Identifying /el/-/æl/: a comparison between two regional Australian towns

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Abstract

This paper focuses on a merger in the south-eastern Australian state of Victoria where /el/->/æl/. We investigate regional variation by comparing listener reactions to /el/-/æl/ and control stimuli in two regional cities; Warrnambool in the south-west of the state and Albury-Wodonga in the north-east. We show evidence of /el/->/æl/ merger in Warrnambool but not in Albury-Wodonga, and by comparison with previous work narrow down an isogloss for the phenomenon. Along with analysis of overall community reactions to the stimuli, we also focus on individual variation in Warrnambool to further understand how the merger affects identification of /el/->/æl/.

Index Terms: vowel perception, merger, Australian English, regional variation

1. Introduction

This paper reports ongoing work into the investigation of a merger which occurs for some speakers of Australian English where /el/->/æl/. When this merger occurs, a word like *bell* is realised [bæɬ], and minimal pairs such as *Ellen* and *Alan* are lost, with both becoming [æɬən]. This is the same type of merger that occurs in New Zealand [e.g. 1] and various other Englishes (see the summary in [2]).

1.1. Regional variation in /el/ realisation

/el/->/æl/ is known to occur in one region of Australia only, in the south-eastern state of Victoria and its capital Melbourne, although the exact geographical extension of the phenomenon remains unknown. The merger has been observed in production [e.g. 2, 3] and perception [2,4]. Compared to listeners from elsewhere in Australia, Victorian listeners are more likely to be confused when attempting to identify /el/ and /æl/ in listening tasks, more likely to make errors and to report that they guessed their answers [4]. While the merger is widely understood to be "Victorian", including in popular perception [e.g. 5], the precise geographical limits of the merger are as yet unknown.

1.2. Possible phonetic reasons for the merger

While /el/->/æl/ has been studied in detail in New Zealand English [e.g. 1 & discussion therein], work on this phenomenon in Australian English is in the preliminary stages. Early work [e.g. 2] has indicated that there may be a number of phonetic triggers for its occurrence. The merger itself is not surprising in the system given that /l/ is known to have significant coarticulatory effects, causing preceding vowels in different varieties of English to become lower and more retracted [6]. In fact, post-vocalic /l/ is known to be particularly dark in Australian English– at least 30 years ago it was reported that in this variety it appears to be dark in all environments, perhaps even pharyngealised [6].

This backing is coupled with a gradual lowering of the lax front vowels in Australian English, of which /el/ -> /ael/ merger follows the same pattern. The front lax Australian English vowels are said to have raised, reaching a peak in height in the 1990s, and lowered again since then [7]. This results in wide variation in production of Australian English. And finally, although it requires further corroboration, there is also some suggestion that short/lax vowels in general are lower in Melbourne/Victoria [e.g. 8] than elsewhere in Australia. If so, this would also help to explain the occurrence of the merger in this particular region.

2. Aims

We investigate perception of /el/-/æl/ in two regional locations in south-eastern Australia. Our research questions are:

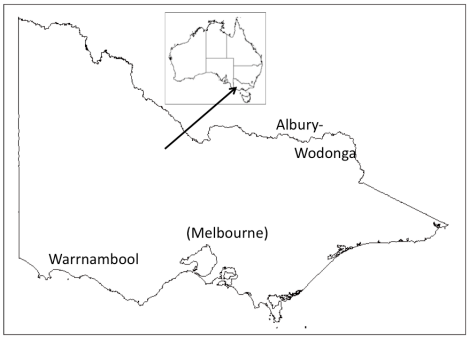
1. /el/ -> /æl/ merger is said to be a Victorian phenomenon but to what extent is this true in terms of its geographical distribution away from Melbourne? Is there evidence for merger in perception in Warrnambool (south-west) and Albury-Wodonga (north-east)?
2. What individual speaker-listener factors account for variation in the results?

3. Method

3.1. Regions

The investigation took place in Warrnambool and Albury-Wodonga in south-eastern Australia, regional cities located 576 km from each other (see Fig.1).

Figure 1: *Map of Victoria, Australia. Location of regional towns and capital city (Melbourne).*



Warrnambool is located in the south-west of the state of Victoria, 263 km to the west of Melbourne and is the largest urban centre in that part of Victoria close to the South Australian border. This town has approximately 33,000 residents. Albury-Wodonga is located in the north-east. It is effectively two connected towns which act as one large community straddling the Victorian and New South Wales (NSW) borders, with Wodonga on the Victorian side. This region has approximately 80,000 people in the urban areas (31,000 in Wodonga). The area of NSW directly across the state border that runs along the Murray River and includes Albury is known as the Riverina. For reasons of relative proximity, the Riverina is economically and culturally oriented to Victoria, and Melbourne (326 km away) compared to Sydney (553 km). It is therefore expected to be more receptive to phonetic innovations that occur in Victoria, than other parts of NSW.

We are interested in these two locations because we want to understand the geographical limits of the merger in Victoria and so have included border/near-border towns. We are also particularly interested in Albury-Wodonga because of observations in a previous study [3]. In that study, merger was observed in Wangaratta, 70km by major highway to the south of Albury-Wodonga but *not* north of the Murray River in three NSW towns, Wagga Wagga, Junee and Temora (128km, 167km and 210 km respectively north-east of Albury on the same major highway in the direction of Sydney).

3.2. Participants

30 participants (15 from each town) took part in the study. They were visited by the first author in their own homes in 2012. The investigator and participants were known to each other through a previous study visit in 2011. Demographic details of the study's participants are shown in Table 1.

Table 1. *Percentage het responses (het/hat continuum)*

Region	Number of participants	Participant ages
Warrnambool	15	mean age 43
	(7 F, 8 M)	min = 18, max = 80 SD = 22.4
Albury-Wodonga	15	mean age 47
	(11 F, 4 M)	min=22, max = 61 SD = 13.5

While there are equal numbers of participants from each town with a similar average age, a greater number of females took part in Albury-Wodonga, and this group, while slightly older, had a narrower age range overall.

3.3. Task

Participants took part in listening experiments presented on an iPad. The session we report on here was a binary forced-choice identification task, using a custom app designed specifically for the task [9]. Data for numerous contrasts were collected, but here we present only 1) a control condition designed to determine how listeners respond to the vowels in *het-hat* and 2) the prelateral (merger) condition *hell-Hal*. Listeners (who wore headphones) were presented with successive screens, each containing two "buttons" which listed, for example, *hell* and *Hal*. Listeners needed to choose which word they heard by pressing the button on the screen. Every part of the experiment was timed (although we do not report on that here). It ran automatically, and was randomised. Listeners could not choose to play an item again, or go backwards.

To test the contrasts, we created 7-step continua using the *Akustyk* (Plichta and Preston 2004) vowel synthesis module in *Praat* (Boersma & Weenink 2014). Each continuum began and ended with a single real speech token produced by a native female AusE speaker from Queensland, aged 40, who maintains the /e/-/æ/ contrast in all contexts. Between each end of the continua were 5 equidistant tokens manipulated for F1, F2 and F3. Acoustic analysis of the formant values of the natural speech tokens confirm that there is clear separation of the items (see [2] for complete details of the acoustics).

There were a total of 4 presentations of each token, resulting in a total of 196 trials per listener. Our procedure, including stimulus manipulation and presentation format, followed [10, 11] who also studied perception of sound changes. Differences between our study and these are that we investigated participants in their homes as opposed to the laboratory, and used a different device for presenting the stimuli.

As outlined by [1], numerous confounding factors can influence word identification in communities where merger (and especially merger-in-progress) exist. In this paper, we therefore test listeners' initial reactions only to the continua (i.e. their first reactions to each of the 7 items in the *het-hat* continuum, and their first reaction to the 7 items in the *hell-Hal* continuum). We acknowledge that the words differ in lexical frequency and type, with *hell* and *hat* being common lexical items, *het* being relatively uncommon, and *Hal* being a name.

4. Results

4.1. Control condition

The first part of the investigation confirms whether listeners identify a difference between the DRESS (*het*) and TRAP (*hat*) vowels in the control condition. Results in Figure 2 show the percentage of *het* responses at each step of the continuum (each point represents all 15 listeners' responses at each site).

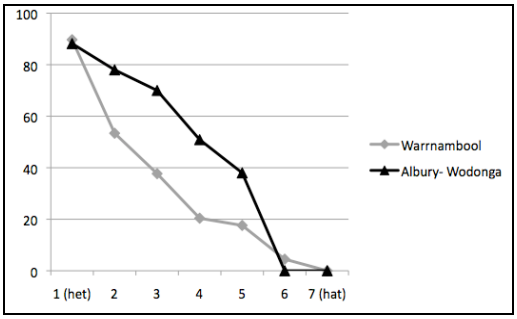


Figure 2. Percentage of *het* responses by regional location (control condition)

These results show some differences between Warrnambool and Albury-Wodonga, but also confirm that participants at

each site have separation between *het* and *hat* in perception. In both locations there is a clear monotonic decline in the identification of percepts as *het* along the continuum from unmodified *het* (step 1) towards final unmodified *hat* (step 7). Statistical comparison using Fisher's exact test indicates that there are no significant differences between the sites at any step in the continuum, despite an apparent greater trend in favour of *hat* in Warrnambool. Comparing the total proportion of *het* responses per site overall, the proportion of *het* responses for Albury-Wodonga is 0.41, and for Warrnambool is 0.29 – but again with no significant difference between the groups (z = 1.84, p = 0.07).

While both groups have a bias towards *hat* (probably due to lexical frequency effects), Albury-Wodonga listeners hold on to *het* for longer. This difference is clearly visible in Figure 2, where at step 2 of the continuum just over half of Warrnambool speakers hear *hat*. Albury-Wodonga listeners reach this point at the midpoint, step 4 on the continuum. It is not entirely clear why Warrnambool listeners are choosing *hat* earlier than the Albury-Wodonga listeners. Given that vowels may be lower in Victoria than elsewhere in Australia, as discussed earlier, this is counter to what we might expect. One possible reason for the difference is that Warrnambool listeners may have differing (extra) sensitivity to lexical frequency with respect to the *het-hat* pair.

At step 1, identification of *het* is not at 100% for either of the sites (although it is for *hat*). When we focus on the individual speakers who answered *hat* at step one, we see that these are older speakers. For these listeners, it is likely that the baseline DRESS vowel produced by the 40 year old speaker was too open to be classified as such by them.

4.2. Merger condition

We now turn to results comparing responses to the *hell-Hal* (merger) condition. Figure 3 shows the percentage of *hell* responses at each step.

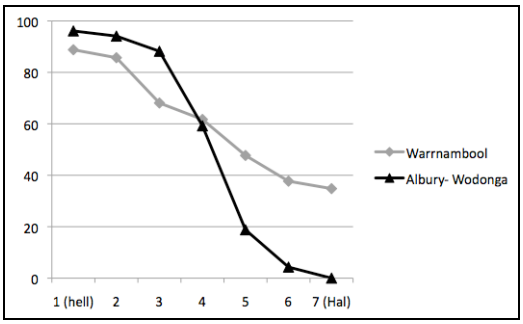


Figure 3. Percentage of *hell* responses by region (merger condition)

This figure shows a marked difference between Warrnambool and Albury-Wodonga, largely at the *Hal* end of the continuum. Interestingly, the groups act similarly when responding to the *hell* end of the continuum. At the midpoint (step 4), the groups have almost equal numbers of *hell* responses to the token which is acoustically "in between" *hell* and *Hal*, but after this point there is a sharp difference in results. At step 5, half of the Warrnambool listeners chose *hell* while half chose *Hal* – whereas a majority of Albury-Wodonga listeners chose *Hal*. At step 6 and 7, results are similar. For the most open item, Albury-Wodonga listeners all agree the item is *Hal* whereas 35% of Warrnambool listeners believe they heard *hell*.

For the merger condition, there was no significant difference between the proportion of *hell* responses overall. (z = -0.15, p = 0.88). The proportion of *hell* responses is similar for both groups; 0.53 for Albury-Wodonga and 0.57 for Warrnambool (with a slight bias to the lexically more common *hell*). There were, however some significant differences between the two groups at two steps along the continuum; Fisher's exact test demonstrated the associations seen at step 3 and step 7 (the *Hal* end) to be significant (p = 0.04).

4.3. Variation in Warrnambool listeners' responses

The data for Albury-Wodonga listeners are relatively straightforward, with almost all listeners agreeing on the end points of each continuum (although, as already noted, even the closest DRESS tokens (i.e. *het*) in the *het/hat* continuum appear to have been too open to classify as *het* at all for a small number of older listeners).

Amongst the Warrnambool listeners, on the other hand, inspection of individual perception results points to variation within the community which requires exploration. Some of this is reported in [5]. In that study, we looked in close detail at the same Warrnambool participants' production and perception of the data presented here. We classed them as *combiners* (those who merge /el/-/æl/ in production) and *maintainers* (those who keep them distinct). This was a useful classification to determine the relationship between production and perception which we focused on in that paper, but also gives an insight into speaker-listener behaviours. Relevant for the current study is that:

1. There are more *combiners* (10) than *maintainers* (4).
2. There are no effects for gender with regard to "merger status" in the sample.
3. *Combiners* tend to be younger, with a mean age of 34 years. *Maintainers* have a mean age of 58 years. However, it does not entail that young listeners are not necessarily losing the distinction in production, and vice versa. For example, the 80 year old speaker in the sample merged her vowels.
4. *Combiners* and *maintainers* acted significantly differently to one another in perception of *hell-Hal* (but not *het-hat*).
5. In perception, the *maintainers*, who tend to be older, hold on to the DRESS vowel longer than the *combiners* who tend to be younger.
6. *Combiners* respond at random to the *hell-Hal* stimuli after the midpoint (i.e. /æ/-like tokens are confusing).

In summary, merger status in production (associated to some degree with age), accounts for perceptual variation seen within the Warrnambool community.

5. Discussion

This study provides more evidence that the /el/-/æl/ merger is in progress in south-eastern Australia (see previously, e.g. [4,5,6]. Comparing our results with [4], the data indicates an isogloss close to but not yet at Victoria's northern border with

NSW. The current study shows that merger is *not* evident in Albury-Wodonga which straddles the border and is only 70km north of Wangaratta where the process is known to occur [4]. This is true at least in perception, and while production results are still to be fully processed for Albury-Wodonga, merger is not evident impressionistically for those speakers. Our expectation, based on perceptual results presented here, is precisely that these subjects maintain such a distinction in production.

While further work still needs to be carried out on production. we predict varying baseline vowel values within and across sites, due to age-related accent differences and possible regional effects. As such, it was a difficult task ensuring that stimuli would be adequate for all groups of listeners. However, the fact that Albury-Wodonga listeners and Warrnambool *maintainers* mostly agreed on the endpoints of the baseline (*het-hat)* continuum indicates that the stimuli are appropriate for the task. Confusion occurs primarily when *mergers* are asked to identify an /æl/-like token.

The results showing confusion in Warrnambool at the /æ/ end of the *hell-Hal* continuum supports an exemplar approach [e.g. 1]. When listeners hear an /æ/-like token, both DRESS and TRAP exemplars are activated. If the listener merges /el/ and /æl/, they have no way of distinguishing which token they have heard (hence answering at random or selecting on the basis of lexical frequency). If they do not merge, they should be able to determine that they are hearing an open vowel as opposed to /el/. This is the case for the Albury-Wodonga listeners, and for the *maintainers* in Warrnambool.

When comparing Albury-Wodonga and Warrnambool, the trends appear to show evident differences between the regions which are not always borne out in the statistical analysis. This discrepancy is likely because of low token numbers overall in this preliminary comparison, and also because of individual variation within the communities (especially for Warrnambool where there are known to be two groups of listeners [5]). As discussed in section 6 below, the analysis of more data from the same two regional locations is a future research plan.

6. Conclusion

Unlike New Zealand English where /el/-/æl/ merger is almost complete, our study supports previous work, and also popular views, regarding this case of regional variation in AusE. Specifically, we see more evidence that /el/-/æl/ merger is a Victorian phenomenon. In Warrnambool, production of /el/ is in flux making perception of /æl/ problematic for some. This contrasts with Albury-Wodonga where perception of /el/-/æl/ is unproblematic. Comparing our study with [1], there is evidence for an /el/-/æl/ isogloss, at least in perception, near the north-eastern Victorian border with NSW between Wangaratta and Albury-Wodonga. The precise location of the isogloss between these centres remains unknown for the moment and requires investigation.

To further understand this merger in progress, our plan is to:

1. Focus more closely on production of baseline vowels and /el/-/æl/ in the towns presented here;
2. include more repetitions to compare variation within listener responses;
3. investigate perceptual response time information which we have collected but not yet analysed;
4. investigate nonsense word production and perception across all sites.

This will help us to understand regional variation with respect to /el/->/æl/, describe the merger more generally, and will also allow us to address theoretical issues (see, e.g. [1, 14, 15]) in a more comprehensive manner.

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