What reaction times reveal about listener groups: L1 Aboriginal English and Standard Australian English responses to a prelateral merger-in-progress

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In Australian English, a sound change is in progress where /el/>/æl/. This is restricted, and occurs:

1. Geographically - there is an isogloss in the southern-most region of south-east Australia, and;
2. Diachronically - while not solely related to speaker age, previous research (Loakes et al., 2014) has shown that older speakers are more likely to maintain an /el/-/æl/ distinction.

Previously, we have analysed this merger as a consequence of (mis)perception, where /el/>[el]-->/æl/. Our early work has shown that in the Standard Australian English speaking community where this sound change is present, production and perception are correlated but not aligned (Loakes et al. 2014). In production, variability pre-laterally is extremely high. Some speakers have completely merged vowels in words such as hell-Hal, while others have very open [el]-like productions of /el/ sequences. There is also a marked difference between older and younger speakers, with younger speakers having expanded vowel spaces in the F1 dimension (see also Cox 2006). In places where this prelateral merger occurs there is variation within the community, and also with the way the merger presents. People who merge in production tend to do so in perception, but not always. Likewise those who do not merge sometimes show confusion when identifying /el/-/æl/.

We report on the results of a perception experiment carried out with 52 participants from three listener groups (in two locations) in regional towns in south-eastern Australia. The groups are:

2. Warrnambool. Standard Australian English speaking, sound change occurs. n = 15
3. Warrnambool. Aboriginal English (a unique variety, see e.g. Butcher 2008). Sound change. n = 22.

Albury-Wodonga and Warrnambool are at opposite ends of one state (Victoria), and are 567km (352 miles) from one another. They fall on either side of the isogloss. The Aboriginal community in Victoria is a minority community whose traditional languages are in revival mode. All Indigenous people in this study self-identify as Aboriginal, and have Aboriginal English as their L1. We predict that listeners will respond similarly to the "control" stimuli, but in sound change communities participants will be slower to respond to prelateral "merger condition" stimuli. Aboriginal participants may respond more slowly because of the standard accent used as the experimental stimuli.

Listeners were presented with a two-alternative forced-choice identification task via a specialised iPad app which was carried out in the field. Participants heard a word and had to choose from two options on the screen. The experiment included 7-step continua, and here we report on the accuracy and timing of results for the endpoints of het-hat (control) and hell-Hal (sound change) continua. All listeners responded similarly to one another in the control condition, with virtual agreement at either end of the het-hat continuum. There is some variation in responses at the /et/ end of the continuum, for older listeners who, we expect, require a less open vowel to categorise the stimuli as /e/ (the effect of accent change, see e.g. Cox 2006). The sound change condition, hell-Hal, presents a more complex picture. Albury-Wodonga listeners accurately distinguish each end of the continuum. For Warrnambool listeners, the /el/ end of the hell-Hal continuum is identified well by both the Standard Australian and Aboriginal groups. However the /æl/-like stimuli is difficult for these groups. The Standard Australian English listeners respond at random, while the Aboriginal English listeners prefer /el/ at both ends of the continuum, with 15/22 listeners responding that they had heard /hel/ when in fact the stimulus was Hal.

Reaction times further reveal the processing difficulties faced by listeners in the sound change communities, compared with Albury-Wodonga. Tables below show mean response times across the continua endpoints, for /et/-/el/ (Table 1) and /æt/-/æl/ (Table 2). As well as difficulties identifying
listeners are much slower to respond when faced with /æl/ compared to all other stimuli. Both Warrnambool groups are also relatively slow identifying /e/ in both conditions, despite their accuracy.

### Table 1. Mean response times (ms) for /e/ stimuli across three communities

<table>
<thead>
<tr>
<th></th>
<th>Albury-Wodonga Standard AusEng (no sound change)</th>
<th>Warrnambool Standard AusEng (sound change)</th>
<th>Warrnambool L1 AbEng (sound change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>control /het/</td>
<td>339.72</td>
<td>781.79</td>
<td>959.52</td>
</tr>
<tr>
<td>merger condition /hel/</td>
<td>496.01</td>
<td>763.22</td>
<td>932.42</td>
</tr>
</tbody>
</table>

### Table 2. Mean response times (ms) for /æ/ stimuli across three communities

<table>
<thead>
<tr>
<th></th>
<th>Albury-Wodonga Standard AusEng (no sound change)</th>
<th>Warrnambool Standard AusEng (sound change)</th>
<th>Warrnambool L1 AbEng (sound change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>control /hæt/</td>
<td>305.85</td>
<td>322.38</td>
<td>611.40</td>
</tr>
<tr>
<td>merger condition /hæl/</td>
<td>581.03</td>
<td>821.79</td>
<td>1143.32</td>
</tr>
</tbody>
</table>

The reaction time data for standard Australian English speakers were analysed with linear mixed effects models using the lme4 package (Bates et al., 2015) in the R statistical environment (R Core Team, 2015). Participants and repetition were specified as random factors, and the best model demonstrated significant fixed effects for site, and an interaction between continuum, site, and continuum step. This was deemed the best fitting model by comparison with other less saturated models, and a null model, \( \chi^2_{14}=148.48, p<.001 \). Further, within the reaction time data collected at Warrnambool, linear mixed effects modelling using the same random effects structure was used. This showed significant fixed effects for variety (Standard Australian or Aboriginal English), continuum, and an interaction term between continuum and continuum step. This model proved to fit best as compared to less saturated models, and a null model, \( \chi^2_{14}=153.82, p<.001 \).

The predictions of the study are borne out, with reaction time data indicating that community membership effectively predicts the response to the merger-in-progress. Listeners who experience merged (and therefore ambiguous) stimuli a) often respond wrongly, and b) show lengthy processing times. Reaction times between hat-Hal are more than double for the sound change condition, for example. The reaction times summarised in the tables above support our predictions about the merger and how it affects listeners, but results also open up new questions about the longer reaction times to all /e/ stimuli for the sound change communities, e.g. Table 1 shows much longer processing for both Warrnambool groups for both control and merger conditions. While this may be partly explained by the older listeners in the group (who are more inclined to maintain a distinction between /el/-/æl/), the Albury-Wodonga group also contained older listeners so this does not fully explain the effect. Further analysis of additional vowel production data is required, and this will be presented in a future study.

### References


