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The pronunciation of the word "Māori"

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Abstract

This paper considers the pronunciation of the word *Māori* in the speech of three groups of Māori speakers, historical elders (born 1871–1916), present-day elders (born 1918–1944) and young speakers (born 1969–1992). The young speakers include both first- and second-language speakers of Māori. The study focuses on the production of the consonant /r/ and the diphthong /a:o/, two sounds that are particularly difficult for non-Māori to produce. Nine-hundred and seventy-six tokens of /r/ and 930 tokens of /a:o/ were analysed. Over time, more tokens of /r/ were realised as approximants in Māori until the young female second-language speakers used taps and approximants 50% of the time in both New Zealand English and the Māori language. The men and women behaved significantly differently for the diphthong /a:o/, with the women producing a higher proportion of monophthongs in Māori and the men producing a higher proportion in English. The patterns observed are complex and merit further study.

Keywords

Māori language; Māori speakers; /r/ tokens; diphthong /a:o/; change over time

1   Introduction

The word *Māori* (/ma:ori/) appears regularly in recordings collected in the MAONZE (Māori and New Zealand English) database (King et al. 2020). There are recordings in both English and te reo Māori, the Māori language, for most of the speakers. The MAONZE database was set up specifically to examine changes over time and across languages in te reo Māori and in the English of speakers who identify as Māori. It therefore presents a unique opportunity to determine whether there exist language-specific (and other) differences in the pronunciation of the same word over time. In this paper we present an analysis of the word *Māori* from all the speakers in the MAONZE database for whom there are recordings in both Māori and English. We excluded speakers for whom there was only data in one language because we wanted to compare pronunciations across the two languages from the same speakers without bias from speakers who had interviews in only one of the languages. For the historical female elder WU05, for example, we only have a long interview in English and for the present-day female

elders R011 and R012 we only have interviews in Māori. We focus on the pronunciation of the phoneme /r/ and on the characteristics of the long diphthong /aːo/ because these are the two salient characteristics of the word *Māori* that can be difficult for non-first-language speakers of Māori to pronounce and because we have noticed variations in pronunciation of this word from [mɑɔɾi] to [mạːɹi] depending on the speaker.

2 Background

2.1 Historical background

Māori were the first people to arrive in Aotearoa/New Zealand. Scholars currently place their arrival late in the 13ᵗʰ century (Wilson 2020). The first Europeans to settle in the country were sealers and whalers in the late 18ᵗʰ century, followed in the early 19ᵗʰ century by missionaries who settled in the North Island (Parsonson 2013). Once the Treaty of Waitangi was signed in 1840, increasing numbers of Pākehā (non-Māori) settlers arrived and by 1860 the settlers outnumbered the original inhabitants (Stats NZ n.d.). In addition, Māori were susceptible to diseases brought by the new settlers, so that in 1856, Dr Featherston, who was at that time the superintendent of the Wellington Province, commented "Our plain duty, as good, compassionate colonists, is to smooth down their dying pillow. Then history will have nothing to reproach us with" (Sinclair 1974: 11). As the numbers of Māori declined, so too did the use of the Māori language. In addition, when the Native Schools Act was passed in 1867, one of the aims was to force Māori children to speak in English (Calman 2012). The decline was exacerbated by the movement of many Māori from the country to urban areas, especially during the 1960s (Meredith 2015). Since the 1980s, there has been a concerted effort to revive the Māori language, strengthened by the *Kōhanga Reo* (language nest) movement where young children are taught in a totally Māori language environment. Māori was made an official language of Aotearoa/New Zealand in 1987.

Because Aotearoa/New Zealand was settled relatively recently, there are recordings of both Māori and Pākehā speakers who were born within one generation of the Treaty of Waitangi being signed. These recordings are held in the Origins of New Zealand English archive at the University of Canterbury (https://www.canterbury.ac.nz/nzilbb/research/onze/ and see Gordon et al. 2004). The oldest Pākehā speaker was born in 1851 and the oldest Māori speaker in 1871. It is therefore possible to obtain indications of changes over time in the pronunciation of both the English and the Māori languages for almost all the period that European settlers have been in the country (for a history of English in Aotearoa/New Zealand, see Gordon et al. 2004; for Māori speakers, see, e.g., Watson et al. 2016; Maclagan et al. 2017 and King et al. 2020).

2.2 Māori phonology

The Māori language has five vowels that are contrastively short or long (for Māori phonology see Bauer 1993 and Harlow 2007). In addition, it has diphthongs that move from a lower to a higher articulatory position (e.g. *tau* 'year' /au/ or *wai* 'water' /ai/). There are also long diphthongs, as in the word *Māori*, where the first element would traditionally be twice as long as the second element /aːo/.

The consonant /r/ is traditionally realised as the tap [ɾ] in te reo Māori. It is sometimes realised as [ɹ] by those who do not speak te reo Māori, or by those who do speak Māori when they are speaking in English (Bell 2000; Maclagan & King 2004). Potentially under the influence of New Zealand English, approximant pronunciations of /r/ can be heard in some

Māori words, especially by speakers of English. Lateral realisations of /r/ can also occasionally be heard (see Harlow 2007: 77).

2.3   The MAONZE database

The MAONZE database was set up specifically to trace changes in the Māori language over time. It consists of three groups of speakers: historical elders born between 1871 and 1916, present-day elders, *kaumātua* and *kuia,* born 1918–1944, and young speakers, *rangatahi* born 1969–1992. Where possible there are equal numbers of male and female speakers in each group and for most speakers there are interviews in both English and te reo Māori (King et al. 2011). There are currently 61 speakers in the original MAONZE database plus 10 Ngāi Tūhoe elders. The historical elders, the Tūhoe elders and the present-day elders were all first language speakers of Māori. Five of the young males and six of the young females were first-language speakers of Māori, the other young males and females were second-language speakers. Their parents did not speak Māori, and most learnt it from grandparents or in *Kōhanga Reo*. In addition, and unlike the other present-day elders, most Tūhoe elders lived in te reo Māori-speaking areas most of their lives. The database contains 60 hours of speech in te reo Māori.

The recordings of the male historical elders were sourced from the Mobile Unit collection of the Radio New Zealand Sound Archives[1] (see King et al. 2010). These recordings were made for broadcast between 1946 and 1948 and are relatively formal in style. It was more difficult to find recordings for the female historical elders. Two recordings were sourced from the Mobile Unit collection. Others were obtained from Sound Archives/Ngā Taonga Kōrero and from Television New Zealand. The other recordings in the database were made by members of the MAONZE team except for two of the present-day female elders whose recordings come from Dr Joe Te Rito's collection of recordings from Ngāti Kahungunu.[2] Where possible, recordings were an hour long in each language. However, the Mobile Unit interviews vary from 10 to 90 minutes.

Topics in the interviews were not controlled but by their very nature the word *Māori* occurred frequently in both the Māori and the English interviews. The frequency of the word *Māori* makes the comparison presented in this paper possible.

3   Sound change over time – previous studies

Since Labov (1966) studied /r/ with the phrase *fourth floor* in a New York department store and presented his study on the logic of nonstandard English at the twentieth annual Georgetown Round Table Meeting on Linguistics and Language Studies in Washington DC in 1969 (see Labov 1970), many sociolinguistic researchers have studied language differences between different groups of people (see, e.g., Labov 1972; Cheshire 1982; Byrd 1992; Milroy & Milroy 1992; Edwards 1997; Labov 2001; Adank et al. 2007; Kerswill 2009; Cheshire et al. 2011; Trudgill 2011; Broś & Lipowska 2019; Mayr et al. 2021). Two important factors that emerged from this research are the importance of speaker age and speaker gender when sounds are changing. Labov (2001: 274) states that "Women lead in both the acquisition of new prestige patterns and the elimination of stigmatized forms". The MAONZE project has found instances where women lead changes that become established and others where they behave

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[1] The copyright for the Mobile Unit recordings is held by Sound Archives/Ngā Taonga Kōrero (www.soundarchives.co.nz) while the copyright for the television recordings (used for some of the historical female speakers) is held by Television New Zealand Ltd.
[2] We thank Dr Te Rito for permission to include these recordings in the MAONZE database.

conservatively and do not follow changes in progress that later die out (see Maclagan et al. 1999; Maclagan et al. 2013; King et al. 2020).

In studies directly comparable to the present study, Byrd (1992) used the TIMIT database to investigate adult speaker differences in English, and Adank et al. (2004) and Adank et al. (2007) compared Dutch and Flemish speakers in a sample that was stratified for gender and region. With reference to children, Mayr et al. (2021) stated that "little is known about speech sound development across different generations of children growing up in heritage language settings". The MAONZE database does not contain material on children but Māori is clearly a heritage language that has been observed over several generations. Because it is carefully organised to contain speakers from three different age groups and both genders, the MAONZE database allows us to carry out studies within this long-standing tradition of examining sound change over time.

3.1   Changes in te reo Māori vowels

The MAONZE group has found widespread changes in the pronunciation of Māori vowels over time (see Figure 1). In an earlier study, Bell (1997) found that older Māori speakers used a higher proportion of high-front KIT variants ([i] and [ɪ]) than younger and Pākehā speakers when speaking English. [3] The younger and Pākehā speakers used more centralised and lowered variants, akin to [ə]. Bell indicated that it was possible that the pronunciation of the English KIT vowel by older fluent Māori speakers may have been influenced by their Māori-language pronunciation of short /i/ in Māori. In addition, speakers who were more fluent in te reo Māori had higher proportions of KIT fronting than those who were less fluent.

Figure 1 shows the changes found over time in the three groups of speakers analysed by the MAONZE group. The arrows indicate the direction of the changes. The data come from the MAONZE corpus and were analysed by members of the MAONZE team. The historical elders kept the five short and long vowels clearly separated within the vowel space. Over time, the high vowels /u/ and /u:/ fronted until, for the young speakers, they are front of centre and for some speakers almost to [y]. The mid vowels /e/~/e:/ and /o/~/o:/ rose so that /e/~/e:/ overlap the vowel space of /i/~/i:/ and /o/~/o:/ are now the high back vowels. From Figure 1 it can be seen that the female historical elders and present-day elders keep /u/~/u:/ relatively farther back than do the men. For the women, /u/~/u:/ are farther back than /a/~/a:/, whereas for the men they are almost as central as /a/~/a:/. By the time of the present-day elders, the fronting of /u/~/u:/ had become stigmatised (Maclagan et al. 2009). The behaviour of the historical and present-day female elders is consistent with international findings that women lead "in the elimination of stigmatized forms" (Labov 2001: 274). In order to highlight the extent of the changes, Figure 2 contrasts the most conservative group of speakers, the historical male elders, with the most innovative group, the young females. The plots for Figures 1 to 4 come from King et al. (2011, reprinted in Keegan et al. 2014: 41).

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[3] Bell uses Wells's (1982) KEY WORDS to indicate the vowel sound that is being referred to. In this system each vowel is surrounded by a different pair of consonants.
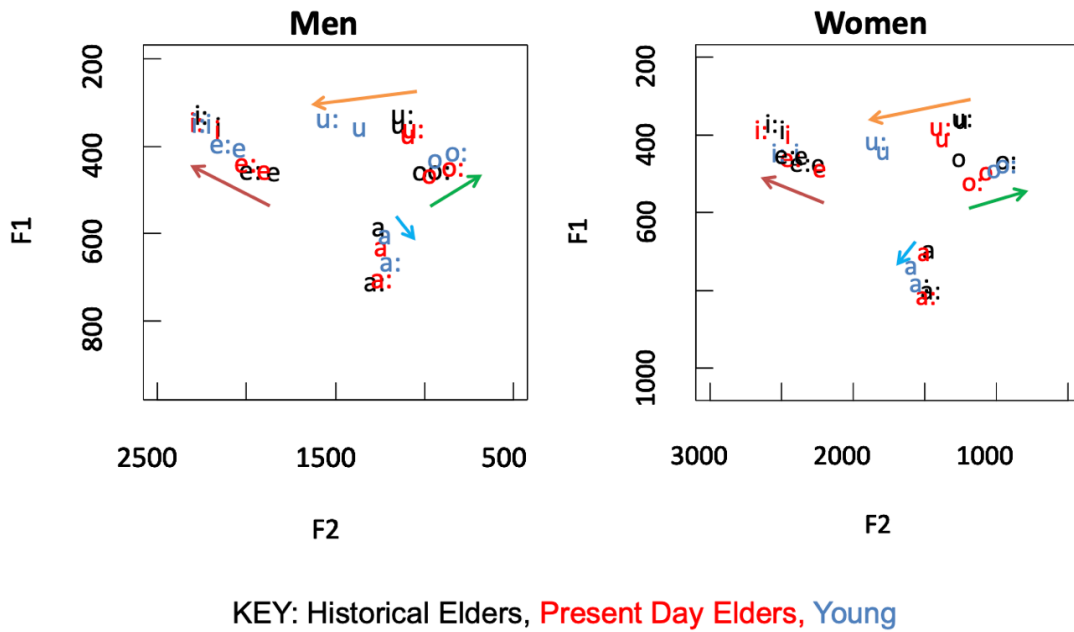
KEY: Historical Elders, Present Day Elders, Young

Figure 1: Sound change over time in the Māori short and long vowels. The arrows indicate the direction of change. The plots come from Watson (2022), used with permission.
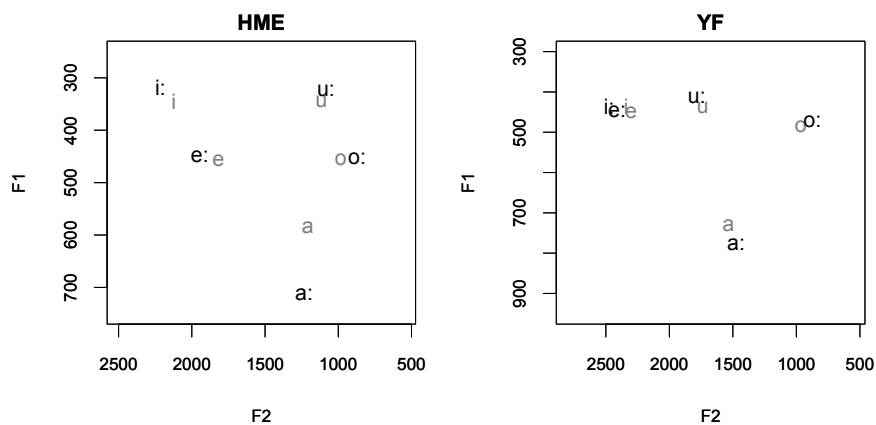

Figure 2: Sound change over time in the Māori short and long vowels. The most conservative group of speakers, the historical male elders (HME), on the left, are contrasted with the most innovative group of speakers, the young female speakers (YF), on the right. The plots come from Keegan et al. (2014: 41, used with permission of Huia Publishers).

Two pairs of Māori diphthongs are potentially merging: /au/~/ou/ and /ai/~/ae/. The increasing similarity of the diphthong pairs can be seen in Figure 3, where the conservative historical male elders are again compared with the innovative young females. For the historical elders, the five Māori closing diphthongs started and ended within the space of their associated short vowels as can be seen in Figure 3 (Keegan et al. 2014: 42). In this figure, the ellipses contain 95% of the target positions for the short vowels. Over time, the diphthong trajectories shortened. For the historical elders and the young speakers, the diphthongs still headed towards the ellipses of their associated short vowels and the second elements fronted as the associated monophthongs fronted. The most innovative group, the young female speakers, clearly shows the merger of /ai/~/ae/ and /au/~/ao/ (see Figure 3). Although their /au/ and /ou/ start at different places within the ellipse for /a/, this difference in starting point is unlikely to be perceptible.

The exception to the fronting movements are the vowels /ao/~/a:o/, which consistently point back towards the ellipses for /o/ and, even for the innovative young females, these vowels still reach the target ellipse. The MAONZE group has not analysed the long diphthongs, but we consider that the behaviour of /ao/ provides a guide to the way the long diphthong /a:o/ will behave.
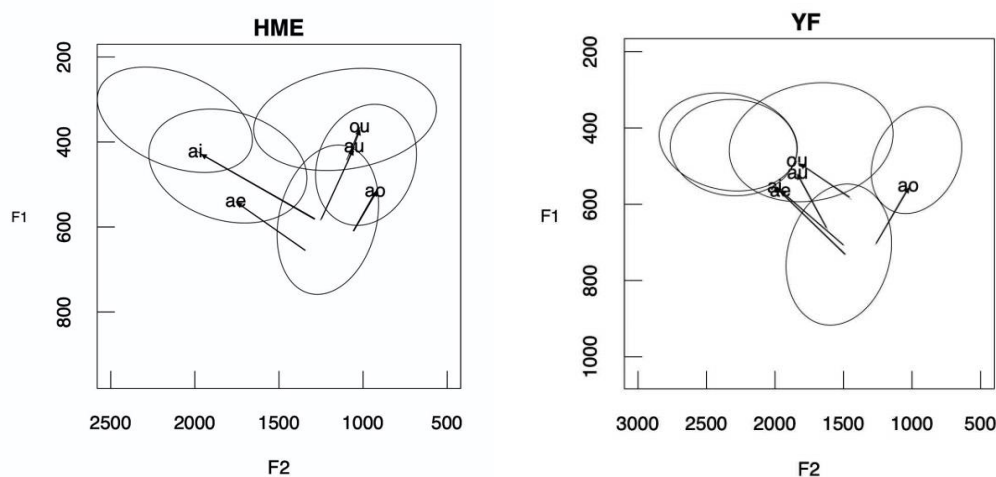

Figure 3: Centroid plots of five closing diphthongs. The diphthong symbol is placed at the second target. The arrow is an indication of the tongue movement and ends at the second target. The ellipses contain 95% of the speaker groups' short monophthongs. The most conservative group of speakers, the historical male elders (HME), on the left, are contrasted with the most innovative group of speakers, the young female speakers (YF), on the right. The plots come from Keegan et al. (2014: 42, used with permission of Huia Publishers).

Figure 4 (Keegan et al. 2014: 45) shows the relative lengths of the long and short vowels in milliseconds. The short vowels do not change greatly in length across speaker group. The long vowels, by contrast, shorten noticeably so that there is less difference in duration between the long and short vowel pairs over time. The exception is the vowel /a:/ which lengthens slightly over time for the women. If the length of the /a:/ vowel in the diphthong /a:o/ behaves in the same way as the individual vowel /a:/ for the women, we might expect the ratio of /o/ to /a:/ in the long diphthong /a:o/ to decrease over time.
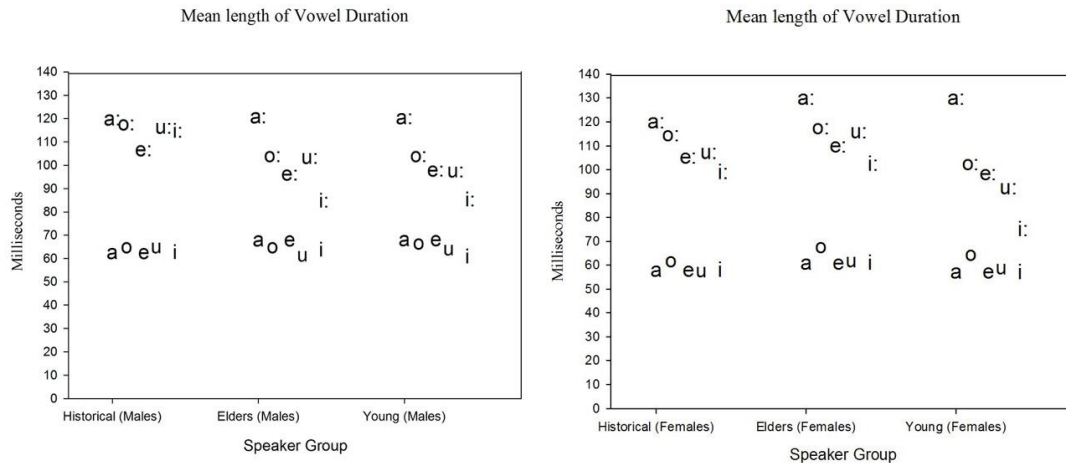
Figure 4: Relative lengths of the Māori short and long vowels. Values are in milliseconds, male speakers are shown in the left plot and female speakers in the right plot. The plots come from Keegan et al. (2014: 45, used with permission of Huia Publishers).

3.2   *Changes in te reo Māori consonant sounds*

There have been few studies of Māori consonants, with only the fricative <wh> (Maclagan & King 2002), the plosives, /p, t, k/ (Maclagan & King 2007; Maclagan et al. 2009), and /r/ (Maclagan & King 2004; Shields et al. 2022) having received attention. Historically, <wh> was a voiceless bilabial fricative and plosives in Māori were regarded as unaspirated. Over time, Māori <wh> has changed to [f] or [ʰw] for most speakers and /p, t, k/ have become more aspirated until there is now little difference between the Māori consonants and their English counterparts. The consonant most relevant to the present study is /r/. We will investigate whether, over time, it also has become more similar to the usual English pronunciation.

Maclagan & King (2004) auditorily analysed production of /r/ in the speech of one of the Mobile Unit speakers in the MAONZE database. A total of 787 tokens were analysed from both his Māori and his English recordings. All of the tokens of /r/ were realised as a tap when he was speaking in Māori; 88% of the /r/ tokens were realised as a tap when he used Māori words while speaking in English and 12% as approximants. When he was speaking English, 14% of the /r/ tokens in English words, which could have been expected to be realised as approximants, were actually taps. Eighty-four percent of the /r/ tokens in English words were realised as approximants as expected, and 2 tokens [2%] as [l]. There were no lateral tokens when he was speaking in Māori (see Harlow 2007: 77). For this speaker, it is clear that the matrix language in which he was speaking largely controlled the realisation of the /r/ sound in all of his words, including the word *Māori*.

Shields et al. (2022) carried out an analysis of /r/ in different vowel environments in 475 tokens from the speech of three fluent speakers of Māori. Their main focus was on the duration of the /r/ sounds and the effects of word stress on their production. All except three tokens were realised as taps and at least one formant could be seen throughout most of the /r/ sounds, indicating that the tap closure did not completely block the air flow.

4   Method

4.1   Participants

For this analysis, we analysed tokens of the word *Māori* from the 57 speakers for whom we had interviews in both Māori and English. The use of speakers for whom we had interviews in both languages ensured that the results were not biased by speakers (like WU05) who had relatively long interviews in one language only. Table 1 gives the details of the speakers who were included. As indicated above, five of the young male speakers and six of the young female speakers were first-language speakers of Māori, having learnt it from their grandparents and then in *Kōhanga Reo*. The remaining young speakers were second-language speakers of te reo Māori, having learnt it from their grandparents or after they started school. None of the young speakers spoke Māori regularly in their home environments. The difference between the L1 and L2 young speakers is not always significant; we report results separately when differences become apparent.

**Table 1:** Details of the speakers from the MAONZE project used in the present analysis

Sex	Speaker group	No of speakers	Date of birth	Date recorded	Age at recording
Male	Historical elders	6	~1871–1885	1946–1948	~62–77
	Ngāi Tūhoe elders	5	1927–1943	2009	59–82
	Present-day elders	10	1925–1939	2001–2006	64–79
	Young	10	1969–1984	2001–2006	21–35
Female	Historical elders	5	1881–1916	1938–2000	49–101
	Present-day elders	10	1918–1944	1981–2010	59–87
	Young	11	1975–1992	2007–2009	17–32

4.2   Tokens analysed

We included all analysable tokens of the word *Māori* from the eligible speakers. All tokens were extracted from connected speech in interviews between the speakers and members of the MAONZE group. Possible tokens were identified using the search function of LaBB-CAT (Fromont & Hay 2012) within the MAONZE database. All tokens were checked auditorily and visually (from Praat spectrograms, Boersma & Weenink 2019) as part of the analysis. Tokens were excluded if the whole word was too soft or the recording was too noisy, if it was spoken in creaky voice (usually by a male speaker) so that voicing could not be reliably analysed, or if the final syllable was too soft (usually in phrase-final position). Tokens were also excluded if the speaker was actually speaking the other language, e.g. if a speaker said 'The Māori women's welfare league' when speaking in a Māori interview, or 'tikanga Māori' ('correct Māori procedure') when they were otherwise speaking in English. A total of 976 tokens were analysed for the /r/ sound and 930 for the /a:o/ diphthong. Because female Ngāi Tūhoe elders were not available for this analysis, the male Ngāi Tūhoe elders were excluded when fitting models including sex as a predictor, leaving 837 tokens for this part of the analysis.

4.3   Analysis methods

The identified tokens of the word *Māori* were automatically annotated at word and phoneme level by LaBB-CAT and displayed in Praat spectrograms (Boersma & Weenink 2019). The /r/ sounds were analysed auditorily, with the spectrograms used as a visual check. Because the basic analysis of /r/ was auditory and because the traditional pronunciation of /r/ is a tap [ɾ] and we were considering potential sound change over time, we were careful not to overanalyse the presence of taps. If we were not sure about the presence or absence of a tap from the auditory analysis, the spectrograms were used to check. If there was continuous voicing and no indication of any gap in the spectrogram from the tap, the token was analysed as not containing a tap. The diphthongs were analysed in Praat. Because the first and second formants of /a/ are low, there were minimal transition effects on them from the preceding nasal. We used the start of the vowel formants plus the marked increase in the intensity of the waveform (together with its characteristic change of pattern) to determine the start of the diphthong. The division between the /a:/ and the /o/ of the diphthong was determined from the formant movements and waveform patterns. Initial analysis was carried out by a research assistant. If the traditional length differentiation was maintained in the diphthong /a:o/, the /a:/ section of the diphthong would be twice as long as the /o/ portion and the ratio of /o/:/a:/ would be approximately 0.5. If the ratio was higher than 0.5, this would indicate that the /a:/ portion of the diphthong was relatively shorter and the diphthong was becoming short. If the /o/:/a:/ ratio was lower than 0.5, this would indicate that the /a/ portion of the diphthong was lengthening and the vowel was potentially becoming a monophthong. The first author (Margaret Maclagan) randomly checked 12% of the tokens for both the /r/ and the diphthong analysis. For the diphthongs, she additionally checked all tokens where the analysed ratio was below 0.3 or above 0.7, well outside the range of the expected mean of 0.5. Figure 5 shows 2 sound files and Praat text grids demonstrating the analysis of the /r/ and the /a:o/ diphthong for two of the present-day male elders. The caption for spectrogram b), 'nā reira, he pātai i nāianei he aha ōu whakaaro mō te . Māori pāti? o te pāti Māori?', translates to 'So, a question now, what are your thoughts about the Māori Party, of the Māori Party?' where *te pāti Māori* is the usual Māori noun adjective word order and *te Māori pāti* is the English word order.
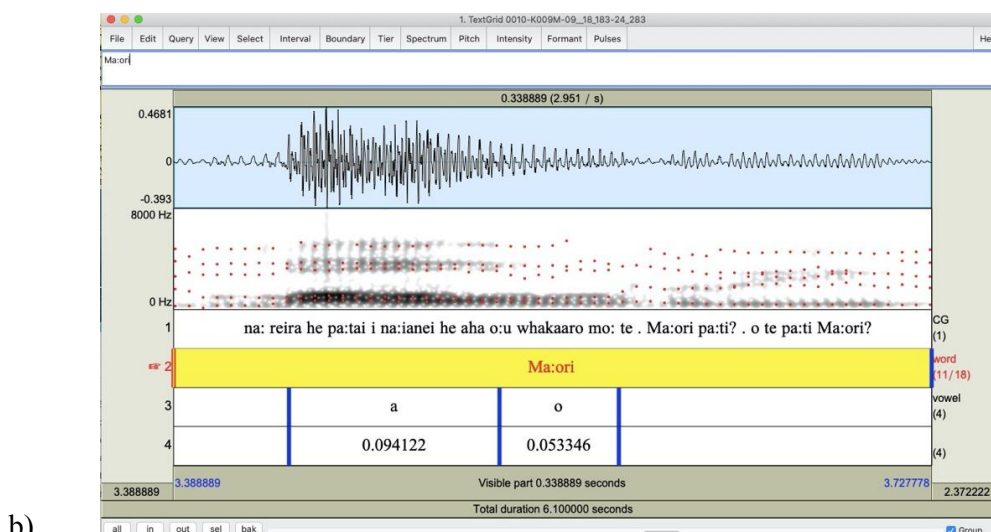

a)

b)
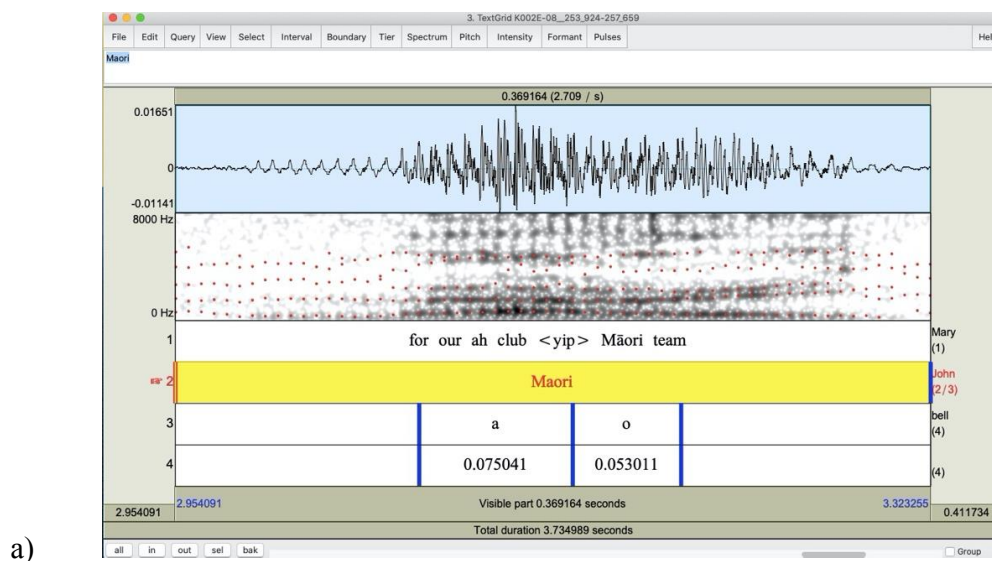
Figure 5: Spectrograms showing (a) an approximant token of /r/ and (b) a tapped token of /r/. The division of the diphthong /a:o/ is also shown. The Māori caption for (b) translates to 'So, a question now, what are your thoughts about the Māori Party, of the Māori Party?'

We fit a series of generalised linear mixed models using the 'glmer' and 'lmer' functions from the 'lme4' package in the R programming language (Bates et al. 2015; R Core Team 2022. Three response variables were investigated: a binary variable indicating the presence of a tap /r/, a binary variable indicating whether the vowel before /r/ was realised as a diphthong, and the ratio of /o/ to /a:/. We used the matrix language, speaker group and speaker sex as predictor variables and fit random intercepts and random slopes on the matrix language for each speaker to control for individual variation. The base level for sex was set to female, for language it was set to English, and for generation it was set to historical elders. Models with binary response variables were fit using the binomial family with the logit link function. Models for the ratio variable were linear mixed models.

We selected the best performing model for each response variable by backwards selection, starting with a maximal model containing all possible interactions between predictor variables. If the three-way interaction was not found to be significant, we fit a model with two-way interactions. If a particular variable was not found to be significant, we then removed it. Model performance was further tested using a likelihood-ratio test. We carried out post hoc comparisons of the matrix language contrast using the "emmeans" package to determine if there was a significant difference in the response variable due to language in each of the remaining groups (Lenth 2023). If speaker sex was not found to be significant, we refit the best performing model additionally including the Ngāi Tūhoe tokens.

5   Results and discussion

Full details of the statistical analysis are presented in the supplementary materials for this paper (see https://nzilbb.github.io/pronunciation-maori/maori_public.html).

5.1   *Tapping in /r/*

The results of the study on tapping in /r/ are shown in Table 2 and Figure 6. Table 2 shows the numbers of /r/ sounds realised as taps and Figure 6 shows the proportion of /r/ sounds realised

as taps. The totals columns in Table 2 show the total numbers or /r/ sounds analysed for the different speaker groups. Overall, 976 tokens of /r/ were analysed for the 57 speakers with 522 tokens of /r/ being analysed for the men and 454 for the women. We analysed 507 /r/ sounds in speech in Māori and 469 in speech in English. Because of the variability of the interviews, it was not possible to obtain similar numbers of /r/ from each speaker group. There are lower numbers for the historical elders, both male and female, because their interviews were often shorter.

Table 2: Number of tokens of /r/ realised as taps by each speaker group

Speakers		Māori			English			Overall total tokens	Total tokens men
		No tap	Tap	Total tokens	No tap	Tap	Total tokens		
Male	Historical elders	17	22	39	35	4	39	78	
	Tūhoe elders	33	10	43	25	21	46	89	
	Present-day elders	32	59	91	47	31	78	169	
	Young L1	24	19	43	30	21	51	94	
	Young L2	28	18	46	34	12	46	92	522
Female	Historical elders	23	25	48	29	3	32	80	Total tokens women
	Present-day elders	48	41	89	52	33	85	174	
	Young L1	24	36	60	21	25	46	106	
	Young L2	24	24	48	19	27	46	94	454
	Total	253	254	507	292	177	469	976	

Overall, there were no significant differences between the results for the men and the women in terms of the extent to which they used taps for /r/ in the word *Māori*. Because of this, the men and women were combined in the final model for the /r/ analysis. Over time, fewer /r/ sounds were realised as taps in the word *Māori* when speakers were speaking in Māori and more when they were speaking in English until the young female L2 speakers seemed to treat both languages in the same way and used taps and approximants randomly. There were significant differences between the proportion of taps used in Māori and English for the historical elders (p<0.0001) and for the present-day elders (p=0.012) with both groups following the traditional distinction and using more taps in Māori and more approximants in English. There were no significant differences for the young speakers, L1 or L2, or for the Tūhoe elders. The Tūhoe elders used three times as many approximants as taps when speaking Māori (see Table 2). This difference may not have reached significance because of the high within-group variability, which is evident in Figure 6. Although they lived in Māori-speaking environments for most of their lives, they were recorded 60 years later than the male historical elders and at least 20 years later than the female historical elders. This later recording date may well account for some of the results from these speakers.

Even though there were no significant effects for males and females, some trends can be discerned in the raw data. There appeared to be a difference between the male and female present-day elders, with male elders showing an increase in tapping while speaking Māori whereas the female present-day elders showed an increase in approximants. Indeed, in the raw data it looks as though the present-day male elders patterned closely with the historic elders.

The present-day female elders did not pattern with the historic female elders who used relatively more approximants when speaking in Māori than did the men. Rather, the present-day female elders were even less conservative and used even fewer taps when speaking in Māori.
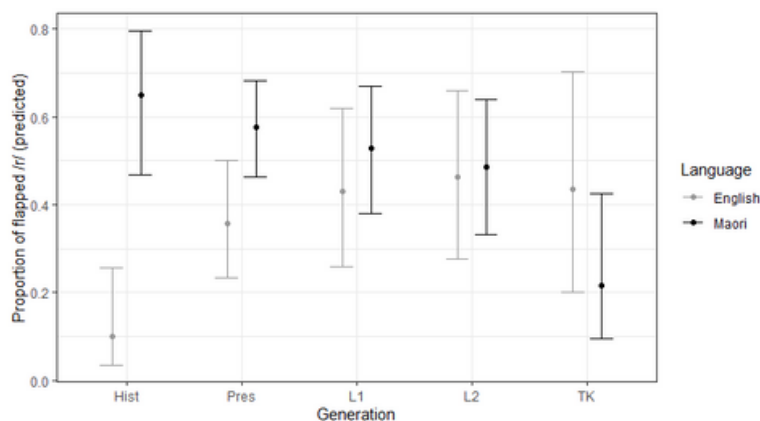

Figure 6. Proportion of /r/ sounds realised as taps by speaker group. Hist is the historical elders, Pres is the present-day elders, L1 and L2 are the young first- and second-language speakers, and TK is the Tūhoe elders. Because there was no significant difference between males and females they are combined in this analysis. The bars mark the 95% confidence intervals.

The present-day male elders produced more taps when they spoke Māori and more approximants when they spoke English. This relatively conservative behaviour for the male present-day elders was similar to their conservative behaviour when /u/~/u:/ started to front in New Zealand English (Maclagan et al. 2009). The female present-day elders, by contrast, produced fewer taps than approximants in both Māori and English and thus led a potential change towards realising /r/ in te reo Māori as an approximant. The young L1 females reversed this trend and produced more taps in Māori and relatively similar numbers of taps and approximants when they spoke English. The change from tap to approximant seems to no longer be an issue for the young L2 females who used taps for 50% of the time in Māori. When speaking English, they used more taps than approximants. Because these speakers learnt Māori as a second language, it is possible that they feel the need to demonstrate their Māori identity particularly when they are speaking in English (we thank members of the MAONZE team for this insight).

5.2 Diphthong analysis

We first considered whether the speakers continued to produce the vowel /a:o/ in the word Māori as a diphthong or whether they were moving towards a monophthongal pronunciation /a:/. As expected, many more tokens were produced as diphthongs than as monophthongs (see Table 3). Overall, a slightly higher proportion of the vowels were produced as monophthongs when the matrix language was English and a slightly higher proportion as diphthongs when the matrix language was Māori, with the women producing slightly more monophthongs in Māori and the men slightly more diphthongs in English. None of these trends reached statistical significance.

Table 3: Numbers of tokens of /a:o/ produced as a diphthong or a monophthong in the word *Māori* by all speaker groups in both Māori and English

		# speakers	Māori			English		
			# tokens	Diph	Mono	# tokens	Diph	Mono
Male	Hist elders	6	22	21	1	39	31	8
	Present elders	10	90	78	12	75	53	21
	Tūhoe elders	5	43	41	2	46	43	3
	Young L1	5	43	40	3	50	46	5
	Young L2	5	44	36	8	48	38	10
Female	Hist elders	5	37	34	3	22	21	1
	Present elders	10	84	76	8	86	76	10
	Young L1	6	61	48	13	47	40	7
	Young L2	5	47	32	15	46	36	10
	Total	57	471	406	65	459	384	75

We turned next to the consideration of whether the vowel /a:o/ was remaining a diphthong or becoming monophthongised in the word *Māori*. If /a:o/ is produced as a traditional long diphthong, the ratio of /o/ to /a:/ should be approximately 0.5. If the diphthong is becoming a monophthong, the ratio will be lower than 0.5. If the ratio is higher than 0.5, the trend is towards the long diphthong /a:o/ becoming the short diphthong /ao/. Figure 7 shows that none of the speaker groups moved far from the expected 0.5 ratio in either Māori or in English. However some of the differences that appear in Figure 7 are statistically significant. The differences in the /o/:/a:/ ratio between languages are significant for both the male and female historical elders.
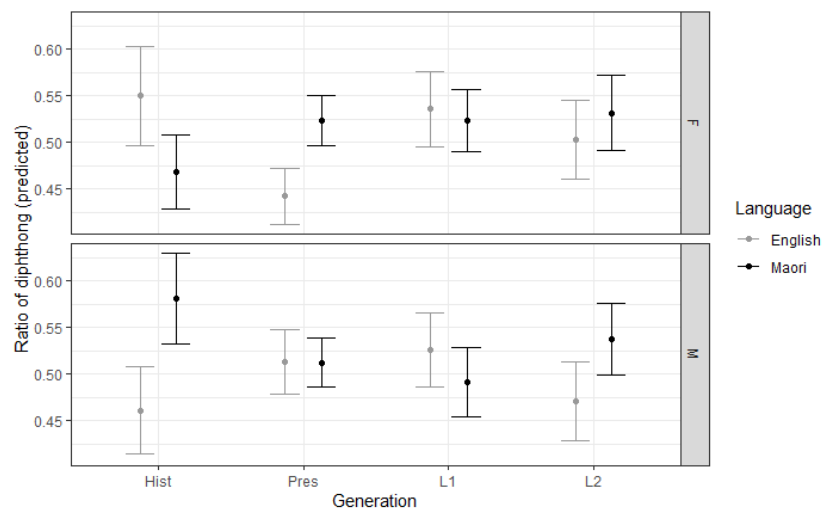
Figure 7: Relative lengths of /o/ to /a:/ in the diphthong /a:o/ for the speaker groups. Hist is the historical elders, Pres is the present-day elders and L1 and L2 are the first- and second-language young speakers. The bars mark the 95% confidence intervals.

The male and female speakers have opposite patterns. The historical male speakers tended towards monophthongisation of the diphthong when they were speaking English and moved towards the short diphthong /ao/ when speaking Māori (p=0.001). The historical women, on the other hand, moved towards the short diphthong /ao/ when speaking English and

towards monophthongisation when speaking Māori (p=0.02). The present-day male elders maintained the traditional ratio when speaking in both Māori and English, with ratios close to 0.5 for both languages (the difference between their behaviour in the two languages was not significant, p=0.6428). The present-day female elders moved towards monophthongising the diphthong when speaking English (p=0.004). The young second-language male speakers behaved similarly when speaking English, but both male and female young first-language speakers maintained the traditional diphthong length in both languages. The contrast between languages reached statistical significance for the young L2 males (p=0.028) but not for the females. Although these differences seem slight, they are perceptible. Of interest is the behaviour of the Tūhoe speakers (whose data are presented in Table 3). When we considered the pronunciation of the /r/ sound, the Tūhoe elders realised relatively few of the /r/ sounds as taps. In contrast, they produce almost all the /a:o/ vowels as diphthongs in both Māori and English. It would seem that, for these speakers, the diphthong is more important than the /r/ sound when they produce the word *Māori*.

6 Conclusion

In this paper we used the data in the MAONZE database (King et al. 2020) to consider the pronunciation of the word *Māori* (/ma:ori/) in both English and in the Māori language, te reo Māori. We considered first whether the /r/ sound was being produced as a tap, as is traditional in te reo Māori, or as an approximant, as is usual in English. We then examined the pronunciation of the diphthong /a:o/ in which the element /a:/ is traditionally twice as long as the element /o/ so that the ratio of /o/ to /a:/ is traditionally approximately 0.5. Because the MAONZE database contains male and female Māori speakers born between 1869 and 1992, it was possible to examine change over time for these variables. Overall, there was a slight reduction in the number of taps over time in the word *Māori* when the speakers were speaking te reo Māori and an increase in the number of taps in English. There was no significant difference between the men and the women but both the historical elders and the present-day elders maintained statistically significant differences between the proportion of taps produced in Māori and in English. This distinction had disappeared in the young speakers. We had noticed that the long Māori vowels had decreased in length over time (see Figure 4) and wondered whether this decrease would also occur in the long diphthong /a:o/. If this were the case, the ratio of /o/ to /a:/ could be expected to decrease overall across time. The men and women behaved significantly differently for the diphthong /a:o/, with the women producing a higher proportion of monophthongs in Māori and the men producing a higher proportion in English. However the movement is not straightforward and the trends observed here may well continue to change over time. The results do not represent a simple response to the shortening of /a:/.

It should be noted that the youngest speakers in the MAONZE database were born in the 1990s. Another generation of young Māori, not yet added to the database, are now producing the word *Māori* in their everyday conversation. In addition, there has been an increase in the use of Māori words in both English speech and writing as can be heard from broadcasters like RNZ (Radio New Zealand) and seen in newspapers like *The Press*. The greater prominence of the Māori language, together with a new generation of speakers, will undoubtedly have changed the picture presented here. This paper has considered the pronunciation of one word, *Māori*. It would be good to carry out similar analyses with other words with both the /r/ sound and the diphthong /a:o/ in order to see whether the patterns of pronunciation change found here apply to other Māori words and whether age differentiation continues, or gender plays an increased role in any observed changes. The MAONZE database

provides sufficient material for such an analysis and, with the present proliferation of Māori words in newspapers and broadcasting, there are additional fruitful sources to use for such a study.

Acknowledgments

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