Mergers in Production and Perception

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Big huge thank you to:

• Our collaborators: Paul Warren, Bryn Thomas, and Rebecca Clifford
Mergers-in-progress

• Production vs. Identification vs. Discrimination
  – a glimpse into how sounds are stored and accessed in the mind

• Social information
  – its role in production and perception
  – priming with the concept of social information (e.g., concept of a region)

• Word-based variation
  – lexical diffusion
  – real vs. nonsense words

• Phonological context
  – conditionally merged
The NEAR-SQUARE merger in NZE

• Merger on [iə]

• Most evidence suggests that this is a female-led merger

• Led by members of lower socioeconomic groups

• The merger is still in progress: older NZers are more likely to maintain the distinction than younger NZers
NEAR/SQUARE Experiments
Hay et al. (2010)

• Identification: played distinct tokens one at a time - participants identified which word they heard in a binary, forced-choice task
  – US & NZ experimenter

• Production: read words in minimal pairs
  – US & NZ experimenter

• Odd One Out task: beer bear bare
  – auditory instructions (UK & NZ)
  – written task (US & NZ)
Summary of results

• In production, participants who met with the US experimenter were more likely to maintain a distinction than those who met with the NZ experimenter (Hay et al. 2009).

• In identification, experimenter identity matters (Hay et al. 2006)
  – merged participants make more errors if they met with the US experimenter
  – but participants who met with the US experimenter were more likely to report that the word pairs were distinct.

• Exposure to instructions/pre-task (Hay et al. 2010)
  – distinct participants were more accurate when exposed to UK instructions/US task
  – merged participants were more accurate when exposed to NZ instructions/NZ task
Our interpretation

• Levels of representation that we assume:
  – phonetically-detailed words/utterances
  – phonological abstraction
  – lexical abstraction

• All levels are indexed to every other level.

• The phonetically-rich level is indexed to social information.

• The other levels are indexed to social information when the relationship is above the level of consciousness.

• Different tasks cause individuals to activate different levels of representation
Sketch of exemplar model with word-level distributions of remembered exemplars, and labeling for phonemic category and dialect area, for someone who is merged on NEAR. (Hay et al 2010: 465)
Resonance
(see Johnson 2006: 495)

<table>
<thead>
<tr>
<th></th>
<th>Merged</th>
<th>Distinct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoneme level</td>
<td>One distribution.</td>
<td>Two distributions.</td>
</tr>
<tr>
<td></td>
<td>‘Distinct’ speech/concept introduces noise → makes distributions overlap even more</td>
<td>‘Distinct’ speech/concept increases distinction between distributions</td>
</tr>
<tr>
<td>Phonetically-detailed word level</td>
<td>Two distributions.</td>
<td>Two distributions.</td>
</tr>
<tr>
<td></td>
<td>‘Distinct’ speech/concept makes more distinct.</td>
<td>‘Distinct’ speech/concept makes more distinct.</td>
</tr>
</tbody>
</table>

(adapted from Hay et al. 2010: 467)
Testing our interpretation: real vs. nonsense words

• In exemplar theory, real words would have representations that are phonetically detailed, while nonsense words would not because they have not previously been encountered.

• This means that individuals rely on word-based exemplars for real words but must rely on phoneme-based representations for nonsense words.
For conditional mergers, this means that:

• In production
  – subjects will be more merged when producing real words because they are relying on phonetically-detailed word-based representations
  – subjects will be less merged when producing nonsense words because they are relying on phoneme-based representations and the merger is only in some phonological contexts

• In perception
  – provided that there are some people in the community who maintain a distinction in all contexts, subjects should be more accurate when identifying real words because they have stored representations of them
The Ellen/Allan merger in NZE

• Prelateral merger of DRESS and TRAP
  – shell/shall
  – celery/salary
  – melody/malady

• Conditioned merger, nearly complete.

• Vowels are merged near the non-prelateral TRAP token
Ellen/Allan Experiment
(Thomas 2004; Thomas & Hay 2005)

16 Participants:
1) real word production
2) nonce word production
3) real word perception
4) nonce word perception
Results

• In production, many speakers maintained more separation between the vowels when producing *nonsense words*
MALE 7: NONSENSE WORDS

- ○ HEAD
- ○ DRESS
- ▲ TRAP

Graph showing the distribution of nonsense words on a 2D scatter plot with axes labeled F1 and F2.
This interacts with social class
In Perception

• Some listeners were more accurate at identifying vowels in real words than nonsense words.
Summary of results

• Some NZers were more accurate with real words than nonsense words in perception...

• But they maintained a greater distinction with nonsense words than real words in production.
Interpretation

• In production, speakers must rely on phoneme-level productions for nonsense words.
• Phonemic representations also contain the non-prelateral (non-merged) tokens, which pulls the distributions apart.
• In perception, the real word exemplars include *some* distinct tokens, which help in identification (even though the listeners feel they are guessing)
Cot/Caught Experiment
(Drager et al. in progress)

• Same experiment design but with the *cot-caught* merger
  • hock  hawk
  • pod    pawed
  • dodd   dawd

• Participants from Hawaiʻi and western states in the continental US
  – regions where we would expect the merger in at least some phonological contexts (Labov et al.)
• All participants were merged to at least some degree, especially before /n/.

• Participants merged to varying degrees in other phonological contexts: some merged entirely on LOT whereas others produced the “correct” vowel in over 65% of tokens.
Example of a “nearly merged” participant
Example of a “nearly merged” participant
Summary of results (so far)

• Those who maintain some distinction were more accurate at identifying real words than nonsense words in perception (p<0.05). In production, these participants were more likely to maintain a distinction in nonsense words than in real words (p<0.01).

• Those who were fully merged were more accurate at identifying nonsense words than real words in perception (p<0.05). They did not produce a distinction in real or nonsense words (though this is based on auditory analysis – acoustic analysis is in progress).
<table>
<thead>
<tr>
<th>sound</th>
<th>task</th>
<th>effect for fully merged</th>
<th>effect for conditional/nearly merged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellen/Allan</td>
<td>Identification</td>
<td>n/a</td>
<td>slightly less accurate with nonse words</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>n/a</td>
<td>greater distinction with nonse words</td>
</tr>
<tr>
<td>cot/caught</td>
<td>Identification</td>
<td>more accurate with nonse words</td>
<td>less accurate with nonse words</td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>merged in both</td>
<td>greater distinction with nonse words</td>
</tr>
</tbody>
</table>
In production...

• Speakers produce the merger because they are accessing phonetically-rich representations of the words.

• Except when they are producing novel words (i.e., when they don’t have phonetically-rich lexical/utterance-level representations to rely on). Then, speakers with some degree of distinction in some real words/phonological contexts are biased by those distinct distributions and are more likely to produce a distinction.
In an identification task...

• Individuals access phonetically-rich lexical information, enabling their high accuracy rates despite their feeling that they are guessing.
  – Feel like the words are “the same” because they are linked to the same phonemic label, but
  – The word-level distributions are not completely overlapping in their representations, so they perform above chance during identification.

• Participants who are fully merged may be more accurate with nonsense words because:
  – they have adopted a spelling-based strategy; participants tune in to some meaningless-to-them phonetic difference and assign a spelling to it, or
  – there may be a greater phonetic distinction in the *cot-caught* nonsense stimuli than the real words
  – more analysis and more data are required
In sum

• There are different levels of mental representations.

• Different tasks (e.g., real vs. nonsense words, production and perception tasks) focus on different levels of representation.

• Mergers-in-progress are the ideal medium in which to explore these questions precisely because their mental representations differ across the different levels.
References

• Drager, Katie, Jen Hay, & Rebecca Clifford (in progress –author order?) The perception and production of caught and cot: evidence from real and nonsense words.


