Speech Rate, Pause, and Linguistic Variation: Evidence from North America

Tyler Kendall
Northwestern University & North Carolina State University

t-kendall@northwestern.edu

Previous sociolinguistic studies

• Features of speech timing have increasingly been of interest within sociophonetics
  – E.g., extensive and growing literature on rhythm
• Recently, studies of pause and speech rate:
  – Kendall 2006 – Pause durations across N.C.
  – Salmons, Jacewicz, and Fox 2008
  – Armstrong, Clopper, and Smiljanić 2008
• Most of these previous studies have asked broad questions like “do Southerners talk slower than Northerners?”

Previous psycholinguistic studies

• Most studies on pause and speech rate, however, originate in psycholinguistics and psychology
  – MacKay and Osgood (1959), Goldman-Eisler (e.g., 1968), Deese (1980), Kowal and O’Connell (e.g., 1980), Crown and Feldstein (e.g., 1985), and others (e.g., Chafe 1980, 1985, 1993)

• Findings like: Pauses more common with more complex tasks, longer before semantically heavy units, etc.
  • There is “a lawful relationship between temporal phenomena in human speech and concurrent cognitive processes” (Kowal and O’Connell 1980)

• Psycholinguistic work more interested in pause than speech rate
  • “The speed of the actual articulation movements ... occupies a very small range of variation (4.4 to 5.9 syllables per second ...) while the range of pause time in relation to speech time was five times that of the rate of articulation” (Goldman-Eisler 1961: 171)

The current project

• My interest in speech rate and pause considers these features for a number of reasons
  – What are the possibilities of sociolinguistic variation?
    • SR and pause are ubiquitous features of all talk – what kinds of patterned variability do we find and what does this tell us about linguistic variation more generally.
      • At what scope/scale do we find variability (i.e. intra-regionally)?
  – What are the intersections of sociolinguistics and psycholinguistics?
    • Speaker and speech accommodation
    • Paralinguistic/channel cues to style (Kendall NAW 2008)

• Extends from my dissertation work (Kendall 2009)
Advantages

• Speech rate and pause are ubiquitous, and also readily measurable
  – Speech rate \( N = 25,996 \)
  – Pause duration \( N = 25,093 \)
• And automatable given the right annotation scheme (see Kendall 2007a, 2008a)
  – Studied here through a corpus sociophonetic approach

Disadvantages?

• But, is pause really a linguistic feature?
  – “Conversation analysis ... and psychologists ... have shown the significance of pauses and silence in communicating. However, there can be no linguistic analysis of silence, though pauses may be a guide to linguistic units.” (Macaulay 2002: 284, emphasis added)

• Speakers manipulate speech rate and pause for a number of reasons (pragmatic, task difficulty, ...)
  – But isn’t this true of many variables? Attention to speech...
  – Psycholinguistic effects are fairly well studied so allow us to consider sociolinguistic variation as it relates to psycholinguistic variability

Definitions

• Pause durations
  – Measured in milliseconds
  – 60 ms low threshold
  – Intra-turn silent pauses only

• Speech Rate = Articulation Rate
  – Syllables per second
  – Pause exclusive!

Data

• The project leverages about 35 hours of transcribed audio data from the Sociolinguistic Archive and Analysis Project (SLAAP; Kendall 2007a, 2008a)
  – Sociolinguistic interview recordings primarily from studies conducted by the NCLLP (Wolfram, Thomas, Schilling-Estes, Mallinson, and associates) but also from other research groups (e.g., the MUN sociolinguistics lab)
• Focusing today on 120 speakers from the US
The speakers

Primary 120 speakers by year of birth

Speech Rate N = 25,996
Pause Duration N = 25,093

General patterns

• Model the data using mixed-effect regression in Rbrl (Johnson 2009)
  – All tokens from each dataset with predictors:
    • Region
    • Ethnicity
    • Gender (=Sex)
    • Age (contin and grp)
    • Year-of-birth
  – Speaker as a random intercept

General patterns, 2

• Some indications of an inverse relationship between pause duration and speech rate

• But there are also other ways to examine (and model) these data
  – E.g. on a per-speaker and not per-token level

Are pause and speech rate related?

• Using each speaker’s median value for pause duration and speech rate as the dependent variable
  – Predictors:
    • Region
    • Ethnicity
    • Gender (=Sex)
    • Age (contin and grp)
    • Year-of-birth
    • Median Pause or S.R. (contin)

Best models from step-up/step-down analyses
Significant factor groups only; highest significance on left

Best models from step-up/step-down analyses
Significant factor groups only; highest significance on left

On a per-speaker level, longer pauses predict shorter speech rates. SR not significant predictor on pause duration
More closely...

- But what do these findings (i.e. significant effects) mean?
  - Are pause durations and speech rates characteristic of speakers and speech communities?
  - Are they characteristic of specific interactions and interactional settings?
  - (Relating this to broader sociolinguistic variables is the ultimate goal.)

- Now turn to look at accommodation

Accommodation and ethnicity

Accommodation and ethnicity, 2

Accommodation and gender
Number of talkers

- Prev slides showed general accommodation patterns, but what about when we look at an individual?

- Mallinson & Kendall (2009 & NWAV 2007) examined interviews in Washington DC conducted by a white sociologist from Minnesota with 10 African American adolescent girls
  - How does the interviewer’s talk change across interviews?

A final note: utterance length and speech rate

- A strong effect of utterance length of speech rate!

- (see also Quéné 2008; Yuan et al. 2006)

Accommodation & the individual

- Prev slides showed general accommodation patterns, but what about when we look at an individual?

- Mallinson & Kendall (2009 & NWAV 2007) examined interviews in Washington DC conducted by a white sociologist from Minnesota with 10 African American adolescent girls
  - How does the interviewer’s talk change across interviews?

  - Spearman $r_s = 0.54$ for speech rate; $r_s = 0.30$ for pause

Summarizing...

- Pause duration and speech rate are socially variable
  - Correlations with region, ethnicity, and gender
  - Speech rate appears to pattern more strongly with social factors than pause
    - This is inline with psycholinguistic findings about pause variability

- This patterning is interestingly complex
  - Relating also to interactional and linguistic (and physiological) factors

- There is much more to do
  - And much more that pause and speech rate can tell us about linguistic variation
Thanks!

- Thanks to Walt Wolfram, Erik Thomas, Ron Butters, Agnes Bolonyai, and Charlotte Vaughn for many helpful discussions about this project
- Thanks to all of the NCLLP members and many other researchers who have contributed to SLAAP
- Thanks to the many NSF grants that supported the collection of the data in SLAAP as well as the William C. Friday Endowment at NCSU and the NCSU Libraries for funding support

- The data presented here are slightly extended from my dissertation dataset, but the main points discussed today and references can be found in that document:
  