Capturing listeners’ real-time reactions to the NURSE~SQUARE merger

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http://www.lancs.ac.uk/fass/projects/phono_leveling/index.htm
Outline

• **AIM**: explore whether listeners’ reactions to accent stimuli can be correlated with the occurrence of instances of linguistic variation (especially the NURSE~SQUARE merger)

**STRUCTURE:**
1. What is the NURSE~SQUARE merger?
2. New methods for understanding salience
3. Results of NURSE~SQUARE experiment
4. Problems & questions for the future
NURSE/SQUARE merger

- ‘her’ = ‘hair’
- ‘fur’ = ‘fair’

- Merseyside: front vowel
- Lancashire: central vowel
The NURSE~SQUARE merger

• Salient?
  • ‘Performed’ by speakers writing online (Kerswill & Watson 2007) & frequently represented in Liverpool ‘folk dictionaries’ (Honeybone & Watson, in prep)

  – Cf Warren & Hay (2006) for the NEAR/SQUARE merger in New Zealand

  – Labov (2001: 27) mergers are ‘invisible’ to social evaluation

• **Question**: how ‘visible’ is the NURSE~SQUARE merger in NW England?
Previous approaches to eliciting attitude reactions

- Listener reactions via the matched or verbal guise technique
  - But what aspects of the speech signal trigger particular reactions?
- Campbell-Kibler (2006, 2008): manipulates the speech signal to test reactions to (ING)
- Labov et al (fc) provide listeners with a movable slide on which to register their reaction language stimuli
  - BUT only the final slider position is considered, not the movement of the slider
What do you think?

This website is part of a research project which hopes to find out about how we react to people with different accents. Thank you for visiting, and we hope you agree to take part.

Over the next few pages, you will hear short clips of two people reading some sentences. They were recorded during a telephone interview for a job in a call centre. It's important that call centre employees give the right impression to potential clients, so part of the interview process tested whether interviewees spoke with standard accents. To do this, the call centre gave each person some sentences to read aloud.

Sometimes the interviewees sounded more 'posh' than other times, and we would like you to judge whether the speaker sounds posh in each clip you listen to. There are 10 clips in total.

The sentences are a little strange so don't focus too much on what the people say, we want you to listen to what they sound like.

About this project

ESRC ECONOMIC & SOCIAL RESEARCH COUNCIL
LANCASTER UNIVERSITY

If you would like to contact us about this project, we would love to hear from you. Email us by clicking on the links below:

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Lynn Clark: lclarkd@lancaster.ac.uk
Example: how to take part

Let's get started. On the next few pages, you will listen to 10 sound clips and be asked a question about each one. We would like you to react to the question as you listen to the clip.

We will ask you whether you think each speaker sounds posh.

So you play the clip, and then as you listen to what the speaker says, we would like to know if at any point anything they say makes them sound more posh or less posh. As they talk, if you think they sound more posh, move the slider to the right to indicate this, if you think they sound less posh, move the slider to the left. Feel free to move the slider for the duration of the sound clip.

For a demonstration, click 'play' on the clip below. If your sound is working, you will hear someone speaking.

Click button to play

Move the slider with your mouse as the audio plays

Question: Does this speaker sound posh?

Definitely No

Definitely Yes

Example Audio Clip
Centralised NURSE~SQUARE

Fronted NURSE~SQUARE

“Cursed”

“Share”

“Heard”
Participants

**Participants contacted via the web**
- previous participation in this project
- friends of friends
- no linguistic training
- facebook

<table>
<thead>
<tr>
<th></th>
<th>Fronted</th>
<th>Centralised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liverpool</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>Lancashire (St Helens)</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>53 participants</td>
</tr>
</tbody>
</table>
Experiment design

1. NURSE (x4) -> SQUARE (x4)
2. SQUARE (x4) -> NURSE (x4)
3. NURSE (x4) -> SQUARE (x4)
4. SQUARE (x4) -> NURSE (x4)
5. [ɛː] NURSE (x8) -> [ɜː]
6. [ɛː] SQUARE (x8) -> [ɜː]
How is a speaker with a NURSE ~ SQUARE merger evaluated on the status dimension? (Does he sound ‘posh’?)

No, he doesn’t sound posh...

- Regardless of whether the merger is to a front vowel (typical of Liverpool) or a central vowel (typical of Lancashire)
- Both front and central mergers evaluated equally negatively (no difference in mean or variance)
- No difference between Liverpool and Lancashire listeners’ evaluation
- NURSE~SQUARE merger is a non-standard phonological feature so negative evaluations are to be expected

Overall negatively evaluated
Is there a relationship between the time at which these evaluations take place and instances of NURSE and/or SQUARE?

Where are the **significant** reactions?
Change Point Analysis

• Change Point Analysis (CPA) is a statistical approach which, when used with a time-ordered dataset, can identify the points at which statistical properties of the data change (Killick et al. submitted)
  – Used in a range of other disciplines including bioinformatics (Lio and Vannucci, 2000), network and traffic analyses (Kwon et al., 2006), climatology (Reeves et al., 2007), econometrics (Perron and Yabu, 2009) and engineering (Killick et al. 2010)

• CPA can be used to detect changes in mean, variance and regression coefficient across a stated period of time.

• Different CPA methods; here we adopt a new technique known as Pruned Exact Linear Time (PELT).

• These calculations can be carried out using the changepoint package available in the R environment (Killick 2011; available on CRAN).
## CPA structure

<table>
<thead>
<tr>
<th></th>
<th>Fronted</th>
<th>Centralised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liverpool</td>
<td>25 x 6</td>
<td>12 x 6</td>
</tr>
<tr>
<td>Lancashire (St Helens)</td>
<td>9 x 6</td>
<td>7 x 6</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td></td>
<td><strong>53 participants x 6 conditions = 318 CPAs</strong></td>
</tr>
</tbody>
</table>

- Extract all significant change points
- Look for clusters in reaction time between & across groups (≥10% agreement)
Liv = 45% of all shifts happen at N/S words
Lanc = 71% of all shifts happen at N/S words
66% agreement across both Liv & Lanc data
Is there a relationship between the time at which these evaluations take place and instances of NURSE and/or SQUARE?

**Largely, yes**

- Across all 29 change points with ≥10% group agreement, 24 correlate with an instance of NURSE or SQUARE

- 10 are selected by listeners from both Liverpool and Lancashire

- Good evidence to suggest that listeners are reacting to the quality of the NURSE/SQUARE vowel (i.e. the quality of the vowel is ‘salient’ in the non-standard lexical set)
Do reactions to vowel quality depend on where the non-standard NURSE or SQUARE vowel appears in the sequence?
Do reactions to vowel quality depend on where the non-standard NURSE or SQUARE vowel appears in the sequence?

- **Liverpool listeners**
  - React to front NURSE anywhere in audio
  - React to central SQUARE only early in audio

- **Lancashire listeners**
  - React to central SQUARE anywhere in audio
  - React to front NURSE only early in audio

- **Front merger**
- **Central merger**
Do listeners react to the minimal pair (and so, possibly, react to the fact of the NURSE~SQUARE merger?)

Central NURSE~SQUARE stimuli guise

- No reaction at minimal pair

Fronted NURSE~SQUARE stimuli guise

- Reaction at minimal pair from both Lanc and Liv listeners
- Front merger more salient?
  - Only in condition 2
Salience and context

• Sociophonetics: usually think of salience as a property of the variable/variant
  – Labov (1972): indicators, markers & stereotypes
  – Podesva (2006): once a linguistic unit becomes salient, it can acquire social meaning

• This experiment:
  – Salience depends on listeners’ own use of the form (usage-based model)
  – Salience depends on the surrounding context
Problems/future work

• Pilot audio stimuli were messy; more controlled audio stimuli in this experiment bring other problems:
  – Data are ‘un-natural’ so it’s difficult to extrapolate findings to the ‘speech community’
  – Correlation ≠ causation

• BUT on the plus side...
  – We can begin to carry out research which treats evaluative reactions towards language as dynamic events
  – This is a big (first) step forward
• Thanks...
  – The beginnings of this idea were sparked during a discussion with Shaun Austin, and we would like to thank him for his thoughtful responses and enthusiastic comments on our plans as the idea came to fruition
  – We would also like to thank Bill Labov for his email correspondence on this topic
  – Finally, we must thank Rebecca Killick for her help with CPA and, in particular, giving us access to the changepoint package before it was available on CRAN.

• Campbell-Kibler, Kathryn. 2008. 'I'll be the judge of that: Diversity in social perceptions of (ING)'. *Language in Society*. 37(5), 637-659.


• Kerswill, P. & Watson, K. (2007) "'The invasion of the biggest pest since the cockroach, yes, the Scouser": Exploring language ideologies and relationships between regions in England's north-west.' Invited panel session the Regions and Regionalism in and Beyond Europe conference, 17th-19th September, Lancaster University.


• Labov, William; Sharon Ash; Maya Ravindranath; Tracey Weldon; Maciej Baranowski; Naomi Nagy (under review) “Listeners’ Sensitivity to the Frequency of Sociolinguistic Variables”. *Language Variation and Change*. 

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### Agreement on change points for central guise

<table>
<thead>
<tr>
<th>Standard vowel</th>
<th>Non-standard vowel</th>
<th>Liverpool listeners % agreement on CP</th>
<th>Lancashire listeners % agreement on CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>NNSS</td>
<td>Non-agreement on CP</td>
<td>No agreement on CP</td>
<td>18% at 2nd S word</td>
</tr>
<tr>
<td>NNSS (MP)</td>
<td>Non-agreement on CP</td>
<td>No agreement on CP</td>
<td>No agreement on CP</td>
</tr>
<tr>
<td>SSNN</td>
<td>19% at 3rd S word</td>
<td>22% agreement at 3rd S word</td>
<td></td>
</tr>
<tr>
<td>SSNN (MP)</td>
<td>24% 1 second after 1st S word</td>
<td>29% agreement at 2nd S word</td>
<td></td>
</tr>
</tbody>
</table>

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Agreement on change points for **fronted** guise

<table>
<thead>
<tr>
<th></th>
<th>Liverpool listeners % agreement on CP</th>
<th>Lancashire listeners % agreement on CP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NNSS</strong></td>
<td>• 16% at 2&lt;sup&gt;nd&lt;/sup&gt; N word</td>
<td>• 17% at first S word</td>
</tr>
<tr>
<td></td>
<td>• 2 more CPs which don’t cluster around N/S words</td>
<td>• 2 more CPs which don’t cluster around N/S words</td>
</tr>
<tr>
<td><strong>NNSS(MP)</strong></td>
<td>• 16% at 2&lt;sup&gt;nd&lt;/sup&gt; N word</td>
<td>• 14% at 1&lt;sup&gt;st&lt;/sup&gt; N word</td>
</tr>
<tr>
<td></td>
<td>• 12% at 4&lt;sup&gt;th&lt;/sup&gt; N word</td>
<td>• 14% at 2&lt;sup&gt;nd&lt;/sup&gt; N word</td>
</tr>
<tr>
<td></td>
<td>• 10% at MP</td>
<td>• 19% at 3&lt;sup&gt;rd&lt;/sup&gt; N word</td>
</tr>
<tr>
<td></td>
<td>• 10% at pause following MP</td>
<td>• 10% at MP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 14% at pause after MP</td>
</tr>
<tr>
<td><strong>SSNN</strong></td>
<td>• 19% 1 sec after 1&lt;sup&gt;st&lt;/sup&gt; S word</td>
<td>• 22% at 2&lt;sup&gt;nd&lt;/sup&gt; S word</td>
</tr>
<tr>
<td></td>
<td>• 14% 1 sec after 2&lt;sup&gt;nd&lt;/sup&gt; S word</td>
<td>• 17% 1 sec after 3&lt;sup&gt;rd&lt;/sup&gt; S word</td>
</tr>
<tr>
<td></td>
<td>• 14% 1 sec after 2&lt;sup&gt;nd&lt;/sup&gt; N word</td>
<td></td>
</tr>
<tr>
<td><strong>SSNN(MP)</strong></td>
<td>• 19% at 1&lt;sup&gt;st&lt;/sup&gt; S word</td>
<td>• 1 CP doesn’t cluster around N/S words</td>
</tr>
<tr>
<td></td>
<td>• 14% 1 sec after 1&lt;sup&gt;st&lt;/sup&gt; S word</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 14% 1 sec after first N word</td>
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</tbody>
</table>