The English pronunciation of successive groups of Maori speakers

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Abstract

We have acoustically analysed the English of four groups of Maori males, representing the English spoken by Maori over a 100 year time span. Three of these four groups had English as a second language and Maori as their first language; for the forth group the situation was reversed. We have shown that the English pronunciation of the groups for whom English is a second language, is affected by their Maori pronunciation. However we have also shown that the well documented changes in NZE over the last 100 years, can also be seen in the speech of the Maori speakers.

Index Terms: New Zealand English, vowel shift, bilingual speakers, Maori.

1. Introduction

New Zealand English (NZE) has undergone a noticeable and well documented vowel shift whereby the front vowels DRESS and TRAP have raised, KIT has retracted and lowered, GOOSE has fronted and LOT and THOUGHT have raised (see e.g., [1] for details and references). In the studies to date on this vowel-shift in New Zealand English, there has not been a conscious effort to study the English of Maori although Bell [2] commented on Maori speakers in his auditory study of the front vowels. Maori in New Zealand have spoken English for well over one hundred years. Today all Maori speak English whereas the number who are fluent in the Maori language is relatively low, as few as 4% of the Maori population of ca. 0.25 million [3, p195]. The MAONZE project (Maori and New Zealand English) is studying the Maori and English of New Zealand. The only dialect difference was that one occasionally used rhotic NURSE vowels (there are no other effects on the vowel space, see [6], p188). The MAONZE L1 Maori speakers are compared with L1 English speakers: other MU speakers (the ONZE group see [1]), speakers recorded by the NZBC (see [7,8] and the NZEY group.

Table 1: Details of the three speaker groups for whom Maori is their first language, and the three for whom English is their first language.

<table>
<thead>
<tr>
<th>Grp</th>
<th>L1</th>
<th>Date of birth</th>
<th>Date of recording</th>
<th>Approx. Age at recording</th>
<th>No. of Spkrs</th>
<th>No. of Tokens</th>
</tr>
</thead>
<tbody>
<tr>
<td>MU</td>
<td>M</td>
<td>1880s</td>
<td>1948</td>
<td>70 ish</td>
<td>5</td>
<td>1506</td>
</tr>
<tr>
<td>K</td>
<td>M</td>
<td>1920s-30s</td>
<td>2001-06</td>
<td>70-80 ish</td>
<td>10</td>
<td>3086</td>
</tr>
<tr>
<td>L1Y</td>
<td>M</td>
<td>1970s-80s</td>
<td>2004-06</td>
<td>20 ish</td>
<td>5</td>
<td>1579</td>
</tr>
<tr>
<td>ONZE</td>
<td>E</td>
<td>1880s</td>
<td>1946-48</td>
<td>70 ish</td>
<td>5</td>
<td>1878</td>
</tr>
<tr>
<td>NZBC</td>
<td>E</td>
<td>1916-1936</td>
<td>1986-92</td>
<td>70 ish</td>
<td>3</td>
<td>882</td>
</tr>
<tr>
<td>NZEY</td>
<td>E</td>
<td>1970s-80s</td>
<td>2001-06</td>
<td>20 ish</td>
<td>4</td>
<td>1359</td>
</tr>
</tbody>
</table>

2. Method

2.1. Speakers

Table 1 gives the speaker details of the four groups of MAONZE speakers investigated in this study (more details about the MAONZE speakers can be found in [4]). For clarity, the young speakers whose first language is Maori will be referred to as L1Y, and those whose first language is English will be called NZEY. All the speakers were male. The MU, K and L1Y speakers were from the North Island of New Zealand; two NZEY speakers were from the South Island of New Zealand. The only dialect difference was that one occasionally used rhotic NURSE vowels (there are no other effects on the vowel space, see [6], p188). The MAONZE L1 Maori speakers are compared with L1 English speakers: other MU speakers (the ONZE group see [1]), speakers recorded by the NZBC (see [7,8] and the NZEY group.

2.2. Data Collection

The MU and ONZE data was recorded by the Mobile Disc recording unit of the New Zealand Broadcasting service (see [1] for more details). The interviews were relatively formal and were intended for radio broadcast. The NZBC data was extracted from radio interviews. The remaining data was collected by the MAONZE project. The speech data for the K, L1Y and NZEY speakers was collected in interview-style recordings (as opposed to casual conversation). The interviews were recorded on Sony DAT recorders (TCD-D8) with Sony tie clip microphones (ECM-T145). All the data was converted to .wav format for analysis. Interviews were transcribed using Transcriber (http://trans.sourceforge.net/en/presentation.php) and acoustic analysis (except for the NZBC group) was done in Praat (http://www.fon.hum.uva.nl/praat/). The NZBC data was analysed in EMU (http://emu.sourceforge.net/).
2.3. Analysis

The vowel tokens were all extracted from contextual speech, and were taken from syllables with no stress induced reduction. For each speaker approximately 30 tokens of each of the 11 monophthongs of English were analysed, where possible including no more than five tokens from any individual word (it was not always possible to meet these criteria for FOOT and START). All formants were calculated using the default settings. The formant positions were visually checked, and corrected. Measurements were taken at the vowel target, identified using the usual criteria (see [6] plus many others). Vowels adjacent to /l/, /w/ or /r/ were not selected, nor were rhotic nurse vowels for the Southland NZEY speaker. This study focuses on formants F1 and F2.

3. L1 Maori and L1 NZE speakers

We consider each group of speakers in turn, contrasting the L1 Maori speakers with comparable L1 English speakers. To investigate the differences in vowel spaces between the speaker groups two-way ANOVAs were calculated, with speaker group and vowel being the main effects. Where significance between the F1 and F2 values of the speaker groups were identified, post hoc comparisons were made between the vowel types. In this study and throughout the paper the Bonferroni correction was applied to the 0.01 alpha level to account for the multiple comparisons. All statistics were done in R (http://www.r-project.org/).

Figure 1: Ellipse plots (containing 95% of the tokens) in the F1 vs F2 vowel space of the 11 monophthongs of New Zealand English for 5 Maori MU speakers (left) and 5 ONZE speakers (right). The data for the ONZE speakers is from [1]. Symbol Key: For all plots in study we have used Machine Readable Phonetic Symbols on the graphs. Relating these to Wells’s key words [12] we get: F = FLEECE, I = KIT, E = DRESS, A = TRAP, A: = START, V = STRUT, O – LOT, U = FOOT, U: = GOOSE and @: = NURSE.

The F1 values for the MU and ONZE groups were not significantly different. The MU F2 values were significantly different from the ONZE values (F=5.2789, p=0.022), and there was a significant speaker vowel interaction (F=28.361, p<0.001). Post hoc t-tests revealed that the F2 values for KIT, DRESS, TRAP and NURSE were significantly higher for MU than ONZE and therefore the vowels were further forward. In addition, MU F2 values for START, STRUT and THOUGHT were significantly lower and therefore those vowels were further back. Figure 1 shows vowel plots for the MU speakers compared with five ONZE speakers. As expected the plots are very similar, with the MU speakers having relatively more fronted KIT, DRESS, TRAP, and NURSE and more retracted START, STRUT and THOUGHT vowels. The K and NZBC vowels were not significantly different in F2. The K F1 values were significantly different from the NZBC speakers (F=125, p<0.001) and there was a significant speaker vowel interaction (F=5.4, p<0.001). Post hoc t-tests revealed that F1 values for FLEECE, KIT, START, LOT, THOUGHT, FOOT and GOOSE were all significantly higher for the K than for the NZBC speakers, and therefore the K vowels were apparently lower as shown in figure 2. However the formant values were analysed by different programs, and are therefore less comparable than the other data presented. Visual inspection of the relative differences in the vowel space reveals that KIT is relatively more front and GOOSE, START and STRUT are relatively farther back for the K speakers than for the somewhat older NZBC speakers, indicating that the K speakers are relatively conservative.

Figure 2 Ellipse plots (containing 95% of the tokens) for 10 K speakers (left) and three NZBC speakers born between 1919 and 1936 (right). The data for the NZBC speakers is from [7] and [8].

The L1Y F1 and F2 values were significantly different from the NZEY speakers (F1: F=378, p<0.001, F2:F=61.8, p<0.001) and there was a significant speaker vowel interaction (F1:F=7.5, p<0.001; F2: F=16.9, p<0.001). Post hoc t-tests revealed that the F1 values for all the monophthongs, except TRAP were significantly lower for LIY speakers, than the NZEY speakers, with the vowels being higher. In addition, the F2 values for FLEECE, KIT, FOOT and GOOSE were significantly higher so the vowels were more front for LIY than NZEY, and those for START were significantly lower and the vowel was farther back. All the significant differences can be seen in figure 3 which presents vowel plots for the LIY and NZEY speakers. We suggest that the contracted NZEY vowel plot may have occurred because they are speaking a less formal version of English than the LIY speakers for whom English is their second language (see figure 5 where the Maori L2 vowel space is larger than the English L1 vowel space for the NZEY speakers).

Figure 3: Ellipse plots (containing 95% of the tokens) for 5 L1 Maori (L1Y) speakers (left) and 4 L1 English speakers (NZEY) (right). All data is from the MAONZE project.
4. Change over time for Maori speakers

Figure 4 presents the F1 vs F2 centroid plots for the MU, K, and L1Y speakers placed on the same plot. A two-way ANOVA indicated there were significant differences between all three speaker groups for F1 (F=112.6, p<<0.001) and F2 (F=181.4, p<<0.001). In post hoc tests, the Tukey honest significant difference test indicated that for both F1 and F2 there were significant differences between all combinations of the 3 groups. T-tests were used in the post hoc analysis to establish which vowel movements were significant across the three speaker groups in Figure 4. The results are summarized in Table 2.

![Figure 4: Centroid plots of the vowel spaces of the MU (light grey), K (dark grey) L1Y speakers (black).](image)

Table 2: Summary of significant post-hoc t-test results comparing F1 and F2 values for the three groups of speakers.

<table>
<thead>
<tr>
<th>Vowel</th>
<th>MU-K/L1Y</th>
<th>MU-K/L1Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLEEC</td>
<td>K&gt;L1Y</td>
<td>MU&gt;K&gt;L1Y</td>
</tr>
<tr>
<td>KIT</td>
<td>MU&lt;K/L1Y</td>
<td>L1&gt;MU/K</td>
</tr>
<tr>
<td>DRESS</td>
<td>MU&gt;K&gt;L1Y</td>
<td>K&gt;L1Y</td>
</tr>
<tr>
<td>TRAP</td>
<td>MU&lt;K&gt;L1Y</td>
<td>K&gt;L1Y</td>
</tr>
<tr>
<td>START</td>
<td>K&gt;MU/L1Y</td>
<td>---</td>
</tr>
<tr>
<td>STRUT</td>
<td>K&gt;MU</td>
<td>K&lt;MU</td>
</tr>
<tr>
<td>LOT</td>
<td>L1Y&lt;MU/K</td>
<td>MU&lt;K/L1Y</td>
</tr>
<tr>
<td>THOUGHT</td>
<td>L1Y&lt;MU/K</td>
<td>MU&lt;L1Y</td>
</tr>
<tr>
<td>FOOT</td>
<td>MU&lt;K/L1Y</td>
<td>L1Y&lt;K</td>
</tr>
<tr>
<td>GOOSE</td>
<td>K&lt;MU/L1Y</td>
<td>L1Y&gt;MU/K</td>
</tr>
<tr>
<td>NURSE</td>
<td>MU&gt;K/L1Y</td>
<td>L1Y&gt;MU/K</td>
</tr>
</tbody>
</table>

To interpret the results, we start with the high front vowels and move around the vowel space, comparing the data in Table 2 with Figure 4. For FLEEC the only significant feature is that the L1Y vowel is more raised than the other groups. For KIT the retraction and lowering over time is significant. For DRESS and TRAP the raising over time is significant, as is the fronting in L1Y compared to MU and K. START is similarly back for MU, K and L1Y, with the only difference over time being a small variation in height. For STRUT, MU is significantly higher and farther forward than K, but there are no significant differences between K and L1Y. From Figure 4, it can be seen that K and L1Y START and STRUT are closer together in both F1 and F2 than are MU START and STRUT. For LOT, the backing and raising over time between MU-K and L1Y is significant. For THOUGHT, the slight backing and raising over time is similarly significant. For FOOT the lowering between MU and L1Y is significant as is the fronting between K and L1Y. For GOOSE the fronting over time is significant, as is the raising and fronting over time for NURSE.

5. Maori influence on English

![Figure 5: Centroid plots of the vowel spaces of the MU, K, L1Y and NZEY speakers’ English (black) and Maori vowels (grey).](image)

Figure 5 presents the centroids of the English vowels superimposed on the centroids of the Maori vowels for each of the MAONZE speaker groups. It is immediately obvious that the English vowels of each group are very similar to their Maori vowels. In particular, the Maori long vowels /e: a: o: u:/ are in a similar place to the NZE vowels FLEECE, DRESS, START, THOUGHT and GOOSE. To investigate the changing nature of these two sets over time we performed a two-way ANOVA with Language and Vowels as main effect for all four groups. For MU there was no significant difference in Language for F1, but there was for F2 (F=85.2, p<<0.001). Post hoc t-tests revealed that the MUe GOOSE was significantly more front than MUm vowel. For K Maori and English, there were significant differences in Language for both F1 (F=12.7, p=0.004), and F2 (F=117, p<<0.001). Post hoc t-tests revealed that for Ke FLEECE is significantly lower, DRESS lower and more retracted, GOOSE and START are more front and THOUGHT farther back than for Km. For L1Y Maori and English there were significant differences in Language for both F1 (F=4.0, p=0.04), and F2 (F=289, p<<0.001). Post hoc t-tests revealed that for Ke GOOSE was significantly lower, DRESS lower and more retracted, GOOSE and START are more front and THOUGHT farther back than for Km. For L1Y Maori and English there were significant differences in Language for both F1 (F=19.5, p>>0.001). Post hoc t-tests revealed GOOSE was significantly less open for NZEYe than for NZEYm. All these effects can be seen in Figure 5.

We note that, throughout this paper, statistically significant vowel differences were separately verified as being perceptually different, except for K/NZBC speakers.
6. Discussion

Analysis of the English of the three L1 Maori speaker groups (MU, K and L1Y groups) shows that their speech is very similar to that of comparable L1 NZE speakers (ONZE, NZBC and NZEY groups). Research has shown that, since the mid 1800s, the NZE front vowels DRESS and TRAP have raised, KIT has retracted and lowered, GOOSE has fronted and LOT and THOUGHT have raised (see [1] for details and references). From figures 1, 2 and 3, these vowel movements can be seen in the speech of the comparison groups of L1 English speakers. From figure 4 it can be seen that the changes in the vowel spaces of the three groups for whom English is a second language parallel those already known for NZE and shown by the L1 English groups. In particular we note the increasing retraction and lowering of KIT, fronting of GOOSE and raising of DRESS, TRAP, LOT, THOUGHT and NURSE, with the changes usually progressing from the MU to the L1Y speakers. We also note that the K speakers’ START, STRUT and GOOSE vowels are relatively more retracted than those of comparable L1 English speakers (NZBC group) and therefore closer to Received Pronunciation. We suggest that this is one cause of the common mid 20th century comments on the “purity of vowels” for Maori speaking English ([9], p 131). In most cases where the Maori speakers’ vowels differed from those of the comparable L1 English group in section 3, the differences can be attributed to influence from the speakers’ Maori vowels (see section 5). This would be expected from studies of second language speakers and represents assimilation of the L2 vowels to the position of the L1 vowels [10]. However it is clear that the speakers are not simply assimilating their English vowels (MU, K, L1Y) or Maori vowels (NZEY) to the vowels of their first language. Maori has no vowels that correspond to TRAP or NURSE, and these vowels are assimilated from their Maori vowels and appear in an appropriate place for English [10]. In contrast, the NZEY speakers both assimilate their Maori vowels to their NZE vowels for /i/, /e/, /æ/, /o/ and /u/ from their NZE GOOSE.

The different effects of Maori on the speakers’ English can also be explained in terms of the different times at which the groups of speakers learnt their second language. The MU speakers learnt English as adults, and continued to speak Maori on a daily basis. They are late bilinguals [10] whose second language continued to be influenced by their first language [11]. The same is true, though to a lesser degree for the K speakers, because they would have received considerably more exposure to the L2, English, throughout their lives (see [10], p468). Although the L1Y speakers are early bilinguals, there is dissimilation in their pronunciation, in that FLEECE, KIT, FOOT and GOOSE were more front and TRAP and START farther back than for NZEY. The NZEY speakers show no influence from Maori in their English pronunciation, but rather their English influences their Maori (e.g. the more front FLEECE, GOOSE and START compared with LY1 [5]) as is appropriate for late bilinguals learning Maori as a second language.

7. Conclusions

We have acoustically analysed the English of four groups of Maori males, representing the English spoken by Maori over a 100 year time span. Three of these four groups had English as a second language and Maori as their first language, for the fourth group the situation was reversed. We have shown that the English pronunciation of the MU K and L1Y groups for whom English is a second language, is affected by their Maori pronunciation. In contrast the NZEY group show English effects in their Maori pronunciation. In addition, we have shown that the well documented changes in NZE over the last 100 years, changes that are demonstrated from continuous speech by the L1 English groups, can also be seen in the speech of the Maori speakers in the MAONZE study.

8. Acknowledgements

We gratefully acknowledge the work done by members of the Origins of New Zealand English Project in preparing and analyzing the data for the non-Maori MU speakers, Dr S. Palethorpe for her work in preparing and analyzing data for the NZBC speakers and the Radio NZ Sound Archives Nga Taonga Korero from whom the MU and NZBC speakers were accessed.

9. References