Priming and sociophonetic variation in natural speech
Lynn Clark
University of Canterbury
lynn.clark@canterbury.ac.nz

Thanks to Liam Walsh
Syntactic priming in experiments

“The referee was punched by one of the fans”

PRIME

The Vatican was struck by lightening ~ lightening struck the Vatican

TARGET (describe)

Syntactic priming: well established in experimental psycholinguistics (e.g. Bock (1986), Bock and Loebell (1990) Branigan et al. (2000), Branigan et al. (2006), Branigan et al. (2007), Pickering & Garrod 2004)
Syntactic priming(?) in natural speech

- **corpus linguistics**: Repetition effects, strikingly similar to those found in experimental studies of syntactic priming (Szmrecsanyi (2006), Gries (2005) Jaeger & Snider (2013))

- **Sociolinguistics**: Model both social & linguistic constraints on syntactic variation; previous realisation of variable is sig predictor of following realisation (Weiner and Labov (1983), Poplack & Tagliamonte (1993, 1996) & Travis (2007))

“I avoid using psycholinguistic terminology (‘priming’, ‘prime’, ‘target’, etc.) a priori because a corpus-based study may be inappropriate to explicitly investigate psycholinguistic mechanisms such as production priming effects...In naturalistic data, speakers’ output may exhibit persistence effects for reasons of rhetoric, politeness...or thematic coherence, to aid the process of gap filling in creating and processing elliptical utterances ...to open up question-answer pairs ...because speakers feel like intentionally repeating items from previous discourse, or because they have been primed in preceding discourse - but it is not easily possible to disentangle the above motivations through corpus study in a waterproof fashion”. (Szmrecsanyi 2005: 144)
Extension to phonology

Conflicting evidence from sociophonetics

- Clark (2014) – th-fronting in East-Central Scotland
- Statistically significant repetition effect but needed to be tested on larger/more appropriate corpus
- Not designed with priming as a research question

- “… persistence appears in a generalized form across instances of a variable only when the variation is morphological. In contrast, it does not appear in variation that is the outcome of a probabilistic phonological process, except when the prime and target are the same word.” (Tamminga 2014: 76)
1. Does a speaker’s previous realisation of a variable phoneme influence their following realisation of that phoneme?

2. Do repetition effects pattern in the same way for all variants of a variable?

3. How do repetition effects interact with other factors known to operate on phonological variation and change?

4. Do repetition effects pattern in the same way within and across speakers?
Research Questions

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The UC QuakeBox Corpus

www.ceismic.org.nz

www.nzilbb.canterbury.ac.nz

The QuakeBox in transit
The QuakeBox at the Re:Start Mall
Stories recorded in audio & video format

Collected stories from April-December 2012
8 different sites across the city
722 stories collected in 13 languages
Variation in medial /t/ in NZE

- Range of allophonic variation
  - including [t], [s], [d] and [ɾ]
- Following Hay & Foulkes (2016), these were collapsed to T (voiceless) and D (voiced)
- 5087 tokens of word medial, intervocalic /t/
- 163 speakers
Analysis of variation in medial /t/

HYPOTHESIS

A speaker’s realisation of a variable should be predictable from their previous realisation of the same variable.

METHOD

Fit a mixed effects logistic regression model to the data using the lme4 package in R (Baayen et al 2008), speaker & word = random intercepts.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realisation of medial /t/ as D</td>
<td>Realisation of previous medial /t/ as D [REPETITION]</td>
</tr>
<tr>
<td></td>
<td>Time into the interview (log)</td>
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<tr>
<td></td>
<td>Repetition in word in discourse</td>
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<tr>
<td></td>
<td>Time difference between two consecutive instances of medial /t/ (log) [DECAY]</td>
</tr>
<tr>
<td></td>
<td>Repetition of immediately preceding lexical item [LEXICAL BOOST]</td>
</tr>
<tr>
<td></td>
<td>Speech rate of the utterance</td>
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<tr>
<td></td>
<td>Speaker’s gender</td>
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<td></td>
<td>Speaker’s age</td>
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<td></td>
<td>Inflectional affix juncture</td>
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</tbody>
</table>
Summary of statistical model of medial (t): D

- Known effects continue to constraint (t): D
  - Males favour D
  - High frequency lexical items favour D
  - Repetition of the word in the discourse favours D
  - Faster speech favours D

- **Additional effects not previously known:**
  - Preceding variable realised as D favours D [REPETITION]
  - D more likely if preceding D is in same lexical item [LEXICAL BOOST]
  - D more likely the less time that occurs between instances of medial (t): D [DECAY]
    - NB: these effects remain even when 25% of the least-variable speakers are removed
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Phonetic variants of medial /t/

[t]

[s]

[d]

[ɾ]

and um to let off you know their frustrations anxieties and um - to identify also the idea was to identify what were their needs you know

submitted.

and um - we sort of huddled together and comforted each other -

comforted.

so that was my experience pretty much of the February quake we ended up getting the ahli do 

cor’s wi- ahli grandmother ninety six year old grandmother back to - ahli the rest home whic

getting
### HYPOTHESIS

If recency effects pattern in the same way for all variants, the likelihood of finding two consecutive variants of medial /t/ as [t] should be no greater than the likelihood of finding two consecutive variants as [s], for instance.

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Fit a mixed effects logistic regression model to the data using the lme4 package in R (Baayen et al 2008), speaker & word = random intercepts.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
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</tr>
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<tbody>
<tr>
<td>Match between two consecutive medial /t/s</td>
<td>Realisation of previous medial /t/</td>
</tr>
</tbody>
</table>

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<tr>
<td>Speaker’s gender</td>
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<tr>
<td>Time into the interview (log)</td>
<td>Repetition of immediately preceding lexical item [LEXICAL BOOST]</td>
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Asymmetrical repetition
Asymmetrical priming

- Within-variant priming is more robust with [s] and [r] than with [d] and [t].

- Why the asymmetry?
  - Asymmetrical effects also reported for syntactic priming
  - ‘Inverse frequency’ or ‘inverse preference’ effect; correlates with lexical frequency (e.g., Bock, 1986; Ferreira, 2003; Hartsuiker & Kolk, 1998; Kaschak, Kutta, & Jones, 2011; Scheepers, 2003)
  - Can’t explain these results as both [s] and [r] are more frequent than [d] and [t]
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variant x gender
Interpreting variant x gender

- Underlying most work on priming is an activation network model of cognition
- Medial /t/ is a change in progress with females leading in [s] and males leading in [ɾ].

1. If these variants carry social meaning, perhaps sociolinguistic salience contributes to heightened activation in a spreading activation model; [s] is more socially salient for females so leads to higher activation (and [ɾ] for males)

2. Frequency of [s] and [ɾ] across different groups of speakers could lead to females hearing more [s] at the community level, and so have heightened activation of [s] (and [ɾ] for males)
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ONZE corpus of dialogues

Extract from ONZE showing conversational nature of the data
HYPOTHESIS

The effect of a variant uttered by another conversational partner should be statistically indistinguishable from a variant uttered by the speaker themselves on the likelihood of those variants having the same realisation.

METHOD

1. Time-aligned the interviewer tier in ONZE corpus
2. Replicated the analysis of medial /t/ variation in NZE using data from ONZE, including speech data from the interviewer. 4170 tokens of medial /t/ across 36 speakers
ONZE data: main effects
Branigan et al. (2000) Confederate scripting

Clear evidence of syntactic priming in dialogue

Much larger priming effects in dialogue between speakers than within-speaker

Priming might be a very pervasive feature of conversation/natural dialogue: “a major reason why priming effects occur is to facilitate alignment, and therefore [priming effects] are likely to be particularly strong during natural interactions” (Pickering and Garrod 2004: 174).

Major methodological differences between this study and Branigan et al (2000)
Onze data: interactions
Implications for sociolinguistics

- Adds another layer of complexity to existing work on phonological recency (cf. Tamminga 2014)
- Widely held (but largely untested) assumption in most sociolinguistic work that there is no relationship between different instances of variation in speech.
- If speakers do cluster variants of a phonological variable together in speech, analyses which don’t consider this predictor variable could be seriously overestimating the importance of other linguistic and social constraints.
- Mechanisms underlying accommodation not well understood; these results point to both priming (decay and lexical boost) and social motivations (greater repetition effects within speakers than across speakers cf Branigan et al 2000; Pickering and Garrod 2004)
References


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lynn.clark@canterbury.ac.nz
Methods

View in ELAN (transcription software)

View in LaBB-CAT (forced aligner; Fromont & Hay 2012)
Phonological priming is **enhanced** when both prime and target medial /t/ occur in the same word. This is like the ‘**lexical boost**’ effect found in experimental studies of priming (cf. Hartsuiker et al., 2008; Jaeger & Snider 2013) in which there is a stronger priming effect when the prime and target share the same lemma.
Main effect: gender of speaker