THE ENGLISH SPOKEN BY MĀORI: CHANGES IN RHYTHM OVER TIME[1]

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Abstract

This study investigates the rhythm of English spoken by Māori. Recordings are analysed from speakers who have varying degrees of fluency and socialisation in Māori. The rhythm of their English language recordings is measured and analysed in order to address the question, 'has the distinctively less stress-timed rhythm of modern Māori English developed from the rhythm of the Māori language?' The rhythm of these speakers is then compared with age-matched Pākehā English speakers. The results show that the distinctively less stress-timed rhythm has indeed developed from the rhythm of the Māori language and the use of this rhythm is related to the prestige of Māori in the speakers' socialisation and the degree of Māori identity felt by the speaker.

1. Introduction

Throughout the first century or so of Māori and English language contact, Māori was the first language for most Māori people and was used for all functions outside of schooling. This was especially the case in rural, predominantly ethnically Māori areas, where interactions with Pākehā[2] were

few and the need for English was small. Māori children typically learned English as a second language in schools. Over time there was increasing contact between Māori and Pākehā and gradually, English became the language of interaction in more situations, both between Māori and Pākehā and within Māori communities (Benton 1991).

As the use of English grew, so the percentage of first language Māori speakers began to decline (Benton 1978) and the number of situations in which Māori was the primary language of communication also declined. While recent statistics indicate an increase in the percentage of Māori able to speak the Māori language and an increase in proficiency across all speakers (Te Puni Kōkiri 2008), these findings have been challenged by Bauer (2008), who argues that the health of the Māori language continues to deteriorate. An entire generation of Māori were actively discouraged from speaking Māori, by both Pākehā and Māori, who believed that providing a monolingual English environment would be in the best interests of the Māori children (Selby 1999: 16). As a result, although the next generation of children have had access to Māori as a medium of instruction in *kōhanga reo* ('language nests') and *kura kaupapa Māori* (Māori medium schools), many do not have Māori as a language in the home and do not have access to the same socialisation in Māori, which the earlier generations had (Benton 2001). Today, children learning Māori, even as a first language, 'are being raised in an environment largely populated by adult second language speakers of Māori' (King et al. 2010: 192).

It is now widely accepted that there are distinctive characteristics of the way most Māori speak English and this variety is referred to by linguists as Māori English (ME). In the early 1970s, Bender (1971: 47) identified a 'Māorified Colloquial English' variety, while Richards (1970: 124) distinguished Māori English 1 (ME1) and Māori English 2 (ME2). Of these two Māori English varieties, ME1 referred to the English spoken by high-status Māori, often used on formal occasions. ME2 was the label used for the more colloquial variety of Māori English.

Today, the term ME describes the vernacular variety, similar to Māorified Colloquial English, or ME2. It is important to distinguish this from English spoken by Māori[3] (EM), which is not an interchangeable term. EM describes the multiple varieties of English spoken by Māori people. This broad term encompasses ME, but also covers the speech of Māori who do not speak ME. This includes contemporary Māori who have little or no integration in the Māori community or Māori who eschew the ME vernacular. It also includes

older speakers who spoke Māori as a first language and learned English later as a second language (i.e. speakers of ME1). The English they spoke shared some of the features of ME, but was not the same variety as is spoken today. These older speakers of ME1 had features that appeared to be transferred directly from the Māori language, such as third person singular pronoun confusion (Māori has only one pronoun, *ia*, where English has both *he* and *she*), different preposition usage (*he came on his car*) and plural markers used on mass nouns (*breads, hays*) (Mitcalfe 1967). Such usages do not feature in ME today. By contrast, current ME speakers use terms of address like *bro* or *coz* (King 1999) that speakers of ME1 did not use.

King (1993) noted that not all ethnically Māori people speak ME and suggested that not all ME speakers are ethnically Māori. Some Pākehā who identify with Māori society speak ME, as confirmed by Szakay (2006), who found a significant correlation between speakers' Māori integration and their use of the distinctively less stress-timed rhythm of ME. It should also be noted that ME is not used consistently across all settings. Some ME speakers, particularly younger speakers, appear to use ME exclusively, however for many speakers ME is one register they can select depending on factors such as their addressee, the location and the occasion (King 1999).

Most ME speakers are monolingual English-speakers (Benton 1991) and although some speak Māori, very few claim to have 'native' fluency (King et al. 2011). Because they are not able to use the Māori language competently to show their identity, they use other linguistic features to mark their identity in the way they speak English. Holmes (1997) observed that,

> … even young Māori people who do not speak Māori generally have some contact with the language — often through older family members, but also through hearing it used on the marae, and perhaps in the media. This exposure to Māori rhythms in contexts where Māori is an admired and prestigious code is a potential influence on their use of English, especially in social contexts where Māori people predominate. (p. 89)

This explanation is consistent with the results of the study by Nazzi, Jusczyk and Johnson (2000), who found that infants are able to discriminate the rhythm of their native dialect from other dialects, even within the same rhythm class. Accordingly, we would expect that Māori children who are regularly exposed to the Māori language will recognise the rhythm as being associated with those Māori environments and will be able to distinguish the rhythm of

the Māori and English languages. They would presumably also be able to distinguish the characteristic rhythm of Māori English. It is not, however, an adequate explanation of why urban Māori children, who grow up with less exposure to the Māori language and more exposure to Pākehā English (PE), use the distinctively less stress-timed rhythm of ME. Although it is assumed that the rhythm of ME originated in the rhythm of the Māori language, this assumption has not actually been examined prior to this study.

The origins of the less stress-timed rhythm of ME is especially relevant since rhythm was shown to be not only one of the major contrastive features of ME and PE, but also the most salient for listeners in recognising ME (Szakay 2008). For these reasons, the aim of the present study is to investigate the origins of the distinctive rhythm of ME, using recordings of speakers born in the late 1880s through to the early 1980s.

One of the first researchers to comment on the rhythm of the English spoken by Māori was Benton (1965: 71), who observed that Māori children used an 'un-English' stress pattern. He noted that these speakers used full vowels in place of neutral vowels and he perceived this as a 'tendency to give undue emphasis to vowels, and to place primary stress on secondarily stressed syllables'.

Since then, researchers have examined the rhythm of ME more closely and found a greater use of full vowels (Ainsworth 1993, Holmes 1997) and a significantly less stress-timed rhythm in comparison with PE (Warren 1998; Szakay 2008). Similarly, the Māori language is considered to be less stress-timed than English (see King et al. 2009)[4] and was described as mora-timed by Bauer (1981). The similarities between the Māori language and ME, in contrast to PE, were summarised by Holmes (2005: 96):

> [The] tendency to pronounce small grammatical words in unstressed positions with full vowels more often than is customary in stress-timed English may well account for the impression that ME is more syllable-timed than PE. Again this feature may reflect the influence of the Māori language. Māori is mora-timed — a rhythmic pattern which is more similar to syllable-timing than to stress-timing — and so this is another example where te reo Māori [the Māori language] may have contributed to the development of a distinguishing feature of ME.

It seems logical, therefore, that the less stress-timed rhythm of ME has its origins in the mora-timed rhythm of Māori. Ainsworth found that a Māori

newsreader, presenting in English on a Māori radio station, used more full vowels than the newsreaders on Pākehā English stations (Holmes and Ainsworth 1996). Holmes and Ainsworth attributed this to the Māori newsreader's increased association with Māori language speakers, 'some of whom would have been regularly reading the news in Māori' (1996:81). They suggested that this 'direct and indirect contact with the Māori language experienced by Māori people' (1996:81) accounted for the timing of ME.

This assumption that the less stress-timed rhythm of ME is derived from familiarity with the Māori language does not appear to be supported by the fact that the majority of today's ME speakers are not fluent Māori speakers. As noted above, very few of those who do speak Māori, have native fluency, because most have learnt it later in life or after they learnt English and many have learnt it from adults who, themselves, learnt Māori as a second language. Conversely, King (1993) reported that first language Māori speakers born in the late 1800s and early to mid 1900s, who had considerably more contact with the Māori language, did not sound like ME speakers.

The data used for the older speakers in the present study came from recordings made in the 1940s of speakers born in the late 1800s and the social context of these recordings should be taken into account. They were made for radio broadcast, to be heard by predominantly Pākehā listeners and it is likely that the speakers would have adopted a relatively formal variety of speech, similar to the ME1 variety described by Richards (1970). This variety would have been more similar to the PE spoken at that time, which was more stress-timed, even in comparison with PE today (Nokes & Hay 2012). ME2, which is more similar to the ME of today, was typically used in more casual settings, with a predominantly Māori audience.

The intended audience of the broadcasts does not entirely account for the differences in rhythm between the recordings of the older Māori speakers and today's ME speakers. Many modern day young ME speakers sound equally ME in face-to-face situations and on the radio or television, whoever the expected audience (King 1999).

Therefore, a discrepancy remains. The less stress-timed rhythm of ME resembles the mora-timing of the Māori language and is the most salient feature of ME, which would suggest that the rhythm of ME is derived from the Māori language. However, ME has only become a distinctive register since the 1960s or 1970s, which corresponds to the time of greatest decline in the use of the Māori language. This would suggest that the use of a less stress-timed rhythm is not directly related to fluency in Māori. Consequently the current

study addresses the question: Has the distinctively less stress-timed rhythm of modern ME developed from the rhythm of the Māori language?

2. Measuring rhythm[5]

The traditional definition of a 'stress-timed' language, such as English, is one in which there are relatively equal intervals between stressed syllables, whereas a 'syllable-timed' language, such as French, is one in which each syllable is of relatively equal length (Pike 1945; Abercrombie 1967). Grabe and Low (2002) observed that languages described as 'stress-timed' achieved the regular intervals between stressed syllables through means such as combining full vowels with spectrally reduced and shortened vowels. Languages described as 'syllable-timed' on the other hand tended not to have vowel reduction, so that each syllable had a relatively equal length.

Based on this observation, Grabe and Low focused on the variability in vowel length in order to measure the timing of different languages. They used the vocalic Pairwise Variability Index, which compared the duration of adjacent vowel pairs and then measured the variability in these values over a whole section of speech. This raw Pairwise Variability Index (rPVI) was normalised by dividing the difference between the items by the mean duration of the two items, averaging these differences and multiplying by 100. The resulting measurement is known as the normalised Pairwise Variability Index (nPVI) as shown in the formula

$$\text{nPVI}=100\times\left[\sum_{k=1}^{m-1}\left|\frac{d_k-d_{k+1}}{(d_k+d_{k+1})/2}\right|/(m-1)\right]$$

where m is the number of vowels in an utterance and d is the duration of the kth vowel. From their results, Grabe and Low found that languages varied from each other in degree and that 'stress-timed' and 'syllable-timed' languages fell at different ends of a continuum, rather than into dichotomous categories.

Other researchers have used different measures to attempt to characterise rhythm in language. Ramus, Nespor and Mehler (1999) used ΔC, the standard deviation of the consonant intervals in an utterance and %V, the percentage of the utterance duration taken up by vowels. Dellwo (2006) proposed normalising the standard deviation measures by dividing them by the means. He used VarcoC for consonants and VarcoV for vowels.

More recently, Arvaniti (2009, 2012) has criticised the categorisation of languages into 'stress-timed' or 'syllable-timed' or even the placement of them onto a continuum. She found that the metrics used to classify languages into rhythmic groups, such as nPVI, %V-ΔC or Varcos, were unreliable. She argued that these metrics could "at best provide crude measures of speech timing and variability; but they cannot reflect the origins of the variation they measure and thus they cannot convey an overall rhythmic impression" (2009: 55).

Despite these shortcomings for comparing the rhythm of different languages, nPVI has proven useful within the English language when comparing the rhythm of the speech used by ME and PE speakers. For example, Szakay (2008) found that rhythm, as quantified by nPVI scores, was the main distinguishing characteristic between varieties of English identified perceptually as ME or PE. This result was statistically significant despite a general trend towards less stress-timed speech in PE, especially among younger speakers, which would make PE perceptually more similar to ME (Nokes & Hay 2012). nPVI is, therefore, an appropriate method for measuring the relative differences between the English speech of different generations of Māori speakers.

3. Methodology

3.1 Speakers and recordings (ONZE and MAONZE projects)

The Origins of New Zealand English project (ONZE: Gordon et al. 2007) gathered a corpus of New Zealand English speakers, from those born in 1851 to modern day speakers. There are three sub-corpora: the Mobile Unit archive (birth dates 1851 to 1910),[6] the Intermediate Archive (birth dates 1890 to 1930) and the Canterbury Corpus (birth dates 1930 to 1984). Although the interviews in the Mobile Unit are somewhat more formal and those in the Intermediate Archive and the Canterbury Corpus are somewhat less formal, the interviews chosen were as similar as possible in style. This was important because rhythm metrics have been shown to be sensitive to differences in style (Arvaniti 2009).

The Māori and New Zealand English project (MAONZE: King et al. 2011) was developed as a sister project to ONZE with a primary aim of investigating the change in pronunciation of the Māori language over time. The MAONZE database consists of recordings in both Māori and English of historical speakers, elders (kaumātua) and young first and second language speakers, for both men and women. There are approximately fifty years, or two generations,

between the birth years of each group of speakers, resulting in a total span in birth years of approximately one hundred years.

Another section of the MAONZE corpus contains the Tūhoe kaumātua, with recordings in both Māori and English of men and women from Ruātoki in the Tūhoe tribal area. These speakers, who were recorded in their homes, were chosen because they lived in one of the only two places where children were still being raised as speakers of Māori into the late 1970s, the Ruātoki Valley (Benton 1991).[7]

For this study, groups of Māori (EM) and Pākehā (PE) were selected in order to make comparisons of the rhythm of their speech in English. Males were chosen because they typically show greater use of vernacular varieties (Labov 2001). The interviews in the MAONZE corpus were also similar in style to those of the ONZE corpus.

In Section 4.1 the rhythm of English spoken by Māori will be tracked over a span of approximately 100 birth years in order to investigate the relationship between early EM speakers and modern day ME speakers. In Section 4.2 the speech of each group of Māori will be compared with the speech of age-matched Pākehā. Class is a difficult concept to define in the New Zealand context and is especially so in the Māori context due to inconsistencies between the Māori concept of mana ('status' or 'prestige') and international categories of socioeconomic class (Holmes 1997: 76; King et al. 2011). In this study, the groups recorded since the 1990s have been matched according the broad categories of 'professional' or 'non-professional'.

The EM speakers were chosen from the Mobile Unit (MU), Kaumātua (K), Tūhoe Kaumātua (TK), Young First Language Māori (L1Y) and Young Second Language Māori (L2Y) groups of the MAONZE database. These speakers provide not only a comparison of speech rhythm across time but also across experiences with Māori language (King et al. 2011). Speakers from the MU group had the most exposure to Māori, having grown up surrounded by the language and having used it for all purposes of socialisation and interaction. Speakers from the other groups were asked about their language backgrounds during the recordings and their responses reveal differences in their language experiences. The K speakers had a comparable background to the MU speakers in their youth, having grown up in rural, Māori-speaking areas. However, for the K speaker group in the MAONZE corpus, their adult experience of Māori use differed considerably, as they moved into cities where English was their primary language and where their interactions with other Māori speakers were more limited.

The TK speakers, while of a similar age to the K group, had a different experience. For these speakers, most of whom spent the majority of their lives in the predominantly Māori-speaking Ruātoki Valley community, Māori was the language of socialisation and family-life, not only as children but also into their adulthood. As this group of speakers would potentially have had less exposure to PE than either the K or L2Y speakers, their recordings should show the most direct effect of the Māori language on English.

The L1Y speakers grew up in the homes of their Māori-speaking grandparents and learned Māori as a first language. These young speakers differ from the older L1 Māori speakers as they have needed fluency in English throughout their lives in order to participate within the wider community beyond their family and school and have consequently learned English alongside Māori. The L2Y group, in contrast, learned English first and Māori as a second language after starting school. While some of the speakers in this group spent time in Māori speaking environments, the degree of their socialisation in Māori is far less than that of the older speakers and probably less than that of the L1Y speakers (King et al. 2010).

The linguistic backgrounds of the L1Y and L2Y speakers (collectively known as Y speakers) is representative of the backgrounds of many EM and ME speakers today. The topics of all the interviews were relatively similar (discussions of the Māori language, and topics of interest to the individual speakers) so it is unlikely that the results presented here will have been affected by the topics discussed.[8]

Twelve speakers were selected from the MAONZE corpus. All four TK speakers with clear recordings were included as well as two speakers each from the MU group, the K group, the L1Y group and the L2Y group. The two speakers in the MU group were selected on the basis of the clarity of the recordings and the amount of usable English speech. The two K speakers were chosen as they were relatively conservative speakers. The selected L1Y and L2Y speakers were chosen as they are representative of the varied linguistic and Māori integration backgrounds of EM speakers today. The details of these speakers are listed in Table 1.

The focus of the current study is EM, rather than Māori language, therefore only the English recordings were used. It has been shown that reading affects rhythm (Szakay 2006), therefore only spontaneous, predominantly English speech was included in this study. Sections of the recordings consisting primarily of Māori language or read material were omitted, leaving approximately 10 to 15 minutes of speech for each of the MU speakers and

Table 1: Biographical details of the EM speakers

SPEAKER	YEAR OF BIRTH	YEAR OF RECORDING	AGE AT RECORDING
MU01E	1885	1947	62
MU05E	1880	1947	67
K001E	1934	2001	67
K002E	1936	2001	64
TK01E	1949	2009	60
TK02E	1943	2009	66
TK03E	1940	2009	69
TK04E	1927	2009	82
L1Y01E	1980	2004	24
L1Y03E	1970	2004	35
L2Y01E	1972	2001	29
L2Y02E	1979	2004	25

L1Y01E, 25 to 30 minutes of speech for each of the K speakers and the other Y speakers and 40 to 50 minutes of speech for the TK speakers.

In order to draw conclusions about the use of a less stress-timed rhythm as a distinctive feature of EM, comparisons were necessary with age-matched PE speakers. Multiple speakers were available for selection as a result of the work of Nokes and Hay (2012) as part of the ONZE project, and this greater number of speakers was used to enable a comparison with speakers with a greater spread of birthdates. These speakers were only recorded speaking English and only the sections of spontaneous speech were analysed in their study. These speakers were selected from the Mobile Unit (MU) archive, Intermediate Archive (IA) and Canterbury Corpus (CC) groups from the ONZE database (Gordon et al. 2007). Within the CC group, the male/older/non-professional (mon) and male/younger/professional (myp) speakers were selected as being most comparable to their age-matched equivalent EM speakers. Because consistent numbers of speakers are not available for all birth years in the ONZE database, the numbers of PE speakers available for comparison with individual EM speakers varies.

The details of the PE speakers are provided in Table 2 (pages 74 –75). The specific year of recording was not available for the MU speakers, so these are not included in the table. These speakers were recorded between 1946 and 1948 and therefore, their ages ranged from 58 to 72 years.

3.2 Transcriptions

The MU recordings were made on fourteen-inch acetate disks, while the more recently added recordings were recorded digitally by the MAONZE team. LaBB-CAT (Fromont and Hay 2008, http://onzeminer.sourceforge.net/) provides on-line access and search functions for the ONZE recordings; an equivalent database, MAONZE Miner, provides access for the MAONZE recordings (King et al. 2011).

The first step in the transcription process was time-aligning the recordings using the Transcriber software (http://trans.sourceforge.net/en/presentation.php). The transcriptions were language-tagged to indicate any Māori words in the English recordings. This facilitated accurate interpretation of the written Māori words at the later forced-alignment stage. For example, in English speech, the pronoun 'he' would be interpreted as consisting of the phonemes /h/ and /i/. However, in a section with a Māori language tag, the phonemes for the Māori particle or determiner 'he' would be /h/ and /e/.

The transcripts were loaded onto MAONZE Miner, which converted them into textgrids using Praat version 4.125 or higher (Boersma & Weenink 2009). The conventional spellings in these textgrids were interpreted using LaBB-CAT's on-line dictionary (developed from the CELEX database: Baayen et al.1995) and a full phonemic transcript was generated for each textgrid. The Hidden Markov Model Toolkit (HTK) was then used to make a best-guess phonemic alignment of the sound file to the phonemic transcript (http://www.htk.eng.cam.ac.uk/). This alignment of the sound file and phonemic transcript generated a 'segment' tier when the transcripts were converted again into textgrids. These steps were carried out automatically by LaBB-CAT.

This forced-alignment is currently possible using LaBB-CAT for English speech. New Zealand specific vocabulary has been manually added to the dictionary over time. A separate Māori dictionary has not yet been fully developed (see King et al. 2011). However automatic phoneme alignment in Māori language recordings is possible using spelling to phoneme rules developed by the MAONZE team and implemented by Robert Fromont, software programmer for LaBB-CAT, at the New Zealand Institute of Language, Brain and Behaviour. In the current study, any Māori words or sentences were aligned according to these rules (See Vowell 2012 for more detailed methodology).

While the forced-alignment was accurate for the vast majority of phonemes, some manual correcting of the textgrids was required and this was completed in Praat. Manual correcting involved checking the accuracy of the

Table 2: Biographical and recording details of the PE speakers

SPEAKER	YEAR OF BIRTH	SPEAKER	YEAR OF BIRTH	YEAR OF RECORDING	AGE AT RECORDING	SPEAKER	YEAR OF BIRTH	YEAR OF RECORDING	AGE AT RECORDING
MU*			**IA**				**CC**		
TC	1876	BG	1924	1995	71	mon03-5c	1947	2003	56
TM	1876	GG	1924	1993	69	mon95-4b	1947	1995	48
JS	1876	LA	1926	1993	67	mon99-3	1947	1999	52
HS	1877	SF	1928	1994	66	mon97-18a	1948	1997	49
CK	1877	JW	1929	1993	64	mon00-16	1949	2000	51
JD	1880		**CC**			mon95-15	1949	1995	46
GW	1884	mon95-1a	1932	1995	63	mon99-14	1949	1999	50
VY	1885	mon94-23b	1934	1994	60	myp01-7a	1980	2001	21
RT	1887	mon94-35a	1935	1994	59	myp02-7	1980	2002	22
AW	1888	mon99-22b	1937	1999	62	myp05-4	1980	2005	25
		mon95-7b	1939	1995	56	myp99-16b	1979	1999	20
		mon94-33a	1940	1994	54	myp00-1b	1978	2000	22

* The MU speakers were all recorded between 1946 and 1948. Their ages at recording ranged from 58 to 72 years.

SPEAKER	YEAR OF BIRTH	SPEAKER	YEAR OF BIRTH	YEAR OF RECORDING	AGE AT RECORDING	SPEAKER	YEAR OF BIRTH	YEAR OF RECORDING	AGE AT RECORDING
MU*		**CC**				**CC**			
		mon97-7a	1940	1997	57	myp02-6b	1978	2002	24
		mon99-1b	1940	1999	59	myp99-25	1978	1999	21
		mon94-12b	1942	1994	52	myp00-18a	1973	2000	27
		mon98-14b	1942	1998	56	myp03-7c	1973	2003	30
		mon01-2b	1943	2001	58	myp95-20a	1973	1995	22
		mon01-14	1944	2001	57	myp99-27	1973	1999	26
		mon94-28b	1944	1994	50	myp95-17	1972	1995	23
		mon02-15	1945	2002	57	myp96-4	1972	1996	24
		mon95-18b	1945	1995	50	myp96-7b	1972	1996	24
		mon95-24a	1946	1995	49	myp01-16a	1971	2001	30
		mon98-15b	1946	1998	52	myp98-9b	1971	1998	27

* The MU speakers were all recorded between 1946 and 1948. Their ages at recording ranged from 58 to 72 years.

phonemic boundaries and removing the coding for any unwanted noise at the segment level, so it would not be analysed. Hesitations, including part words and repetitions, were also removed, because their rhythm is unlikely to be typical. The corrected textgrids were reloaded into the MAONZE database for the final part of the analysis. Figure 1 shows an example of a completely analysed text grid. Even though the automatic analysis required hand checking and correction, it was a great deal faster than a totally manual analysis, and allowed more material to be analysed than could otherwise have been done in a reasonable time.

A Praat script was used to measure nPVI. It differs from the traditional method documented by Grabe and Low (2002), which measured the variability between adjacent vowel intervals. In the traditional method immediately adjacent vowels, for example in the word 'doing', were grouped together in one vowel interval, transcribed manually as 'CVC' (Consonant-Vowel-Consonant, Tier 6 in Figure 1). Some speakers in the present study tended not to use linking /r/ and consequently there were adjacent vowels in the words, 'we're actually', which were combined into one vowel segment. This corresponds to the 'intervallic nPVI' measurements in Nokes and Hay's (2012) study.

With the development of forced-alignment, it was possible to generate a segment tier in Praat with individual phonemes listed. In response to this new technology, Nokes and Hay developed the segmental nPVI method,

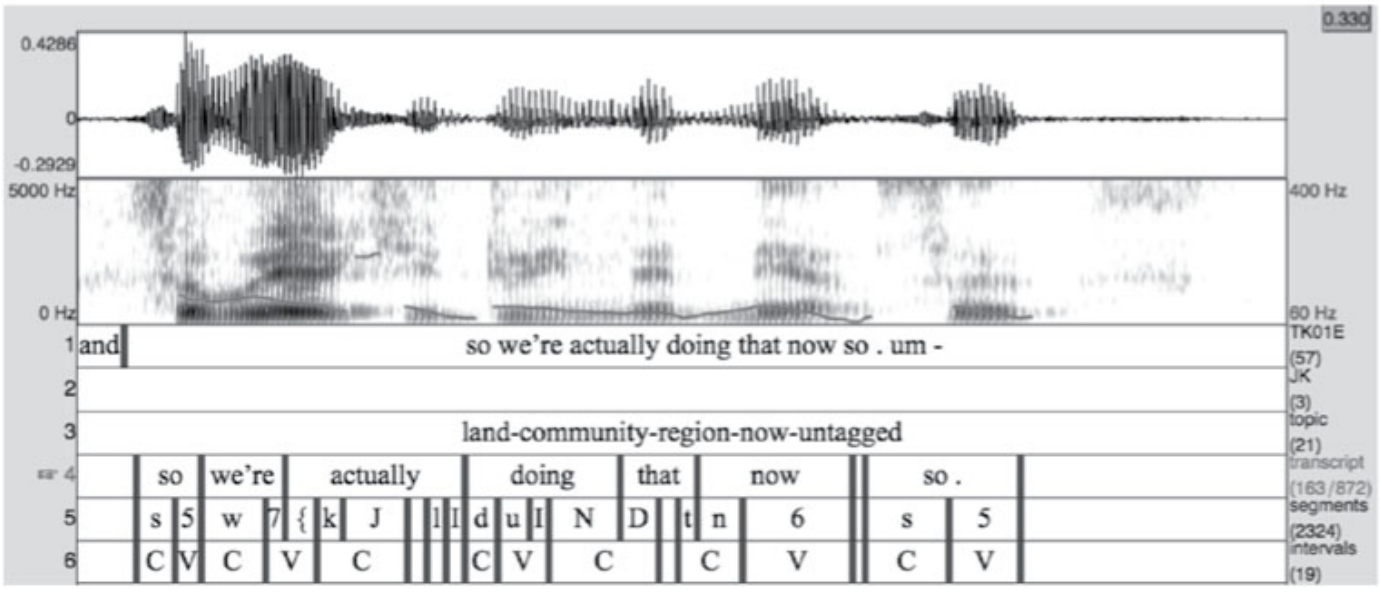

Figure 1: Textgrid with DISC phonemes marked on the segments tier and traditional CVCV intervals marked on the intervals tier

which measured the variability between adjacent separate vowels. Using the examples above, and based on DISC phonemes which are used in LaB-CATT, Tier 5 in Figure 1 shows that 'doing' was transcribed as 'duIN' (/duɪŋ/), and 'we're actually' was transcribed as 'w7{kJ@lI' (/wɪəæktʃəlɪ/).

This study uses segmental nPVI calculated from tier 5 of the textgrids as the most efficient means of comparing the rhythm of multiple recordings from several speakers. The values in Grabe and Low's charts of other languages and dialects are calculated using intervallic nPVI and therefore cannot be directly compared against the values generated using the segmental nPVI calculations. The results from the study by Nokes and Hay indicate that the methods are comparable with regard to their ability to measure variations in rhythm.

4. Results

Two aspects of EM rhythm were investigated in the present study. Section 4.1 compares the rhythm of EM speakers over time and between linguistic backgrounds. Section 4.2 compares the rhythm of EM speakers to age-matched PE speakers.

4.1 EM speakers

Table 3 and Figure 2 show the mean nPVI of the EM speakers arranged in chronological order, by year of birth. With some notable exceptions, they show a general trend of lower nPVI values over time, indicating a less stress-timed rhythm. This trend is statistically significant (see Table 6 and section 4.2 for details). Perceptually, it was noted that the speech of L2Y01E sounded the least like ME and the most PE-like of the speakers in the two Young groups. This was reflected in the results which showed that his speech was more stress-timed than that of the other Young EM speakers.

The speakers were then grouped in order to make comparisons between their different linguistic backgrounds (Table 4). From the Mobile Unit group to the Young First Language Māori speakers of today, the same downward trend in nPVI values is evident for all speakers except the K speakers who have the highest average nPVI. Neither the K ($t = 1.08$, $df = 2$, $p = .20$) nor the TK speakers ($t = 1.54$, $df = 4$, $p = .40$) are significantly different from the MU speakers. What is most notable is the comparison between these two groups, the Kaumātua and Tūhoe Kaumātua, who were born at similar times. The Kaumātua group's significantly higher nPVI ($t = 5.38$, $df = 4$, $p < .01$)

Table 3: Mean nPVI and standard deviations for EM speakers

SPEAKER	YEAR OF BIRTH	MEAN nPVI	SD
MU05E	1880	61.73	3.93
MU01E	1885	66.34	2.09
TK04E	1927	61.94	1.93
K001E	1934	68.29	1.91
K005E	1936	65.55	2.08
TK03E	1940	62.31	3.00
TK02E	1943	61.86	1.61
TK01E	1949	60.83	2.45
L1Y03E	1970	58.01	3.28
L2Y01E	1972	63.46	1.68
L2Y02E	1979	58.14	0.51
L1Y01E	1980	57.61	2.29

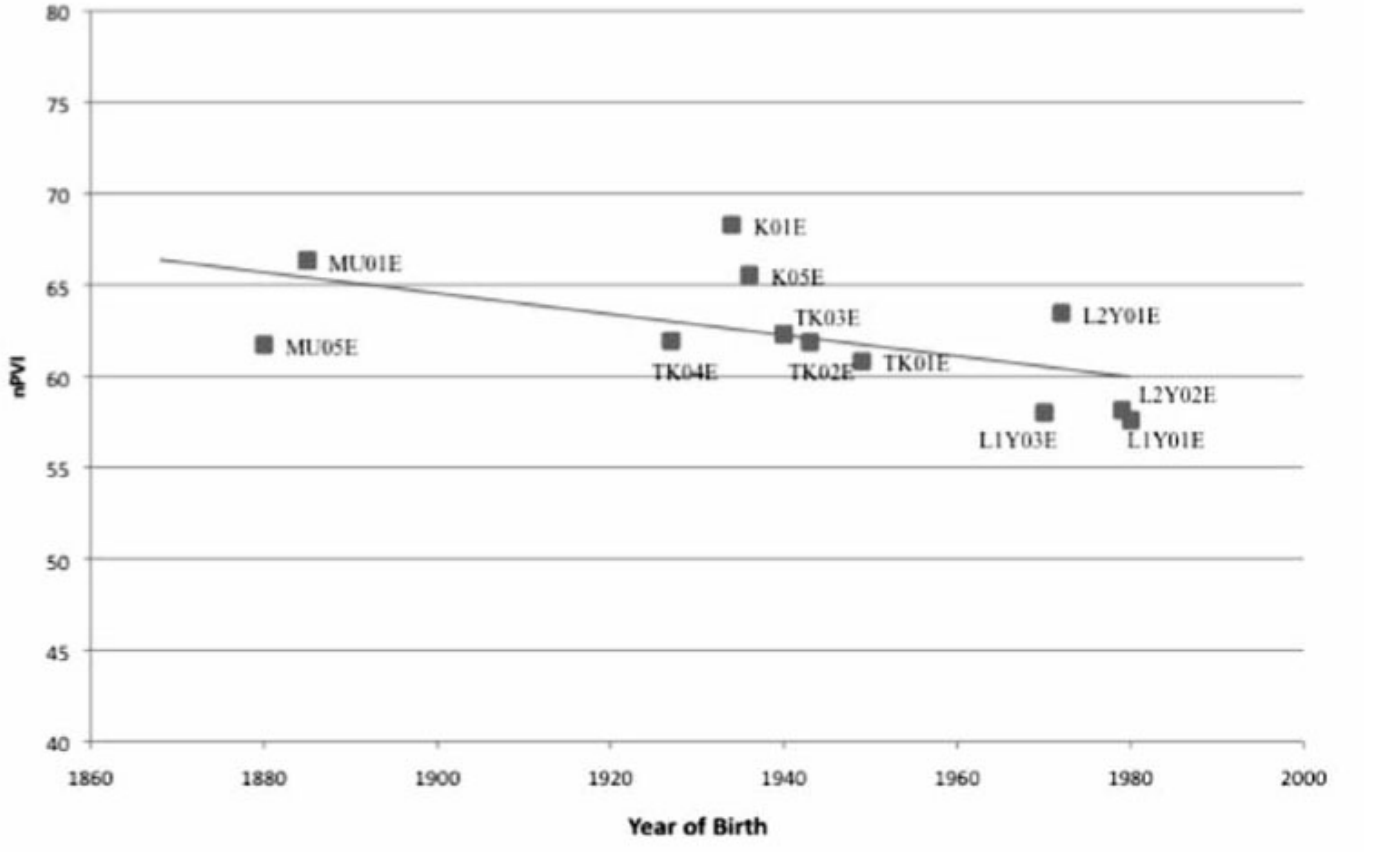

Figure 2: Scatterplot showing nPVI of EM speakers over time with trend line

correlates with their experience of living their adult lives in predominantly Pākehā environments at a time when the rhythm of PE was somewhat more stress-timed than it is today and in a Pākehā world in which the Māori language was somewhat less valued than it is today. There is, however, no significant difference between the rhythm of the Tūhoe Kaumātua speakers and the group of young EM speakers as a whole ($t = 1.70$, $df = 6$, $p = .07$).

Table 4: Average nPVI of groups of EM speakers

GROUP	MEAN nPVI	SD
MU	64.03	3.70
K	66.92	2.37
TK	61.71	2.30
L2Y	61.10	3.06
L1Y	57.81	2.68

A comparison of the Young speakers indicates that the L1Y speakers have a lower nPVI than the L2Y speakers. However, the markedly higher nPVI of L2Y01E (see Table 3) has affected the results of the L2Y speakers. A comparison of L2Y02E with the L1Y speakers shows almost no difference. When only the young first language Māori speakers are compared with the TK speakers, a significant difference in nPVI values is evident ($t = 8.00$, $df = 4$, $p < .05$). The result is similarly significant if L2Y02E is added to the Y group. ($t = 9.58$, $df = 5$, $p < .05$. (The Bonferroni correction for sampling the data pool more than once has been included in these calculations.)

The speakers with the least on-going interaction with Māori-speaking peers, the K speakers and one L2Y speaker, do not form part of the significant decline in nPVI from the MU to the TK to the L1Y speakers. The Y speakers who have the greatest on-going interaction with Māori-speaking peers have the lowest nPVI.

4.2 EM and PE speakers

This section compares the nPVI values of the EM speakers with those of PE speakers matched for age and social class. This comparison investigates whether a lesser degree of stress-timing has always been a feature of EM, as distinct from PE. Table 5 provides the data to address this question.

The PE results confirm previous findings that there has been a trend

over time in PE towards less stress-timed speech (Nokes and Hay 2012). Furthermore, these results show that EM has always been less stress-timed than PE, which suggests that a distinctive rhythm may have always been a feature of the way Māori speak English, even before Māori English was identified as a separate variety (see Figure 3). The three speakers with the highest nPVI values were MU01E, K01E and K05E. The social histories of these speakers indicate that they had a great deal more interaction with PE speakers than their age-matched Māori peers.

Table 6 presents the results of a regression analysis which showed that the rhythm of the Pākehā speakers was significantly more stress-timed than that of the EM speakers ($p < .01$) and that the rhythm of the older speakers, both PE and EM, was significantly more stress-timed than that of younger speakers ($p > .001$). This can be seen in Figure 3. The trend as shown in Figure 3 is clear: as PE has become less stress-timed, EM has become even less stress-timed

Table 5: Average nPVI of EM and PE speakers over time

EM SPEAKERS			PE SPEAKERS			
SPEAKER	YEAR OF BIRTH	AVERAGE nPVI	SPEAKER GROUP	YEAR(S) OF BIRTH	AVERAGE nPVI	SD
MU05E	1880	61.73	MU	1876–1880	69.54	3.90
MU01E	1885	66.34	MU	1884–1888	68.97	3.24
TK04E	1927	61.94	MU/IA	1924–1928	66.73	3.09
K001E	1934	68.29	mon	1932–1934	69.12	3.14
K005E	1936	65.55	mon	1937–1939	71.56	2.66
TK03E	1940	62.31	mon	1940	66.85	2.55
TK02E	1943	61.86	mon	1942–1945	64.05	2.34
TK01E	1949	60.83	mon	1946–1949	65.73	5.07
L1Y03E	1970	58.01	myp	1971–1973	62.10	3.02
L2Y01E	1972	63.46				
L2Y02E	1979	58.14	myp	1978–1980	60.98	4.13
L1Y01E	1980	57.61				

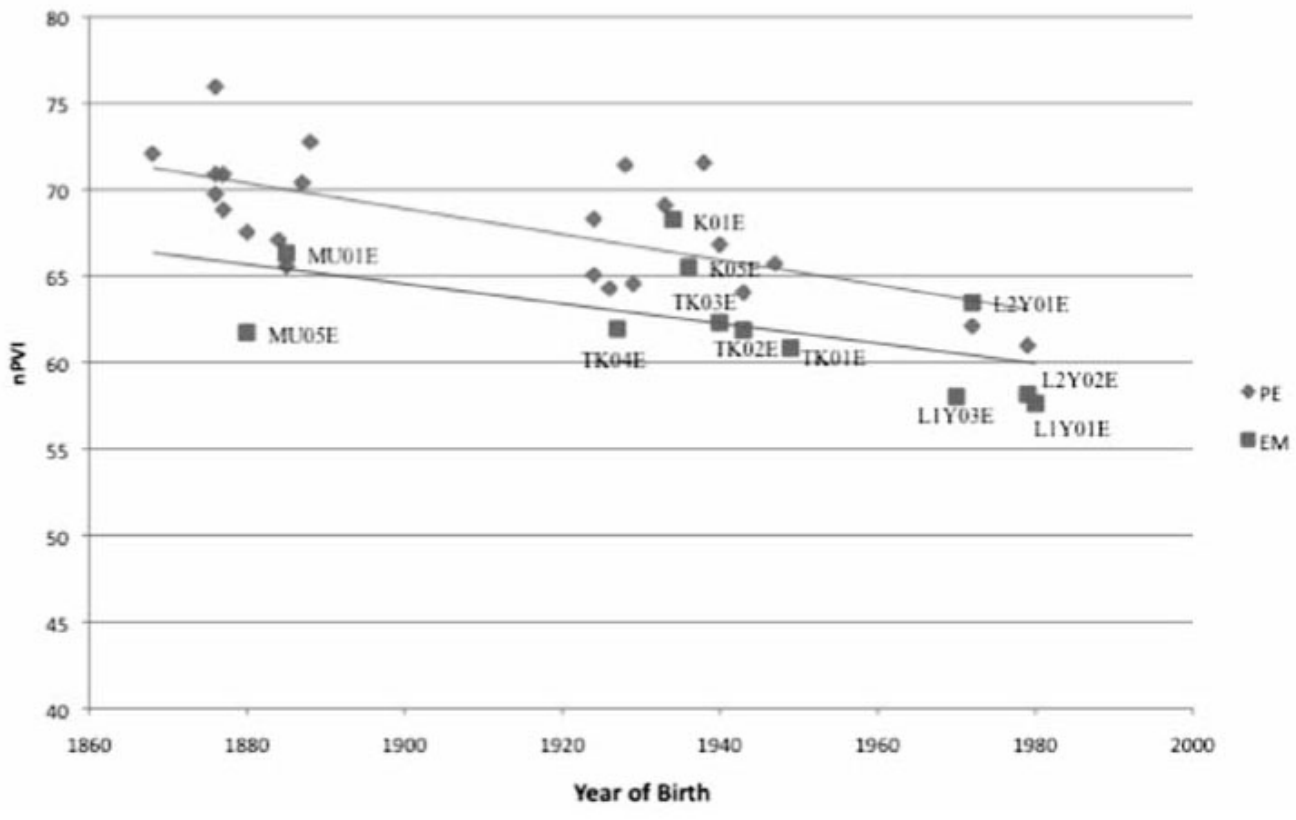

Figure 3: Scatterplot showing the mean nPVI of speakers over time with trend lines. The higher line represents the trend for PE speakers, the lower line the trend for EM speakers

Table 6: Regression analysis

	ESTIMATE	STD ERROR	T VALUE	PR (>ITI)
(Intercept)	195.39196	28.27764	6.910	> 0.001 ***
Class PE	3.84699	1.09131	3.525	> 0.01 **
Year of Birth	-0.06863	0.01456	-4.713	> 0.001 ***

in order to maintain a distinction. The trend in these results suggests that this distinction is decreasing, though the lack of interactions in the regression analysis shows that this is not yet statistically significant.

5. Discussion

The results of this study show four notable relationships: the rhythm of both ME and PE has become less stress-timed over time; the rhythm of the TK

speakers falls between that of the MU speakers and the Y speakers and differs significantly from the rhythm of the K speakers; the rhythm of the K speakers and L2Y01E is closer to that of age-matched PE speakers than EM speakers; there has always been a clear and significant difference between the rhythm of the EM speakers and the PE speakers. This difference has diminished slightly and non significantly over the time period analysed here (see Figure 3).

The trend towards a less stress-timed rhythm for both EM and PE speakers is consistent with the results of previous studies of NZE (Szakay 2006; Nokes & Hay 2012). Given that many of the data in those studies were the same as those used in the present study, it is unremarkable that this trend was confirmed. However less-stress timed varieties of English have also been found in a study of multicultural London English (Torgersen & Szakay 2011). Torgersen and Szakay found that younger speakers in an inner London suburb where there was considerable ethnic mixing had less stress-timed speech than older speakers in the same area and than younger speakers in a less ethnically mixed outer London suburb. They concluded that 'a more syllable-timed speech rhythm appears to be a feature of contact varieties of English' (2011: 172). While we have argued that the rhythm of current ME cannot be attributed to contact with the Māori language, language contact could certainly explain the rhythm of the Tūhoe Kaumātua.

Prior to this study, there was a gap in available English-language recordings between those of the older Māori, who used a speech rhythm perceptually comparable to today's PE speakers, and those of the younger speakers who used a perceptibly less stress-timed rhythm. The present study shows that the Tūhoe Kaumātua speakers fall between these groups in terms of age, language background and speech rhythm in English. The older speakers used Māori for most purposes and learnt English as a second language. The young speakers used English for most purposes and learnt Māori in an environment populated by many second language Māori speakers. The Tūhoe Kaumātua spoke Māori as a first language and continued to use it throughout their lives in their home community, but did spend some time working in English-speaking environments. Prior to this study, the only recordings of speakers of this generation were from the Kaumātua speakers, who spoke Māori as children, but interacted predominantly with English-speaking Pākehā in their adult lives. Therefore their social background differed considerably from that of the Tūhoe Kaumātua.

When the K speakers moved to the cities, there was little prestige associated with being Māori in the community at large (Ministry for Culture and Heritage

2013). By contrast, the other three groups of speakers were socialized in environments in which there was a greater prestige associated with being Māori. Māori was spoken widely during the MU speakers' lifetimes, the TK speakers spent most of their lives in Māori-speaking communities and the Y speakers grew up during the language revitalization efforts of the early 1980s. It is suggested that the K speakers' use of a less Māori-sounding rhythm in English reflects the influence of the attitudes they encountered related to the prestige of Māori.

The location of the TK and K recordings is likely to be an additional factor in the differences in the rhythm of their speech. By recording the TK speakers in their local environment, it was possible to measure the rhythm of EM in speakers of their generation further away from the influence of PE in the cities. It is likely that other kaumātua of their age, who have remained in their traditional communities, would show a comparable rhythm to the TK speakers.

By contrast, the K and L2Y speakers were recorded during interviews with a Pākehā academic in the cities and the nPVI values for K01E, K05E and L2Y01E fit more closely in the PE range than the EM range (see Figure 3). It is suspected that these speakers may have been trying to accommodate towards Pākehā as much as possible. It is entirely possible, and indeed probable, that the informal English speech of these speakers would be less stress-timed in other, more Māori settings.

The socialisation of the two L2Y speakers is likely to have been similar, yet the rhythm of their speech differed considerably. This is consistent with King's suggestion that some young speakers use ME all the time, while others have the option of using other registers. This ability to select different registers in different environments appears to account for the rhythm of L2Y01E's speech. It was observed that L2Y01E's speech was notably less stress-timed when speaking over the phone to another Māori male during the recording, than when speaking with the female Pākehā interviewer. This addressee effect has been widely reported in the literature (e.g. Rickford & McNair-Knox 1994; Hay, Jannedy & Mendoza-Denton 1999). It is noteworthy that the addressee effect was greater for this speaker than the other L2Y speaker. King (1993: 35) identified that 'speakers use ME to a varying amount. Some will use ME all the time and others will use it only in certain situations.' It is likely that L2Y01E would fall into the latter category, and chose to use a more PE-sounding register in the context of speaking to a Pākehā in the presence of a voice recorder.

The results have shown that the TK speakers, who speak fluent Māori, use a rhythm in English similar to the rhythm of modern ME. Prior to this study, it was assumed that the rhythm of ME had developed from the rhythm of Māori, however there was an unexplained gap between the older speakers, who had greater fluency in Māori but used a more stress-timed rhythm and the younger speakers, who had the reverse pattern. These TK speakers can be considered the 'missing link' as they show a direct correlation between their Māori rhythm and their English rhythm. This shows that it is extremely likely that the less stress-timed rhythm of ME has indeed developed from the rhythm of the Māori language.

It is suggested here that young ethnically Māori New Zealanders, who do not have the same degree of fluency in Māori as they do in English, may use a less stress-timed rhythm in English in order to demonstrate their specifically Māori identity by highlighting their differences from Pākehā. These cultural differences are an important part of Māori identity and the distinctions between Māori and Pākehā feature often in Māori humour as an in-group solidarity marker (Holmes & Hay 1997). In order for EM speakers to maintain their distinctive variety and to maintain the status of rhythm as an ethnic marker, EM has become progressively less stress-timed over the generations. For younger EM speakers today, who do not have the same level of fluency in Māori as the older speakers, using the distinctively less stress-timed rhythm of ME mimics the rhythm of the Māori language and signifies their identity with the language and with Māori society. This is similar to the finding of Sharma and Sankaran (2011) that as the prestige of Punjabi identity has grown in the Southall suburb of London, so the local dialect has incorporated Punjabi linguistic features.

Identity may also account for the 'cat-and-mouse' pattern in the shift towards less stress-timed speech across the two NZE varieties. Pākehā New Zealanders seem to be incorporating the influence of Māori culture into their own identities. Support for this can be observed in official social domains, such as the prominent Māori influence in the language, stories, music and designs during the 2011 Rugby World Cup opening ceremony and game in Auckland, New Zealand. This phenomenon was described in a 2012 poll published in the NZ Herald (Harper 2012), which reported an increase in the number of people who considered Māori culture to be an 'essential component' of New Zealand society. In unofficial social domains, particularly New Zealanders' identity signals overseas, Māori logos and quintessential Māori English expressions (e.g. 'bro') feature ubiquitously on clothing. This increase in identification

with Māori culture among Pākehā is likely to be a factor in PE speakers adopting more features of ME, including a less stress-timed rhythm. However, the importance of ME as a solidarity marker has led to EM speakers becoming even less stress-timed to maintain the distinction.

6. Conclusion

This study addressed the question, 'has the distinctively less stress-timed rhythm of modern ME developed from the rhythm of the Māori language?' The results indicate that the distinctive rhythm of ME has indeed developed from the rhythm of the Māori language. This is not a direct effect, however, as older EM speakers in the general NZ community with a greater proficiency in Māori than today's ME speakers used a more stress-timed rhythm than younger speakers. The results from the Tūhoe Kaumātua speakers provide the missing link between these groups. The Tūhoe speakers, who continued their interactions with Māori-speaking peers throughout their lives, used a rhythm in English which matched the rhythm of their Māori speech and fell between that of the two groups who interact more often in English.

Rhythm is a linguistic feature that even infants can use to distinguish their native dialect from non-native dialects (Nazzi et al 2000) and therefore it is not surprising that the use of less stress-timed speech in English is now an ethnic marker (Szakay 2006). This is the case not only among first language Māori speakers, but also for those first language English speakers who either do not speak Māori, or have learnt it as a second language. Perhaps it is precisely *because* many of these young, English-speaking Māori are unable to signal their Māori identity through the use of Māori language that they have adopted this rhythm to emulate the timing of the Māori language.

Identity also plays a role in the rhythm of ME speakers who are not ethnically Māori. They do not use this variety as a marker of their own individual ethnicity, but are more likely to be marking their identity with a Māori group. Similarly, the shift towards a less stress-timed rhythm in the speech of young PE speakers seems to reflect a growing sense of identity with Māori culture as part of their New Zealand identity. The 2006 Census results indicate increases in the proportion of non-Māori who agree that 'Māori culture is part of everybody's heritage' and in the proportion of those who would like to be involved in activities related to Māori culture (Te Puni Kōkiri 2008).

The results of the present study confirm the findings of previous studies (such as Szakay 2006 and Nokes and Hay 2012) and provide additional information about the roles of prestige and identity in linguistic variation. EM speakers who have spent most of their lives in environments in which prestige is associated with Māori tended to have a more Māori-sounding rhythm. Identity is credited with both the shift in PE rhythm towards the less stress-timed rhythm of ME, and the shift in ME towards an even less stress-timed rhythm in order to maintain a distinction.

Notes

1 The authors would like to acknowledge the ONZE and MAONZE projects for the use of the transcripts and recordings; Jennifer Hay and Jacqueline Nokes for the use of their results; Jacqueline Nokes additionally for her development of the Praat scripts; Robert Fromont for technical assistance with MAONZE Miner; Patrick LaShell for his assistance with statistics and the two anonymous reviewers for their helpful feedback.

2 Pākehā is the term commonly used to refer to New Zealanders of European descent.

3 'Māori' is defined as those people who self-identify as being Māori, either through ethnicity (cultural affiliation) or through descent (ancestry), as per the NZ Census definition (Statistics New Zealand 2006)

4 It is difficult to assess the rhythm of the Māori language by the Pairwise Variability Index (nPVI) described below and used to compare the English recordings in this study. Simple nPVI analysis contradicted intuitions of native speakers (Arvaniti 2009) and indicated that Māori was relatively stress-timed (Maclagan et al. 2009). Maclagan et al. showed that this was largely because of the numerous clusters of vowels in the Māori language. Long vowels and diphthongs are traditionally regarded as two morae in Māori (Bauer 1993). When passages were chosen with minimal long vowels and diphthongs so that successive syllables contained single morae, the rhythm of Māori was found to be considerably less stress-timed than the rhythm of NZE.

5 We acknowledge that the metric described here measures *timing* in language, which is only one component of rhythm, albeit an important one (see Arvaniti 2009). For convenience we nevertheless continue to use *rhythm* in this paper.

6 Copyright for the Mobile Unit recordings is held by Radio New Zealand Sound Archives Ngā Taonga Kōrero. See http://www.soundarchives.co.nz/home for more details.

7 There is a real time difference between the historical speakers and the kaumātua and Tūhoe kaumātua speakers because they were recorded fifty years apart. However, there is an apparent time difference between the kaumātua and Tūhoe kaumātua speakers and the young speakers because they were recorded at

the same time. Any differences found between the historical speakers and the kaumātua and Tūhoe kaumātua speakers will indicate genuine changes over time but any differences found between the kaumātua and Tūhoe kaumātua speakers and the young speakers may actually underestimate the differences that will exist when the young speakers are the same age as the kaumātua and Tūhoe kaumātua speakers.

8 Topic was found to have minimal impact on nPVI results (Vowell 2012). The only topic-dependent variation in speech rhythm was related to the affinity assumed to be felt by the speaker towards the person or people being referred to. This was a subtle tendency and was not statistically significant.

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