

# Prince Charles has Two Ears/Heirs: Semantic Ambiguity and the Merger of NEAR and SQUARE in New Zealand English<sup>1</sup>.

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This paper reports on a study of the diphthongs NEAR and SQUARE, which are merging in the speech of many New Zealanders. The study examines older and younger speakers' realisations of NEAR and SQUARE in ambiguous and unambiguous semantic contexts, following research (Charles-Luce 1993, Van Rooy et al 2003) showing that speakers actively preserve phonemic distinctions where the distinction is crucial to the interpretation of a sentence. The results of this study support previous research on the diphthongs: younger speakers appear to merge NEAR and SQUARE in unambiguous contexts, while older speakers are more likely to distinguish the diphthongs. The direction of merger is towards NEAR. However, both younger and older speakers seem able to distinguish NEAR and SQUARE in ambiguous contexts, suggesting that the distinction is still available to them at some level. A larger scale study is required to confirm the findings.

## 1. Introduction

To use the [...] examples of "beer" and "bare" and "here" and "hair", I go into this bar and say, "Beer, please" and the barmaid, being an obliging girl, takes off her top and bra. Because I am devoutly decent, I say indignantly, "Here! Here!" and the barmaid who knows when enough's enough whacks me with a jug of Old Dark which starts a bloody brawl.

You see the potential for misunderstanding is substantial and consequences may be horrendous.

Alex Veysey – Opinion column, *Evening Post*, October 29<sup>th</sup> 1994

The above excerpt has been published in previous reports on the NEAR/SQUARE<sup>2</sup> merger in New Zealand English. The purpose of repeating it here is not simply as evidence of the merger itself, but to illustrate the potential for ambiguity when a phonemic distinction is lost. Admittedly the example itself is not particularly likely – any combination of /b/ and a vowel would probably procure a beer in a pub setting. However, it does raise questions about the pragmatic consequences of sound mergers. The purpose of the research presented in this paper is to examine productions of NEAR and SQUARE vowels in ambiguous and unambiguous contexts<sup>3</sup>. The study asks whether New Zealand English speakers modify productions of NEAR and SQUARE diphthongs where a distinction is crucial to determine the meaning of a sentence.

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<sup>1</sup> The author wishes to acknowledge the assistance of Paul Warren, and in particular his help with data analysis and presentation.

<sup>2</sup> This report refers to NEAR and SQUARE using Wells' (1982) lexical sets to represent English vowel contrasts.

<sup>3</sup> Strictly speaking the sentence context is *biasing* or *non-biasing* and a merged NEAR/SQUARE token *ambiguous*. However, *ambiguous/unambiguous* is used throughout to maintain consistency.

### 1.1 The NEAR/SQUARE merger in New Zealand English

Nine years ago Bayard (1995: 67) described the NEAR/SQUARE diphthongs as 'the most thoroughly studied [variable] in New Zealand English'. The volume of research has hardly slowed since then, and this section necessarily surveys just a small proportion of the material available.

The most extensive examination of NEAR and SQUARE in New Zealand English is a longitudinal study by Gordon and MacLagan (2001). Their research recorded 14-year-old Christchurch speakers of New Zealand English at five yearly intervals, beginning in 1983. Speakers were asked to read word lists, sentences and passages, with NEAR and SQUARE tokens directly contrasted as in (1) below (Gordon and MacLagan 2001: 220):

(1) He sat on a chair and gave a loud cheer.

The researchers noted whether subjects merged the diphthongs, and the direction of merger for those who did (were NEAR words pronounced like SQUARE or SQUARE words like NEAR?). The number of speakers who merged the diphthongs increased throughout the study: in 1983, 16% of speakers were recorded as merging; by 1998 this figure had risen to 80%. Though there was some variation in the earlier repetitions, Gordon and MacLagan (2001) found that 'by 1993, the clear majority of speakers had merged the word pairs on NEAR' (Gordon and MacLagan 2001: 222). Recent publications from other researchers (e.g. Rae and Warren 2002) confirm that the merger appears to be approximating on NEAR.

Other studies (e.g. MacLagan and Gordon 1996, Batterham 2000) have examined NEAR/SQUARE variation in the speech of older and younger New Zealanders. MacLagan and Gordon (1996) compared realisations of NEAR/SQUARE for speakers aged 20-30 years with a group of speakers aged 45-60 years, also controlling for social class (professional or non-professional). The younger non-professional speakers were least likely to distinguish the two diphthongs: only 1.7% pronounced NEAR and SQUARE differently, as against 30% of younger professional participants. Older participants' realisations were more distinct: 43.5% of non-professional and 72.2% of professional participants did not merge NEAR and SQUARE diphthongs (MacLagan and Gordon 1996: 138). Batterham (2000) found similar effects of age and social class for realisations of NEAR and SQUARE by Auckland speakers. Taken together, these studies indicate that the NEAR/SQUARE merger appears to be moving steadily through the variety, but is currently most complete for young non-professional speakers of New Zealand English.

Finally, a recent comprehension study (Warren and Hay submitted) has investigated whether speakers who merge NEAR and SQUARE have the ability to correctly interpret the distinction when it is used by others. Warren and Hay (submitted: 17) found that Wellington participants aged 18-30 who showed little distinction in their own production could correctly comprehend 88% of NEAR tokens and 84.2% of SQUARE tokens in a forced choice lexical decision task, where the speaker was an older New Zealander who distinguished the two sounds. High school aged speakers, for whom the merger is more complete, were less successful at this task. Warren and Hay (submitted: 18) suggest that 'the ability to hear the difference between NEAR and SQUARE is going away, but it is disappearing at a much slower rate than the merger in production is occurring'. This claim is dependent on

production studies giving an accurate picture of the distinctions a speaker has available to them. A question unexamined until now is whether speakers can effectively 'un-merge' NEAR and SQUARE tokens in contexts where the phonemic distinction is semantically important.

## 1.2 Ambiguity and phonetic modification.

The present study asked participants to read sentences containing NEAR and SQUARE tokens in contexts where the diphthong contrast was crucial to the interpretation of the sentence. Semantic conditions have been shown in previous studies to influence the preservation of a phonemic contrast (e.g. Charles-Luce 1993, 1997; Van Rooy, Wissing & Paschall 2003). Charles-Luce (1993) found that native speakers of Catalan preserved a voicing contrast for word-final stops only in semantically ambiguous contexts. If speakers were able to predict the target word from its context, its final stop consonant would assimilate to the voicing of the following word-initial sound (Charles-Luce 1993: 35). Van Rooy et al (2003) found similar results for final stops in Afrikaans, but instead of a voicing contrast they claim speakers produce variation in the feature [tense] to perform the function of disambiguation (Van Rooy et al 2003: 49).

A 1997 study also by Charles-Luce complicates this picture somewhat. Charles-Luce (1997) examined the effects of semantic context on flapped realisations of /t/ and /d/ in words such as *writer* and *rider* – with a flap these words become homonyms. The study found that speakers of American English produced LESS phonetically distinct phonemes in ambiguous sentence contexts than they did in unambiguous contexts. Charles-Luce (1997: 243) suggests that semantic priming from an unambiguous context may facilitate clearer phonological production, and that this effect overrides any requirement to disambiguate for the listener. He considers the disparity with the 1993 result to be 'still open for speculation' (Charles-Luce 1997: 244).

Clearly the effect of context on phonemic contrasts is still uncertain, but all studies cited have noted variation of some sort. An important distinction between the present study and the research cited above is in the nature of the phonemic variation. Charles-Luce (1993, 1997) and Van Rooy et al (2003) all focus on conditioned phonetic changes where speakers use the phonemic distinctions regularly elsewhere in their speech. In previous discussions of New Zealand English NEAR and SQUARE, speakers who do not distinguish the diphthongs are assumed not to be able to do so in any context<sup>4</sup>. The research presented in this section suggests that ambiguous contexts could work as a catalyst to reveal subconscious distinctions between NEAR and SQUARE that have remained unnoticed in previous studies. Intuitively such a distinction would disambiguate the sentence for listeners, but any contrast would be sufficient evidence to suggest that the participants in this study

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<sup>4</sup> This claim can be substantiated only by omissions and categorical statements: 'The nature of variation for these young Wellington speakers is such that they exhibit little variation in production' (Warren and Hay submitted: 24); 'Social factors...have not affected the final outcome, which is the same for all young New Zealanders, the merger of diphthong pairs on NEAR' (Gordon and MacLagan 2001: 236). Semantic context was not explicitly discussed in any of the discussions of NZE NEAR/SQUARE surveyed for this research. (Though Warren and Hay (submitted: 24) note that the vowels are infrequent and carry a low functional load).



retain a NEAR/SQUARE distinction at some level. If speakers with apparently complete merger are able to modify their pronunciation to reflect ambiguity, then this will force re-evaluation of both the progress of the merger and any discussion of word-recognition as a process that draws on New Zealand English NEAR and SQUARE for evidence.

## 2. Hypotheses

That younger speakers will show a near complete merger of NEAR and SQUARE in unambiguous contexts, while older speakers will be less likely to merge.

That participants will phonetically disambiguate merged NEAR and SQUARE diphthongs in ambiguous contexts if the distinction is available to them at some level

## 3. Methodology

### 3.1 Subjects

The participants in this study were 12 Wellington-based native speakers of New Zealand English, who were chosen to reflect variation between older and younger speakers of the dialect. Six of the participants were aged 20-22 years and the remaining six 55-62 years. The participants were chosen to exclude gender, class and ethnicity as variables. All were university educated Pakeha females.

### 3.2 Stimulus Material

Participants were recorded reading aloud a list of sentences. The sentences contained six sets of NEAR/SQUARE minimal pairs, producing 12 test words. Each word was presented in one ambiguous and one non-ambiguous sentence context, which created a total of 24 test diphthongs for each participant (see Table 1).

Read data is generally less acceptable than natural speech for linguistic research (Milroy 1987: 173-174), but necessary here to elicit comparable ambiguous/unambiguous contexts. Participants were asked to read each sentence silently before saying it aloud, hopefully preventing reading errors between test words that often differed by a single letter.

Ambiguous sentence contexts were selected using an initial survey. Twelve native speakers of New Zealand English (5 males, 7 females; ages 21-30; excluded from the main study) were asked to rate pairs of sentences, which were identical apart from a NEAR/SQUARE minimal pair. The survey asked for a naturalness rating for each NEAR/SQUARE word along a continuum from *impossible* (score 0) to *fits perfectly* (score 10). Sentences were included in the study if BOTH versions received an average rating of at least eight out of ten. (An example of the survey design is provided in Appendix A.)

Sentences were designed with all test words in stressed position. Sentence position was fixed for particular minimal pair sets, but varied between sets to disguise the focus of the study. Forty additional sentences were also intended to disguise the target sound. Nevertheless, some speakers reported noticing repetitions of some of the more unusual test

words, in particular *speared* and *heir*. Two younger speakers hesitated before *heir* and eventually pronounced the usually silent <h>, which suggests that the word was unfamiliar to them.

Table 1. *Stimulus Material*

Test sentences containing NEAR/SQUARE<sup>5</sup>

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Prince Charles has two EARS/HEIRS.

Most children in aeroplanes get sore EARS.

The money was left to her three HEIRS.

Some people have no appreciation of what a BEER/BEAR can do to you.

The fans bought enough BEER to last the game.

The zookeeper fed the BEAR a live salmon.

It seems the tiger was SPEARED / SPARED.

All the fish survived except the one that the fisherman SPEARED.

Many departments had layoffs but IT was SPARED.

I REALLY/RARELY like the way she dresses.

We had a REALLY nice evening together last weekend.

She RARELY ever has time to cook elaborate meals.

When are you going to be able to SHEAR / SHARE it?

It is best to SHEAR sheep at least once a year.

Many children have to SHARE a room with their siblings.

That DEER/DARE is dangerous.

The DEER were in the paddock by the house.

His DARE was to jump off the bridge.

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### 3.3 Method of Analysis

Participants were digitally recorded using a minidisc recorder and test diphthongs analysed using the phonetics computer programme Praat. Only the onset of each diphthong was measured, as both then centre to /ə/ – the exact point was modelled on results provided by Watson, Harrington & Evans (1998: 201). The test sounds were isolated on a spectrogram with formants displayed. The programme provided formant 1 (F1) and formant 2 (F2) measurements in Hz for the selected point, which were recorded on a spreadsheet. F1 corresponds (inversely) to height in the vocal tract, and F2 to backness and/or rounding (Hagiwara 1999). When converted to bark scale, F1 and F2 are considered to represent movements within the traditional vowel quadrilateral.

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<sup>5</sup> Test words were, of course, not capitalised in the copy provided to participants.

## 4. Results

Results were collated according to three variables: diphthong type (NEAR/SQUARE), age (old/young) and context (ambiguous/unambiguous). Average F1 and F2 values were calculated (in bark) for each combination of variables and are displayed in Figures 1-4. The bark plots look very similar, but there are actually interesting and significant differences. For a comparison, see Figure 5 below.

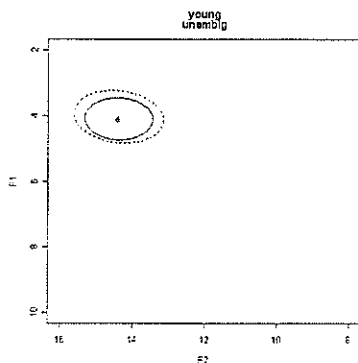


Figure 1. F1/F2 ellipses displaying NEAR and SQUARE onset locations for younger speakers in unambiguous contexts

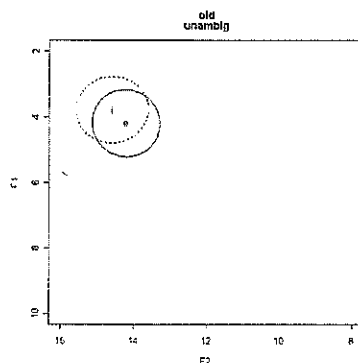


Figure 2. F1/F2 ellipses displaying NEAR and SQUARE onset locations for older speakers in unambiguous contexts

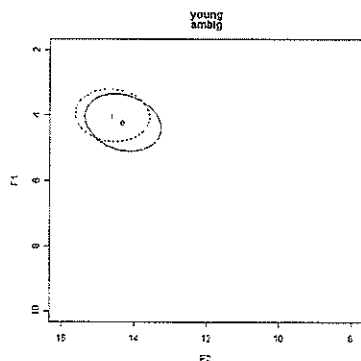


Figure 3. F1/F2 ellipses displaying NEAR and SQUARE onset locations for younger speakers in ambiguous contexts.

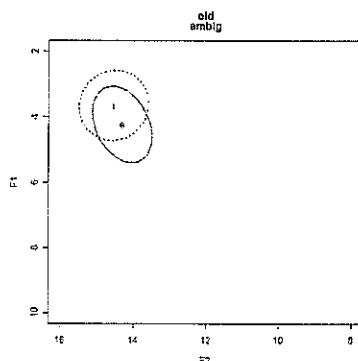


Figure 4. F1/F2 ellipses displaying NEAR and SQUARE onset locations for older speakers in ambiguous contexts.

#### 4.1 Hotelling-Lawley Trace Scores and ANOVA results

Figure 5 compares Hotelling-Lawley trace scores for all conditions. The Hotelling-Lawley trace provides a multivariate statistical measure of NEAR and SQUARE separation, taking into account the distribution of formants. Means and standard error bars are included.

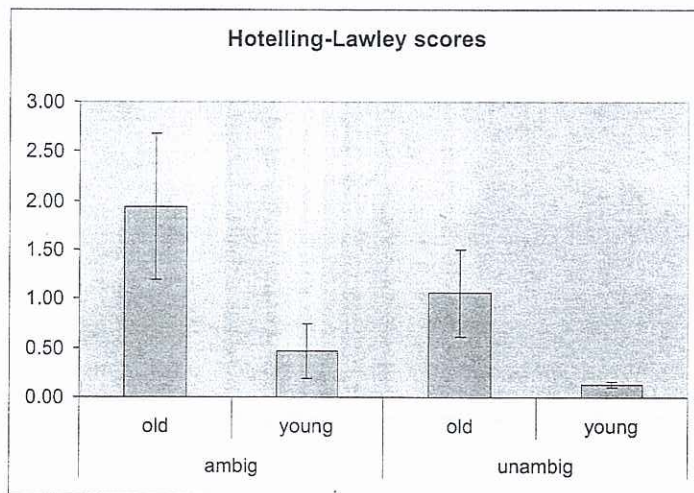


Figure 5. Mean Hotelling-Lawley trace scores, showing level of discrimination in production between NEAR and SQUARE vowels.

The comparison in Figure 5 shows clear effects for both age and context. Mean Hotelling-Lawley scores were also entered into Analysis of Variance (ANOVA) with age and sentence context as independent variables. The main effect of age, though not conventionally significant ( $p < 0.05$ ), did approach significance ( $F_{1,10} = 4.30$ ,  $p = 0.065$ ). The main effect of context again approached significance ( $F_{1,10} = 4.503$ ,  $p = 0.06$ ).

#### 4.2 Variable 1: Age

Figures 1 and 2 illustrate realisations of NEAR (solid line) and SQUARE (dotted line) for younger and older participants in unambiguous (control) contexts. According to Figure 1, the younger participants in this study merge NEAR and SQUARE at an almost identical location in the vowel space. NEAR and SQUARE onsets are more distinct for older participants, but there is considerable overlap.

It is useful to compare the results of this study to the bark plot in Figure 6<sup>1</sup>. Figure 6 displays NEAR and SQUARE onset locations for a more conservative speaker of New Zealand English (in her sixties) who distinguishes the two

<sup>1</sup> My thanks to Paul Warren and Jen Hay for providing this comparison.

diphthongs. Compared with this speaker, the older participants in the present study have very similar realisations of NEAR and SQUARE. It should be noted that there was considerable variation between speakers in the older group.

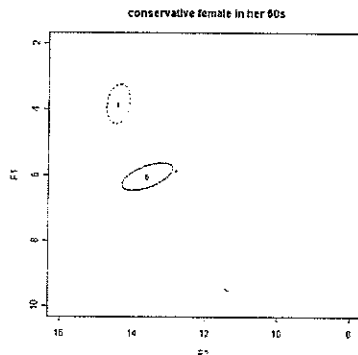


Figure 6. F1/F2 ellipses displaying NEAR and SQUARE onset locations for an older more conservative speaker of NZE

A comparison of Figures 1 and 2 with Figure 6 confirms that the direction of merger for all participants seems to be towards NEAR.

#### 4.3 Variable 2: Ambiguity

F1/F2 ellipses for ambiguous contexts are displayed in Figures 3 and 4, for younger and older participants respectively. There is an effect of context for younger speakers. The ellipses in Figure 3 show that younger speakers distinguish NEAR and SQUARE in ambiguous contexts, pronouncing SQUARE lower and less forward in the vowel space than NEAR. However, there is considerable overlap in the onset locations of the two diphthongs. Older speakers also appear to pronounce NEAR and SQUARE more distinctly in ambiguous contexts (Figure 4) in comparison to their realisations in unambiguous contexts (Figure 2).

These contrasts are shown most clearly in Figure 5, where there are clear effects of both age and context.

### 5. Discussion

Both of the hypotheses in Section 2 are supported by the results of this study. Older speakers, on average, were shown to make a greater distinction between NEAR and SQUARE than younger speakers. Indeed, younger speakers appear to have fully merged the diphthongs in unambiguous contexts. The study shows that the direction of merger for these speakers is towards NEAR, which is consistent with previous research in this area.

The older speakers in this study appear to pronounce NEAR and SQUARE more similarly than would be expected, especially in comparison to the conservative speaker presented above (in Figure 5). As previously mentioned,



there was significant variation between speakers in this group; a fact also noted by Maclagan and Gordon (1996) – 28% of their female older professional participants were recorded as merging. It is likely that this figure has increased in the ten years since their research was carried out and, when averaged across participants, the similar articulations of NEAR and SQUARE for older speakers in the present study supports this tendency.

The results show a clear effect of ambiguity on speakers' distinctions of NEAR and SQUARE. The ellipses in Figures 1-4 indicate that participants distinguish the diphthongs in the direction of their traditional locations in the vowel space. This change suggests that speakers disambiguate NEAR and SQUARE in a manner useful for their listeners, supporting Van Rooy (2003) and the earlier study by Charles-Luce (1993).

### 5.1 Limitations

The present study was limited in both time and resources, and particularly by the number of speakers involved. The ANOVA results would have been much more likely to reach significance had more participants been involved.

The number of tokens for each speaker was also necessarily restricted. Some participants commented on the number of sentences they were expected to read, but it is possible that the 'decoy' sentences were insufficient to completely hide the focus of the study. As mentioned above, speakers were particularly aware of the less common target words. This is understandable given that each was repeated four times in a relatively short space of time. Nonetheless, recognising individual words is unlikely to have reduced the effect of ambiguity unless speakers also recognised sentence contexts. None of the participants reported noticing that (near) identical sentences were repeated.

### 5.2 Implications

The results of this study suggest that the merger-in-progress of NEAR and SQUARE in New Zealand English is in an advanced state, even for older speakers, but both speaker groups show ability to make clearer distinctions if necessary.

These findings support the prediction of near-merger (see Labov 1994) for NEAR and SQUARE in NZE as put forward by Gordon and Maclagan (2001). Gordon and Maclagan (2001: 233) noted a tendency for speakers to monophthongise NEAR and SQUARE, using separate realisations for each – [i:] and [e:] respectively. The results of the present study suggest that such a distinction would be possible for speakers currently thought to merge the diphthongs.

### 5.3 Future directions

There is certainly scope for further research in this area. A similar study in larger scale would be useful to confirm the findings reported here. The present study is only as strong as its methodology, and future investigations should carefully consider the types of words and contexts that will best support semantic ambiguity. A greater focus on stress and accent levels would be worthwhile.

Future research should consider all possible realisations of traditional NEAR and SQUARE, including monophthongs, to establish whether speakers are responding to ambiguity using mechanisms untested in the present study. This would ideally involve analysis of the complete trajectory of F1 and F2 through the diphthongs, and not simply the onset values.

Finally, comprehension studies of ambiguity and the NEAR/SQUARE merger would provide important support for the present findings. A follow-up project could ask listeners to interpret tokens produced in ambiguous contexts in the present study in order to establish whether the distinctions made are useful for comprehension. Another study could measure the time taken for listeners to comprehend ambiguous sentences containing NEAR and SQUARE tokens, where delayed comprehension would suggest they were reacting to the potential ambiguity. Any sensitivity towards ambiguous contexts in such a project would support the idea that the modifications made by speakers in this study were intended (at whatever level) to reduce ambiguity.

## 6. Conclusion

The apparent merger of NEAR and SQUARE in New Zealand English is continuing. Older participants in the research presented here produce more phonetically distinct diphthongs than their younger counterparts, however older speakers' realisations seem to be closer than in previous research. The two sounds are approximating on NEAR. Younger and older participants distinguish NEAR and SQUARE more successfully in ambiguous contexts, which suggests that the merger may be less complete than previously thought. Speakers must retain a NEAR/SQUARE distinction at some level if they are capable of modifying their speech in this way. A larger scale study is required to confirm these findings.

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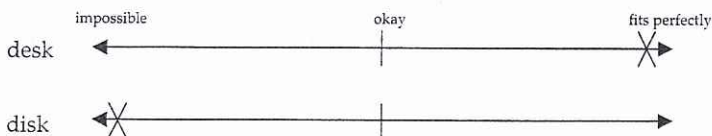
## Appendix A: Survey to determine ambiguous contexts: instructions and example provided to participants

First, read each of the sentences below, together with the two words that are provided to complete it.

Next, make a cross on the scale from 'impossible' to 'fits perfectly' for each word. I am interested in whether you think a word is more or less awkward – or perhaps makes more sense – in the context of the sentence.

An Example:

The student sat at her \_\_\_\_\_



[A ruler placed over the (10cm long) line gave a result out of 10]