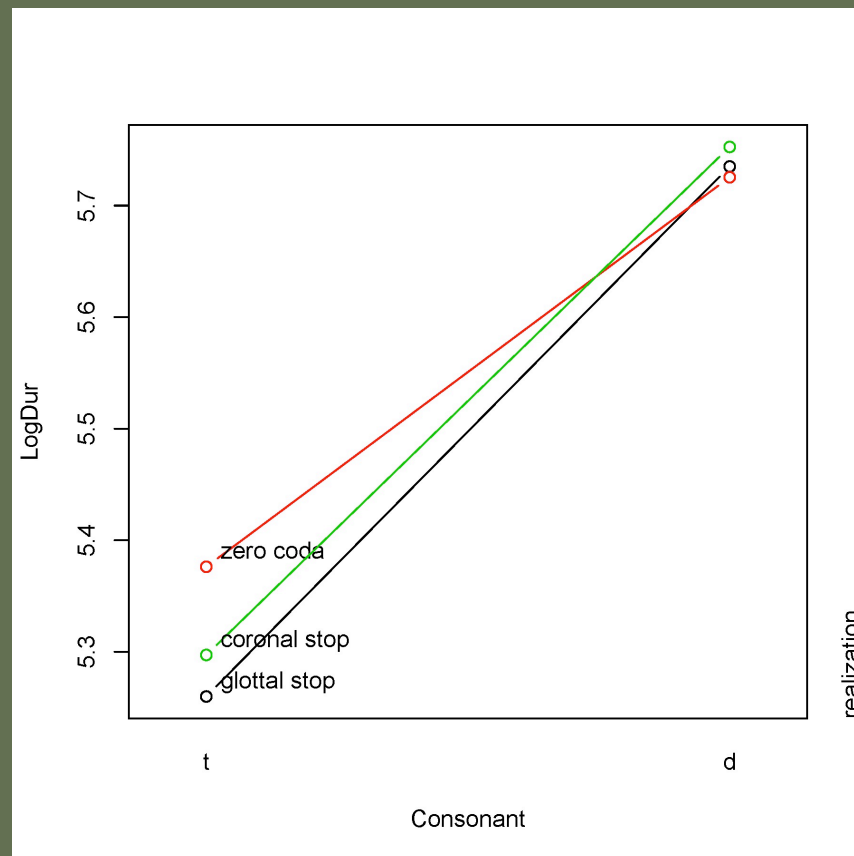
Consonant*Utterance Position

- Interaction $p=0.06$
- Vowels in utterance final position are longer than utterance medial



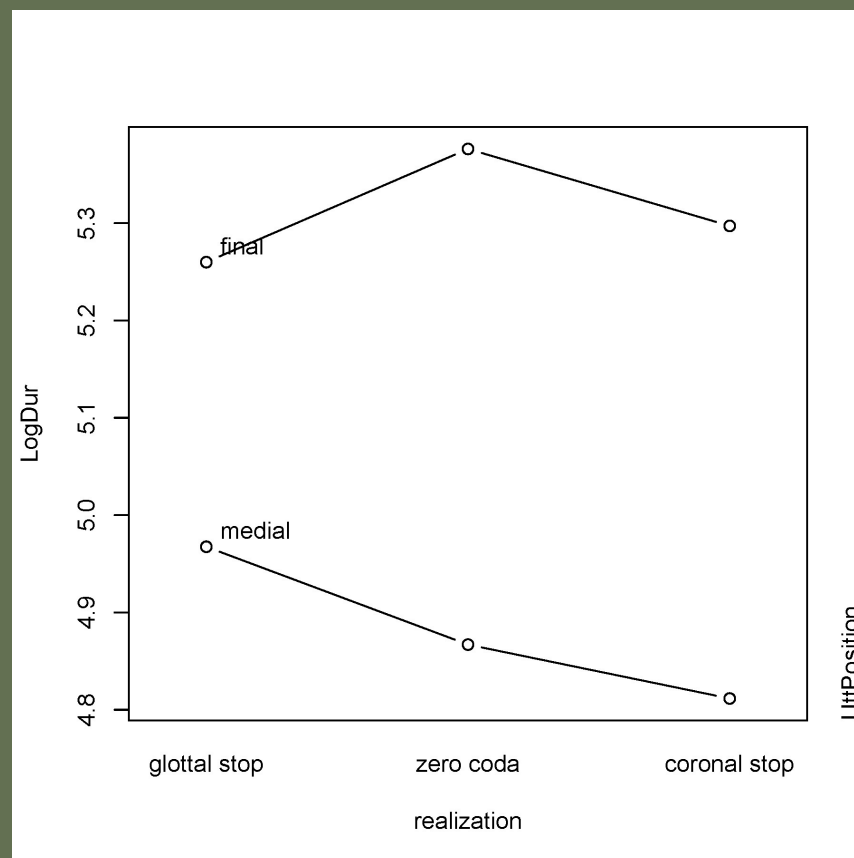
Consonant*Realization

- Significant interaction between consonant and realization
- Zero coda longer than glottal for /t/
- Glottal and coronal stops are not significantly different.



Realization*Utterance Position

- Significant interaction
- In utterance final position, zero codas are longer than glottal stops and coronal stops, regardless of consonant type
- In medial position, vowels before glottal stops are longer than zero codas or coronal stops



Summary

- Vowels are longer before /d/ than before /t/
 - This is expected based on the preponderance of evidence from other languages (and other varieties of English)
 - And also what we know from Holt et al. (2016) in a comparison of AAE to MAE in North Carolina
- We also see expected results for vowel height, vowel tenseness, and utterance position

Summary

- Looking at the relationship between consonant realization and vowel duration we find somewhat surprising results
 - Vowels before /d/ are similar to each other regardless of realization
 - For /t/, zero coda vowels are significantly longer than coronal and glottal stops

Conclusion

- AAE exhibits incomplete neutralization of word final /t/ and /d/
 - Glottal stop replacement and deletion
- Vowel duration is a cue to consonant voicing
 - But duration isn't heightened when compared to non-neutralized contexts
 - Interactions between utterance position and phonetic realization

Future Directions

- Only looked at /t/ and /d/
- But debuccalization and deletion are key phonological processes beyond coronal stops
- So we know that bat and bad are clearly differentiated by vowel duration
 - But what about *bat* from *back* and *bad* from *bag*?
- Underlying vowel quality differences maintained?

Selected References

- Carroll, William S. (1971). A Phonology of Washington Negro Speech. Ph.D. dissertation, Georgetown University.
- Chambers, J.K. (2000). Universal sources of the vernacular. *Sociolinguistica* 14:11-15.
- Eddington, David, & Channer, Caitlin. (2010). American English has go? a lo? of glottal stops: Social diffusion and linguistic motivation. *American speech* 85(3):338-351.
- Farrington, Charlie. (2011). Devoicing in African American English: A longitudinal and apparent-time analysis. Master's capstone, North Carolina State University.
- Fasold, Ralph W. (1972). *Tense marking in Black English: A linguistic and social analysis*. Washington DC: Center for Applied Linguistics.
- Fridland, Valerie. (2001). Social factors in the Southern Shift: Gender, age and class. *Journal of Sociolinguistics* 5(2):233-253.
- Garellek, Marc. (2013). *Production and perception of glottal stops*. Ph.D. dissertation, University of California, Los Angeles.
- Grieser, Jessica A. (2014). *The language of professional blackness: African American English at the intersection of race, place, and class in southeast Washington, DC*. Ph.D. dissertation, Georgetown University.
- Harrison, Phil. (2007). The lost consonants of Atlanta. *Language Sciences* 23(2-3):237-246.
- Holt, Yolanda F., Jacewicz, Ewa, & Fox, Robert A. (2015). Variation in vowel duration among Southern African American English speakers. *American Journal of Speech-Language Pathology* 24:460-469.
- Holt, Yolanda F., Jacewicz, Ewa, & Fox, Robert A. (2016). Temporal variation in African American English: The distinctive use of vowel duration. *Journal of Phonetics & Audiology*, 2(2), 1-8.
- Jacewicz, Ewa, Fox, Robert A., & Salmons, Joseph C. (2007). Vowel duration in three American English dialects. *American Speech* 82:367-385.
- Kendall, Tyler, & Farrington, Charlie. (2017). The Corpus of Regional African American Language. Version #0.5. BETA. Eugene, OR: The Online Resources for African American Language Project.
- Kharlamov, Viktor. (2012). *Incomplete neutralization and task effects in experimentally-elicited speech: evidence from the production and perception of word-final devoicing in Russian*. Ph.D. dissertation, University of Ottawa.
- Koops, Christian, & Niedzielski, Nancy. (2009). /t,d/- glottalization and vowel variation in Houston AAE. Paper presented at New Ways of Analyzing Variation 38. Ottawa, ON.
- Pederson, Lee. (1967). Middle class Negro speech in Minneapolis. *Orbis* XVI:347-353.
- Purnell, Thomas, Tepeli, Dilara, & Salmons, Joseph C. 2005. German Substrate Effects in Wisconsin English: Evidence for Final Fortition. *American Speech* 80:135-164.
- Solé, M. J. (2007). Controlled and mechanical properties in speech. In M. J. Solé, P. S. Beddor, & M. Ohala (eds.), *Experimental Approaches to Phonology*, 302-321.
- Temple, Rosalind. (2014). Where and what is (t,d)? A case study in taking a step back in order to advance sociophonetics. In C. Celata & S. Calamai (eds.), *Advances in Sociophonetics*. Amsterdam: John Benjamins, 97-136.
- Thomas, Erik R. (2007). Phonological and phonetic characteristics of African American Vernacular English. *Language and Linguistics Compass* 1:450-475.
- Yu, Alan C. (2011). Contrast reduction. In J. Goldsmith, J. Riggle, & A. C. Yu (eds.), *The Handbook of Phonological Theory*, 291-318.

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