NEW ZEALAND ENGLISH INFLUENCE ON MĀORI PRONUNCIATION OVER TIME[1]

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Abstract

Māori and English have been in intimate contact for well over a century and a half. This paper presents initial results from a longitudinal study of the changes in the pronunciation of Māori and the influence of English over time. The pronunciation of English and Māori monophthongs for four speakers, two born in the 1880s and two in the 1970s, is analysed acoustically. The speakers' English pronunciation is similar to that of contemporary New Zealand born speakers for whom analyses are already available. Acoustic analyses of their Māori vowels shows change over time. The older speakers maintain significant qualitative and quantitative distinctions between the long and short vowel pairs. These distinctions are breaking down in the younger speakers. The changes seen could reflect influence from New Zealand English or the beginnings of internal language change.

1. Introduction

Māori and English have been in intimate contact for well over a century and a

half. The effects of this contact on Māori have been considerable, particularly over the last century or so, during which period the Māori population has been to all intents and purposes bilingual and, more recently, shifting towards monolingualism in English. The developments in the lexicon, especially in the form of borrowings and shifts of meaning to match English models, and more recently, the deliberate creation of terminologies isomorphic with English, have changed the Māori vocabulary radically (see Harlow 2004: 149-69). The interference of English in the syntax of Māori is also evident, with a number of constructions and collocations in current use which are not found in older texts (cf. e.g. Harlow 1991: 35-7).

Shifts in the pronunciation of Māori and the extent of New Zealand English (NZE) influence on this aspect of the language are the subject of a research project, 'The pronunciation of Māori and the influence of English: a longitudinal study' (MAONZE = Māori and NZE), based at the University of Canterbury, and supported by the Marsden Fund of the Royal Society of New Zealand.

The research is a combination of real time and apparent time studies of changes in the pronunciation of Māori, and is made possible by the existence of tapes of some ten Māori recorded by the Mobile Disk Recording Unit of the New Zealand Broadcasting Service between 1946 and 1948. All these speakers were born in the late nineteenth century and most are recorded speaking in both Māori and English. The interviews vary somewhat in length and clarity; some contain relatively little speech, and in others, the interviewer interrupts the speaker many times during the English recordings. In due course, three groups of ten speakers will be analysed: the Mobile Unit (MU) speakers; *kaumātua* born approximately fifty years later (in the 1920s to 1930s); and younger speakers born approximately fifty years later again (in the 1970s). The MU speakers and the *kaumātua* will be first-language (L1) speakers of Māori. The young speakers will be divided into those who speak Māori as their L1 and those for whom it is their second language (L2). At this stage of the research, only male informants are being interviewed, since the MU speakers are all men.

In this paper we present acoustic analyses of Māori and English monophthongs for four speakers, two older speakers born in the late nineteenth century and two younger speakers, born almost 100 years later. The two speakers from the older group who are analysed here were chosen because there is enough material for analysis in both Māori and English, and because the recordings contain reasonably long stretches of uninterrupted speech.

2. Method

2.1 Speakers

As indicated, four speakers are analysed in this paper, two MU speakers born in the nineteenth century and two young speakers born in the 1970s. R is a MU speaker, born in Te Awamutu in 1885, of Ngāti Maniapoto and Tūwharetoa descent. H is a MU speaker born in Paeroa at about the same time as R. He is of Ngāti Tamaterā descent. Both R and H are first language speakers of Māori.

M is a younger speaker born in Southland in 1972 of Whakatōhea descent. T is also a younger speaker, born in 1979 on the Kapiti Coast and is of Ngāti Raukawa and Ngāi Tahu descent. M and T are both second language speakers of Māori, with M being competent, and T being fluent. The two MU speakers were recorded by the Mobile Disc Recording Unit of the New Zealand Broadcasting Service in 1948. Copies of the recordings are held in the Mobile Unit archive in the Linguistics Department and the Macmillan Brown Library at the University of Canterbury.[2]

2.2 Data

For all four speakers, the short and long monophthongs in their Māori speech, /i, e, a, o, u, i:, e:, a:, o:, u:/, were analysed, and the formant frequencies, pitch and length recorded.[3] In keeping with the convention for the naming of English vowels devised by Wells (1982), we will be naming the Māori vowels in this paper and subsequent work: PIKI, KETE, WAKA, MOKO, TUKU, PĪ, KĒ, WĀ, MŌ, TŪ respectively to represent both the relevant phoneme and the set of words that contain that phoneme. We have set these out in table 8 in the appendix for convenience, together with an explanation of how they were constructed and why we feel they will be useful to researchers. For English the monophthongs /i, ɪ, e, æ, a, ʌ, ʊ, ɔ, ʊ, u, ɜ/ were analysed.

The amount of recorded material available was different for each speaker. For R there was 48 minutes of English and almost 90 minutes of Māori. For H there was 40 minutes of English and almost 31 minutes of Māori. There was just over 45 minutes of both English and Māori for each of the two younger speakers, M and T. The target, largely achieved, was the analysis of approximately 30 tokens for each vowel for each language for each speaker. The tokens were extracted from contextual speech, not analysed from word lists. For English, which has considerable vowel reduction in unstressed syllables, only tokens with prosodic sentence stress were analysed. For Māori which does not have marked vowel reduction in unstressed syllables, it was

often possible to analyse more than one vowel in a word. Vowels were analysed if they were fully voiced and, especially for the younger speakers, did not sound reduced. Because of this, and because of the variation in the amount of speech recorded for each speaker, it was not always possible to find 30 appropriately stressed tokens for each vowel for each speaker. For example, it was not possible to find 30 stressed tokens of the English FOOT vowel for R or of the English START vowel for H. Table 1 shows the number of tokens analysed for each language for each speaker. Overall, 1124 tokens were analysed for Māori and 1294 tokens for English, giving a grand total of 2418 tokens.

For the MU speakers the data is bandlimited to 5 kHz. This is due to the limited frequency response of the recording equipment, which was originally used by the NZ army during world war two. The MU recordings were digitised at 16,000 Hz (16 bit) and the modern recordings at 20,000 Hz (16 bit) and analysed in PRAAT version 4.125 (Boersma and Weenink http://www.fon.hum.uva.nl/praat/). Formants were calculated using the default PRAAT settings (25 ms analysis frame, gaussian window, 10 pole LPC filter). The formant positions were visually checked and corrections made to the analysis parameters as necessary. Measurements were taken during the steady state portion of the vowel. If there was no steady state, formant readings were taken at the F2 maximum (and F1 minimum) for front vowels, the F1 maximum (and F2 minimum) for central vowels and the F2 minimum (and F1 minimum) for back vowels. Length measurements were calculated from wide-band

Table 1: Number of tokens analysed.

SPEAKER	MĀORI LONG VOWELS	MĀORI SHORT VOWELS	MĀORI TOTAL	ENGLISH	**GRAND TOTAL**
R	159	154	313	314	**663**
H	151	146	297	305	**602**
T	118	112	230	343	**594**
M	142	142	284	332	**629**
Totals	**570**	**554**	**1124**	**1294**	**2418**

spectrograms together with the waveforms. Consonant transitions were included within vowel measurements so long as vowel formants could be seen (i.e. so long as there was voicing). Māori does not have syllable final consonants and, with the exception of /r/, anticipatory transitions into the initial consonant of the following syllable were not common, especially for the older speakers. Any anticipatory transitions that did occur were included in the vowel length if there was no break before the initial consonant of the following word. Because of the phonotactics of Māori, many vowels follow each other without forming phonological diphthongs. Where a vowel was adjacent to another vowel, length was measured to the middle of the transition between the two vowels. Graphs were drawn in Emu/R (http://emu.sourceforge.net). Effect sizes (Cohen 1988) and t-tests were used to assess the significance of the results obtained.

3. Results

In this section, we present the results of the analysis of the English vowels followed by the results of the Māori vowel analysis for the two groups. Results are presented for the individual speakers. Then the two older and the two younger speakers are grouped together in order to give an indication of change over time. In order to check how typical the speakers might be, the English results for the older and the younger speakers are compared with already available vowel plots from speakers of similar ages. At this stage, there are unfortunately no comparable standards for the Māori results, and in the case of a number of our observations below, the analysis of further speakers will be needed to achieve more definite conclusions.

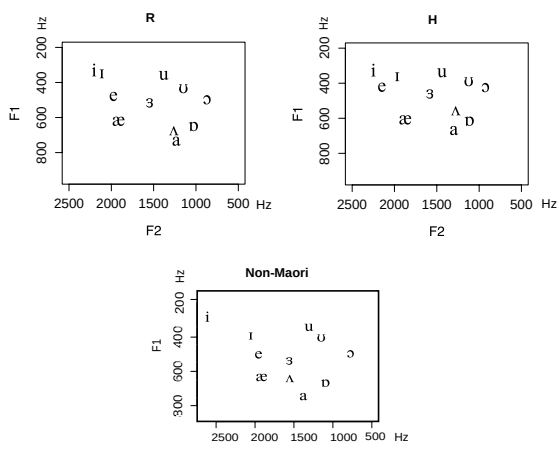
3.1 Older group: English

Formant values in Hz for the English monophthongs for the two older speakers are presented in table 2 and in figure 1 together with a similar vowel plot for five speakers born at a similar time to R and H (based on Gordon et al. 2004: 109). In general, R and H have very similar pronunciations for the English monophthongs, and are also very similar to their New Zealand born English speaking contemporaries. The most obvious difference between R and H and the New Zealand born contemporaries is the relative retraction of FLEECE and STRUT for R and H. We discuss this below.

Table 2: Formant frequencies (Hz) for English vowels for the older speakers, R and H.

	R				H			
	F1		F2		F1		F2	
VOWEL	MEAN	SD	MEAN	SD	MEAN	SD	MEAN	SD
/i/	328	27	2208	80	326	31	2255	100
/ɪ/	365	41	2108	158	373	37	1977	214
/e/	477	96	1975	128	422	33	2145	208
/æ/	627	73	1914	101	620	66	1887	156
/a/	735	84	1236	119	672	101	1302	255
/ʌ/	676	65	1266	176	558	71	1276	137
/ɒ/	650	72	1027	84	612	70	1117	131
/ɔ/	504	62	868	108	432	34	908	108
/ʊ/	435	41	1317	86	384	71	1127	402
/u/	361	32	1381	331	341	35	1436	330
/ɜ/	516	55	1558	143	457	54	1593	215

Figure 1: Formant plots in Hz of the English vowels for the two older speakers, R and H, together with the average formant values for five New Zealand born English speaking contemporaries (based on Gordon et al. 2004: 109).



3.2 Older group: Māori.

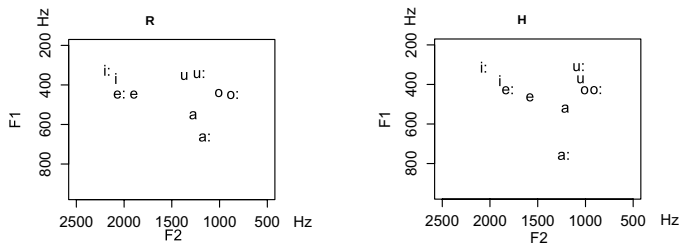
Table 3 and figure 2 show the formant values for the Māori monophthongs as pronounced by R and H. A number of features of this system require comment at this point as they will be significant for the comparison with the values for the younger speakers.

Table 3: Formant frequencies (Hz) for Māori vowels for the older speakers, R and H. Significant differences between the formant frequencies of long/short vowel pairs are indicated.

SPEAKER	FORMANT	MEAN	SD	FORMANT	MEAN	SD	df	t
R	F1 /i:/	326	26	F1 /i/	367	48	43	-4.21**
	F1 /e:/	448	38	F1 /e/	448	43	63	0.01
	F1 /a:/	666	70	F1 /a/	553	79	45	3.93**
	F1 /o:/	451	45	F1 /o/	441	34	59	0.99
	F1 /u:/	345	21	F1 /u/	355	32	57	-1.35
	F2 /i:/	2179	74	F2 /i/	2086	73	61	4.99**
	F2 /e:/	2048	95	F2 /e/	1899	194	45	3.93**
	F2 /a:/	1156	49	F2 /a/	1277	134	41	-4.88**
	F2 /o:/	860	152	F2 /o/	1009	30	59	4.10**
	F2 /u:/	1213	223	F2 /u/	1370	313	48	-2.20*
H	F1 /i:/	312	41	F1 /i/	381	68	46	-4.55**
	F1 /e:/	429	45	F1 /e/	465	56	58	-2.77*
	F1 /a:/	761	81	F1 /a/	522	92	56	10.54**
	F1 /o:/	428	33	F1 /o/	429	43	56	-0.39
	F1 /u:/	312	53	F1 /u/	374	44	63	-5.17**
	F2 /i:/	2066	120	F2 /i/	1896	154	55	4.63**
	F2 /e:/	1812	215	F2 /e/	1582	230	57	4.00**
	F2 /a:/	1228	92	F2 /a/	1213	158	38	0.43
	F2 /o:/	889	92	F2 /o/	1010	162	56	-3.53**
	F2 /u:/	1071	271	F2 /u/	1051	187	50	0.34

** = p <.005, * = p <.05

Figure 2: Formant plots in Hz of the Māori vowels for the two older speakers, R and H.



1. There is a qualitative distinction between the long and corresponding short vowels; in all pairs the long vowel is more peripheral than the short as shown by the significant differences between the F1 and/or F2 values in table 3. This is particularly so in the case of the low vowels, where WAKA is markedly centralised in comparison with WĀ.
2. These two speakers maintain a consistent quantitative distinction between long and short vowels. Table 4 displays the mean values and standard deviations in milliseconds for the long and short vowels in R and H's Māori. Effect size (d), is also presented to display the magnitude of the difference in duration between the means of each long and short vowel pair. An effect size greater than 0.8 is considered large and worthy of note.[4] For both speakers the effect size was very large for each long/short pair, and for the overall long/short means. Whilst R had a greater distinction between long and short vowels (d = 2.22) than H (d = 1.53), both speakers are clearly distinguishing between them.
3. The vowels are distributed in the vowel space symmetrically with respect to height. MŌ and KĒ, and TŪ and PĪ have pairwise extremely similar F1 values, and the distinction between the mid and high vowels, though not as great as that between the mid vowels and WĀ, is clear.[5]
4. TŪ and TUKU both lie further forward than MŌ and MOKO. This is more marked in the speech of R than of H, and generally is a matter where more data will be needed in order to be certain about the pronunciation of these vowels in the nineteenth century. In both speakers, there seems to be a tendency for both these vowels to have slightly fronted articulations following /t/.

Table 4: Length (ms) of the Māori vowels for the older speakers, R and H. Significant differences between the long/short vowel pairs are indicated.

SPEAKER	VOWEL	MEAN	SD	VOWEL	MEAN	SD	EFFECT SIZE* (COHEN'S D)
R	/i:/	160	51	/i/	71	16	2.66
	/e:/	123	32	/e/	69	22	2.00
	/a:/	145	33	/a/	72	23	2.61
	/o:/	125	28	/o/	78	33	1.54
	/u:/	150	39	/u/	61	20	3.02
	long	141	40	short	70	24	2.22
H	/i:/	133	39	/i/	79	31	1.54
	/e:/	117	33	/e/	72	20	1.70
	/a:/	145	46	/a/	79	45	1.45
	/o:/	135	38	/o/	90	30	1.32
	/u:/	142	53	/u/	77	16	1.88
	long	135	43	short	79	30	1.53

* An effect size greater than 0.8 is considered large and worthy of note.

3.3 Older group: Influence of English on Māori.

With no comparable or earlier data available it is manifestly difficult to point to any aspect of R and H's pronunciation which shows any influence from their English. Nor would one expect to see any significant influence, as Māori was very much the first language for both these speakers. As mentioned above R's pronunciation of TUKU and TŪ lie somewhat further forward than H's, and thus nearer to GOOSE in contemporary English. At this stage, we are in no position to determine whether this is a dialect difference, influence of English or even the beginnings of internally motivated change.

3.4 Older group: Influence of Māori on English

The point was made above that R and H pronounce English vowels very much in the same way as their contemporaries. This is especially so for those English vowels with no close equivalent in Māori, such as TRAP and NURSE. There are however a couple of items in their English system which depart

from that of the non-Māori speakers of similar age, and which tend towards the corresponding vowels in their Māori system. These are FLEECE, which is rather less fronted and high, and thus nearer to their PĪ than to FLEECE in the speech of late nineteenth century New Zealanders, and STRUT, which is further back and more like their WAKA than in the speech of their non-Māori speaking peers. In this latter case, however, it is possible that R and H are simply conservative; STRUT was undergoing fronting in NZE at this time (Gordon et al. 2004: 137).

3.5 Older group: Māori in English

All the speakers make use of words and names of Māori origin in their English interviews. This is especially so of R, whose two interviews overlap considerably in content and who produces long stretches of *whakapapa* ('genealogy') when speaking in both languages. For this speaker, some analysis of the Māori vowels used in the English context has already been carried out, and is reported in detail in Maclagan (to appear). The results of this analysis show that the centralisation of the short vowels is greatly reduced in comparison with the purely Māori context, and thus the qualitative contrast with long vowels is less marked. Similarly, the length distinction is reduced in R's Māori-in-English vowels through an increase in mean length for his short vowels. R's long Māori vowels are similar in length whether he is speaking in Māori (mean = 141 ms, sd = 40 ms) or English (mean = 142 ms, sd = 46 ms) but his short Māori vowels are considerably longer when he is speaking in English (mean = 112 ms, sd = 56 ms) than in Māori (mean = 70 ms, sd = 24 ms). What is striking is that R's Māori-in-English vowels show differences from his purely Māori-context vowels in directions which we will observe when we turn to the younger group.

3.6 Younger group: English

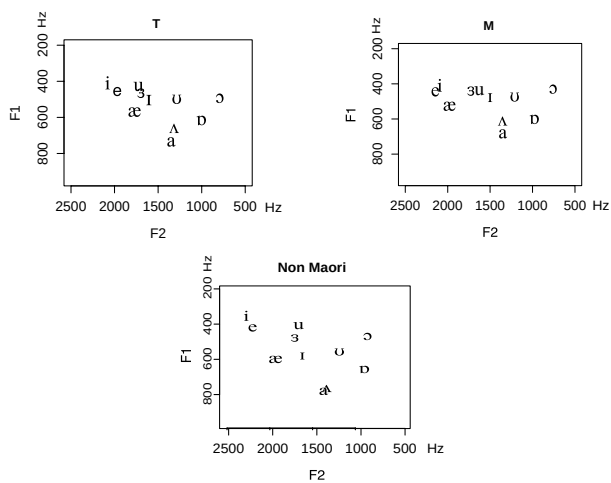
Format values in Hz for the English monophthongs for the two younger speakers, T and M, are presented in table 5 and in figure 3 together with a vowel plot of a similar cohort of 20 contemporary young male speakers of NZE (see Maclagan and Hay 2004 for a description of the speakers). As was the case for the older speakers, M and T's English vowels are very similar to those of their contemporaries, with M's speech being relatively advanced (see Maclagan and Hay 2004).

When compared to the older speakers of English (see figure 1 above) the speech of younger speakers shows the raising of the DRESS, TRAP, LOT and

Table 5: Formant frequencies (Hz) for English vowels for the younger speakers, T and M.

	T				M			
	F1		F2		F1		F2	
VOWEL	MEAN		SD		MEAN		SD	
/i/	435	44	2076	147	408	37	2092	105
/ɪ/	498	33	1613	185	493	44	1496	110
/e/	464	35	1987	152	444	51	2146	133
/æ/	577	42	1754	89	543	37	1953	114
/a/	735	56	1353	62	686	39	1350	67
/ʌ/	663	49	1326	79	614	34	1356	92
/ɒ/	618	52	1006	79	602	34	978	82
/ɔ/	501	51	762	74	433	31	740	84
/ʊ/	491	36	1308	247	468	36	1227	178
/u/	432	26	1722	122	440	24	1627	131
/ɜ/	468	30	1702	100	439	29	1734	84

Figure 3: Formant plots in Hz of the English vowels for the two younger speakers, T and M, together with the average formant values for 20 New Zealand born English speaking contemporaries (based on Maclagan and Hay, 2004).



THOUGHT vowels and the fronting of GOOSE (see Gordon et al. 2004: 209-211). All these changes have been shown to be typical of the development of NZE between the late nineteenth century and the start of the twenty-first century (Gordon et al. 2004). The English of the four speakers analysed here does not differ markedly from the speech of previously analysed speakers.

3.7 Younger group: Māori

Table 6 and figure 4 show the formant values of the Māori monophthongs for the two younger speakers. The symmetrical distribution of the older speakers' vowels in the vowel space has decreased with a noticeable rise in the height of the younger speakers' mid vowel pairs KĒ/KETE and MŌ/MOKO. This result parallels a similar rise in the mid vowels of NZE (Gordon et al. 2004: 210). The rise of KĒ/KETE brings these vowels close to PĪ/PIKI reflecting the difficulty many learners of Māori experience in distinguishing these vowels, particularly KETE and PIKI as the second element of diphthongs. The other point to note is the fronting of TŪ/TUKU, again paralleling a similar fronting of the GOOSE vowel in NZE (see Maclagan 1982; Gordon et al. 2004: 210-211).

In comparing the Māori speech of the younger speakers with that of the older speakers (see figure 5) we note the loss of the qualitative distinction in the place of articulation between the long and short vowel pairs.[6] This is particularly evident with KĒ and KETE but is true to some extent for all five pairs of vowels. For the two older speakers, all the long vowels are significantly more peripheral than the short vowels. For both of the younger speakers, MŌ is significantly farther back than MOKO, although the difference

Figure 4: Formant plots in Hz of the Māori vowels for the two younger speakers, T and M.

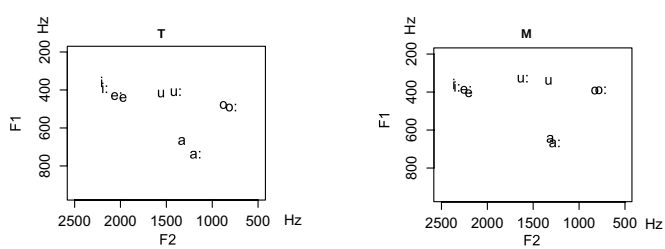


Table 6: Formant frequencies (Hz) for Māori vowels for the younger speakers, T and M. Significant differences between the formant frequencies of long/short vowel pairs are indicated.

SPEAKER	FORMANT	MEAN	SD	FORMANT	MEAN	SD	df	t
T	F1 /i:/	389	28	F1 /i/	358	68	48	2.10*
	F1 /e:/	432	24	F1 /e/	442	33	48	-1.84
	F1 /a:/	741	49	F1 /a/	669	46	48	5.36**
	F1 /o:/	493	46	F1 /o/	479	55	48	.94
	F1 /u:/	412	43	F1 /u/	420	33	49	-.64
	F2 /i:/	2170	139	F2 /i/	2206	124	48	-.95
	F2 /e:/	2042	106	F2 /e/	1973	97	48	2.42*
	F2 /a:/	1181	296	F2 /a/	1331	140	48	-2.30*
	F2 /o:/	791	109	F2 /o/	879	118	48	-2.73**
	F2 /u:/	1396	356	F2 /u/	1558	182	35	-2.00
M	F1 /i:/	370	42	F1 /i/	358	41	55	1.16
	F1 /e:/	388	40	F1 /e/	407	42	58	-1.76
	F1 /a:/	670	41	F1 /a/	647	60	58	1.78
	F1 /o:/	391	37	F1 /o/	392	52	58	-1.43
	F1 /u:/	330	36	F1 /u/	342	44	58	.26
	F2 /i:/	2330	152	F2 /i/	2365	200	55	-.73
	F2 /e:/	2232	115	F2 /e/	2203	126	58	.93
	F2 /a:/	1264	114	F2 /a/	1314	114	58	-1.69
	F2 /o:/	762	98	F2 /o/	828	139	58	-2.13*
	F2 /u:/	1612	326	F2 /u/	1333	324	58	3.33*

** = p <.005, * = p <.05

is less than for the older speakers. For T, TŪ is farther back than TUKU, but for M TŪ is more front than TUKU and for T, but not M, WĀ is more open than WAKA. There are no significant qualitative differences between the other vowel pairs.

Figure 6 shows the aggregated vowel plots for the pairs of older and younger speakers for both long and short vowels. In comparing the long

vowels in figure 6 we see that for the younger speakers PĪ is more forward and lower and KĒ is more forward and higher. WĀ shows no significant differences between the older and younger speakers, whereas MŌ is slightly further back among younger speakers and TŪ is more forward. Again, the changes already found for NZE are reflected in these results.[7] With the exception of MOKO which is further back, all the short vowels of the younger speakers are more forward than for the older group. The KETE vowel of younger speakers is also higher, while the WAKA vowel is more open. Except for TUKU, the short vowels of the younger speakers are more peripheral than those of the older speakers. This is related to the loss of the quality distinction between the younger speakers' long and short vowels.

Figure 5: Comparison of formant frequencies in Hz of the Māori vowels for older and younger speakers.

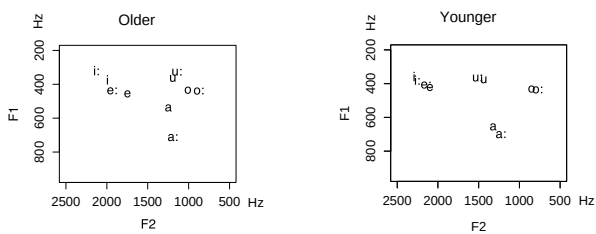


Figure 6: Comparison of formant values in Hz for the long and short Māori vowels for the older and younger speakers. The older speakers' vowels are grey and the younger speakers' black.

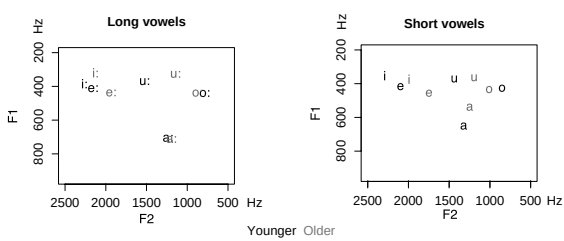


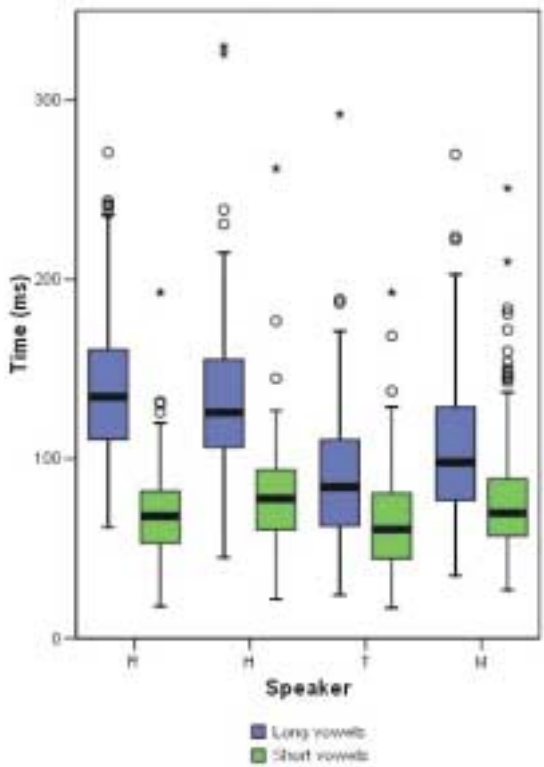
Table 7 shows that the quantitative distinction between the length of long and short vowels evident in the older speakers has also reduced for the younger speakers (see the results of the t-tests shown in this table). The older speakers keep every pair of long-short vowels distinct (as shown in table 4). Although the younger speakers' overall mean long vowel length is significantly longer than their short vowel length, PĪ/PIKI and KĒ/KETE do not differ significantly in length for T and PĪ/PIKI, MŌ/MOKO and TŪ/TUKU do not differ for M. In terms of overall differences between the long and short vowels, T and M had effect sizes of d = 0.66 and d = 0.63 respectively, which are considerably less than for the older speakers (for R, d = 2.22 and for H, d = 1.53). These values dramatically indicate that the clear distinction that the older speakers maintained between their long and short vowels is reducing amongst younger speakers, a phenomenon already observed in the Māori-in-English vowels in R's speech. M follows the regular phonetic pattern of English whereby the higher the vowel, the shorter it is (Peterson and Lehiste 1960: 701-702; Wells 1962).

Table 7: Length (ms) of the Māori vowels for the younger speakers, T and M. Significant differences between long/short vowel pairs are indicated.

SPEAKER	VOWEL	MEAN	SD	VOWEL	MEAN	SD	df	t
T	/i:/	71	33	/i/	77	34	43	-0.43
	/e:/	86	34	/e/	80	36	40	0.62
	/a:/	108	49	/a/	64	26	48	3.97**
	/o:/	97	30	/o/	57	25	46	4.73**
	/u:/	86	42	/u/	57	24	44	2.94*
	long	89	40	short	66	30	228	4.93**
M	/i:/	94	37	/i/	85	38	54	.86
	/e:/	98	36	/e/	74	32	55	2.69**
	/a:/	128	47	/a/	72	28	56	5.48**
	/o:/	116	35	/o/	95	47	56	1.94
	/u:/	89	45	/u/	75	26	54	1.40
	long	105	43	short	80	36	283	5.37**

** = p <.005, * = p <.05

Figure 7: Boxplot of long and short vowel duration for all four speakers. The plot shows the median value, the interquartile range, outliers (small circles), and extreme token values (asterisks).



The length differences and distribution are presented in figure 7, a standard boxplot (Tukey 1977), which shows the median, interquartile range, outliers, and extreme cases of individual token values for each of the four speakers.[8] It can be seen from figure 7 that there was little length difference between the short vowels of all four speakers. The older speakers, R and H, have very little length overlap between their long and short vowels, the younger speakers, T and M, have considerable overlap. We note that the lack of distinction between PĪ and PĪKI for T reflects both examples of shortened PĪ vowels and

lengthened PIKI vowels. In particular, there are a number of instances of shortened PĪ vowels following /t/ (with a further case in the token *mīharo*, 'wonder'). Apart from *mīharo*, all other tokens occur in *tīmata* ('begin') or derivatives (4 tokens) or *Tīmoti* (1 token). There is not enough data to determine whether /t/ + PĪ is routinely pronounced with a shortened vowel by this speaker (a phenomenon for which we can suggest no phonetic rationale) or whether it is a matter of replacement of the PĪ vowel by PIKI in these particular words.

With all these results, analysis of further younger speakers is required to determine more precisely how far these initial results reflect the overall vowel space and vowel length of contemporary younger speakers. If it turns out that the phonetic realisation of the important phonemic length distinction is indeed being reduced almost to the point of merger, the already high level of homophony in Māori will be increased further. This will raise potential questions for speech perception and comprehension.

3.8 Younger group: Influence of Māori on English.

The results show no evidence of any aspect of T and M's pronunciation of English which shows any influence from their Māori. This is unsurprising since both are first language speakers of English and only started learning Māori as teenagers.

3.9 Younger group: Influence of English on Māori.

As noted above, the differences in the pronunciation of the Māori vowels between the older and younger speakers all follow the direction of movements in NZE. In particular KĒ and KETE have risen and overlap the vowel space of raised DRESS. The fronting of TŪ and TUKU, of which the beginnings are perhaps seen in R's speech, parallels the fronting of GOOSE in NZE and the fronting of PĪ and PIKI moves them into the space of modern NZE FLEECE.

Especially in the case of speaker M, MŌ and MOKO have raised in parallel with both his KĒ and KETE and with his high THOUGHT vowel. In the light of the obvious fronting of TŪ and TUKU, which has occurred during the period under study, such raising of MŌ and MOKO has the appearance of a chain shift; as the high back position is vacated, so the mid back vowels raise to fill it. Exactly similar chain shifts have occurred historically in, for instance, Greek and French (Hock 1991: 156, Posner 1996: 239). The changes we have noted could thus be the result of external influences from NZE or language internal factors (see Labov 1994: 601, 602).

4. Conclusion

These preliminary results from the MAONZE project show that there have been considerable developments in the vowel system of Māori and to a lesser extent in English between our two groups of speakers. This is particularly so of the qualitative and quantitative difference between the phonemically long and short vowels of Māori, the fronting of the high back vowels, and the raising of the mid vowels.

Further research will show how far our speakers are typical of their generation, though at this stage we have no reason to expect that they are not. We make no apology for using data from younger speakers for whom Māori is a second language; people like M and T are the modern generation of speakers and it is their language which will be the norm most widely spoken and passed on to yet younger learners, even to younger learners acquiring Māori as their first language, should intergenerational transmission ever be restored to any significant level.

As pointed out, some of the developments parallel shifts in NZE over the same period. However, it would be premature to attribute causation at this stage of the research; it is quite possible that some at least of the shifts are due to internally motivated change of the type described by Labov (1994).

Appendix

Table 8: Keywords naming the vowel phonemes of Māori.

KEYWORD	PHONEME	KEYWORD	PHONEME
PĪ	/i:/	PIKI	/i/
KĒ	/e:/	KETE	/e/
WĀ	/a:/	WAKA	/a/
MŌ	/o:/	MOKO	/o/
TŪ	/u:/	TUKU	/u/

These KEYWORDS are suggested following Wells' (1982) example. Vowels in KEYWORDS are paired with unique consonants, so that the vowel phoneme may be identified however it is pronounced. We acknowledge that the extent of

cross-dialectal vowel variation in English, that led Wells to originally suggest the KEYWORDS, is not present in Māori. The vowels in TUKU and TŪ do, however, show sufficient phonetic variability, from [u] almost to [y], to make the choice of a phonemic symbol problematical. In our experience as a research group, the KEYWORDS are particularly helpful in clarifying whether the long or short vowel is intended. They also allow us to avoid the sort of problem that arises when one speaker says /i/ and others do not know whether the phoneme in PIKI is intended, or whether it is the spelling of the vowel in KETE that is meant. The Māori KEYWORDS were chosen so that the phonemes will be identifiable even if one is not familiar with the Māori language. The long vowel KEYWORDS are one syllable and the short vowel KEYWORDS are two syllables. The long/short vowel pairs start with the same consonant, and both syllables of the short vowel KEYWORDS contain the same vowel.

Notes

1 We wish to thank the Marsden Fund of the Royal Society of New Zealand and the University of Canterbury for funding that made this research possible. We also wish to thank the young speakers and Elizabeth Quinn who helped with the analysis.

2 The copyright for the mobile unit tapes is held by Radio New Zealand Sound Archives, from which copies can be obtained (P.O. Box 1531, Christchurch, New Zealand).

3 Leaving aside the question of the phonological status of the phonetically long vowels; whether they are unit phonemes or sequences of underlying like short vowels. See Bauer 1993: 534-8.

4 Because the effect sizes were large, t-tests were not performed.

5 We note that, because human perception is not linear, for the mid vowels to sound equidistant from both the close and the open vowels, the F1 difference between the mid vowels and the open vowel will need to be greater than the F1 difference between the mid and close vowels. This is what we find for the two older speakers.

6 We consider it unlikely that the centralisation of the older speakers' short vowels in comparison with those of the younger speakers reflects a shrinking of the vowel quadrilateral with age (see Rastatter and Jacques 1990; Rastatter, McGuire, Kalinowski, and Stuart 1997) because the older speakers' long vowels are still relatively peripheral. The important point is that the older speakers' short vowels are more central than the same speakers' long vowels.

7 See Maclagan and Hay 2004 for changes in FLEECE and DRESS that parallel changes in PĪ and KĒ. For NZE it now seems that the front vowels FLEECE, DRESS and TRAP are functioning as one subsystem rather than as separate systems of

short and long vowels. It is therefore not surprising that the long Māori vowel KĒ should be associated with the traditionally short English vowel DRESS.

8 Boxplots show the median, interquartile range, outliers, and extreme cases of individual values. The black line in the box indicates the median value. The box itself shows the interquartile range, from the 25th to the 75th percentile. The "t" at the end of each line indicates the furthest values from the box within 1.5 times the box length. Values between 1.5 to 3 times the box length from the top and bottom edge of the box are termed outliers, and are indicated by small circles. Values more than 3 box lengths from the upper or lower edge of the box are termed "extreme" are indicated by an asterisk.

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