The English of Māori speakers:

changes in rhythm over time

and

prosodic variation by topic.

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ABSTRACT

This thesis investigates the rhythm and mean pitch of the English of Māori speakers. Recordings are analysed from speakers who have varying degrees of fluency and socialisation in Māori. The rhythm and mean pitch of their English language recordings are measured and analysed in order to address two questions.

The first part addresses the question, 'Has the distinctive syllable-timed rhythm of modern Māori English developed from the mora-timed rhythm of the Māori language?' Changes in the rhythm of the English of Māori speakers are measured over time. The rhythm of these speakers is then compared with age-matched Pākehā English speakers. The results show that the distinctive syllable-timed rhythm has indeed developed from the mora-timed rhythm of the Māori language and the use of this rhythm is related to the degree of Māori identity felt by the speaker.

The second part is also concerned with prosody and addresses the question, 'Are rhythm and mean pitch influenced by topic?' This is investigated by topic tagging the recordings and comparing the rhythm and mean pitch of each tagged section of speech. Two sets of topic tags are used; Set One has tags representing five categories (Subject, Referent, Location, Time and Attitude) and Set Two has only one tag per topic. The results suggest that mean pitch is not influenced by topic but is higher in sections of quoted speech than in regular speech. The subtle variations observed in rhythm are highly individualised and are influenced most strongly by the referent of the topic and the degree of affinity felt towards that referent.

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CHAPTER 1

INTRODUCTION

1.1 Introduction to Part One

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[1] were few and the need for English was small. Māori children typically learned English as a second language in schools and their proficiency was considered inadequate by their teachers, in comparison with the English spoken by most monolingual Pākehā children (Dept. of Education, 1971). 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; Statistics New Zealand, 2001). This was accompanied by a related decline in situations in which Māori was the primary language of communication. 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, p. 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).

[1] Pākehā is the term commonly used to refer to New Zealanders of European descent.

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, Watson, Maclagan, Harlow & Keegan, 2010, p. 192).

Over time the first language of Māori speakers began to shift from Māori to English. Certain features became characteristic of the way they spoke English and by the 1960s and early 1970s, researchers began to suggest that Māori English was a distinct variety of New Zealand English (Bender, 1971; Richards, 1970). Consequently, studies began to focus on the *differences* of Māori English, rather than the *deficiencies* of the way Māori people spoke English (McCallum, 1978; Holmes, 1982).

Since the term Māori English (ME) first appeared in the literature, several questions have been addressed by researchers:

(i) What is ME?
(ii) Who speaks ME?
(iii) Does ME exist?
(iv) What are the features of ME?
(v) What are the origins of the features of ME?

Section 1.1 of this chapter will review the findings related to each of these questions in order to provide the background to the question posed in Part One of the current study: Has the distinctive rhythm of modern ME developed from the mora-timed rhythm of the Māori language?

1.1.1 What is ME?

When the idea of Māori English was first introduced, it was defined in the context of other varieties of New Zealand English (NZE). Bender (1971, p. 47) suggested there were three varieties of NZE, of which "Māorified Colloquial English" was one variety or group of varieties, distinct from the Standard English and Colloquial English groups of varieties. Richards (1970, p. 124) however, postulated four varieties of New Zealand English: Pākehā English 1 (PE1), Pākehā English 2 (PE2), Māori English 1 (ME1) and Māori English 2 (ME2).

Of the two Māori English varieties, ME1 referred to the English spoken by high-status Māori, often used in formal occasions. This variety differed from the ME of today and the most common observation of ME1 was its "purity of vowels" (Richards, 1970). Very few other descriptions can be found and Richards himself called for further research into the grammatical, phonological and lexical features which distinguished ME from PE (p. 127). 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 the English of Māori Speakers (EM), which is not an interchangeable term. EM describes the multiple varieties of English spoken by ethnically Māori people. This broad term encompasses ME, but extends to the speech of Māori who do not speak ME. This includes modern 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. The English they spoke shared some of the features of ME, but was not the same variety as is spoken today.

1.1.2 Who Speaks ME?

Although the term Māori English seems to imply that it is the variety of English spoken by Māori, the distinction made in Section 1.1.1 between ME and EM indicates that the reality is more complex. 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, and this was confirmed by Szakay (2006), who found a significant correlation between speakers' Māori integration and their use of the distinctive syllable-timed rhythm of ME.

ME speakers also vary in their linguistic background. Most ME speakers are monolingual English-speakers (Benton, 1991) and although some speak Māori, very few claim to have 'native' fluency (King, Maclagan, Harlow, Keegan & Watson, 2011). ME speakers

converse more comfortably in English yet still want to mark their identity with Māoridom. 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)

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 (J. King, personal communication, March 15, 2012). This variation in use will be addressed in greater detail in Part Two of the current study.

1.1.3 Does ME Exist?

Although the existence of ME is presupposed in Sections 1.1.1 and 1.1.2, it was a subject of debate until quite recently. The issue was most notably addressed by Benton (1991, p. 195), who concluded that, "the evidence for the existence of Māori English as a distinct and stable (or at least autonomous) variety of New Zealand English is at best tentative and ambiguous."

Part of this ambiguity related to the issues described in section 1.1.2. ME was not spoken by all Māori and was not used in all contexts. It was typically used in informal settings with other ME speakers, which would have made it difficult for Pākehā, academic researchers to record reliable examples of this variety (King, 1993).

Additionally, there were no linguistic features which were used by *all* Māori English speakers that weren't also used by Pākehā English speakers. Benton (p. 196) suggested that ME might exist as an "inaudible form" with a different "figurative code", but "syntactically and phonologically indistinguishable" from PE. Holmes (2005) suggested that rather than being distinguished by specific features, ME varied from the standard

variety in the degree of usage of certain features. It is now widely accepted by researchers that ME does, in fact, exist.

Table 1.1: Features which have been suggested as being characteristic of current ME

Area	**Feature**	**References**
Phonology	Decentralisation of the KIT vowel	Bell, 2000
	Final /z/ devoicing	Holmes, 2005; Bell, 2000
	Fronting of the GOOSE vowel	Bell, 2000; Maclagan, King & Szakay, 2008
	Monophthongisation and onset fronting and raising of the GOAT vowel	Maclagan, King & Szakay, 2008
	Monophthongisation of the FACE vowel.	Maclagan, King & Szakay, 2008
	Omission of linking 'r'	Maclagan, King & Szakay, 2008; Starks & Reffell, 2005
	Stopping or affrication of [θ] and [ð]	Benton, 1965
Syntax	Deletion of auxiliary 'have' in 'have got'	Bell, 2000
Discourse	Frequent use of high rising terminals	Szakay, 2008; Bell, 2000; Holmes, 2005; Allan, 1990; Britain, 1992
	Frequent use of the tag 'eh?'	Bell, 2000; Meyerhoff, 1994
	Frequent use of 'y'know'	Bell, 2000
	Humour related to Māori understandings, especially distinctions between Māori and Pākehā	Holmes & Hay, 1997
	Minimal verbal feedback	Stubbe, 1998
	Non-explicit details in narratives	Holmes, 1998
Semantics	Use of Māori words in a broader sense than their usual English translation	Benton, 1985
	Use of metaphors related to Māori knowledge	Benton, 1985
Lexicon	Frequent use of Māori words	King, 1995; Holmes, 2005
Suprasegmentals/ Prosody	Higher mean pitch	Szakay, 2008
	Full vowels in unstressed syllables/ syllable-timed rhythm	Holmes & Ainsworth, 1996; Szakay, 2008

1.1.4 What are the Features of ME?

In the four decades since ME was first described, considerable changes have been observed in the features of ME. Some of the early features of ME have persisted and new ones have been formally identified in the literature, while others are no longer considered distinguishing characteristics. For example, unaspirated [t] was once a characteristic of ME, reflecting the Māori pronunciation (Holmes, 2005; Bell, 2000). However the influence of English means that /t/ is now more aspirated in Māori than it used to be (Maclagan & King, 2007) and is also more aspirated in ME. In addition to changes in phonology, some of the early syntactical features of ME, which were directly derived from the Māori language, have become less common, such as the use of plural –s with non-count nouns (e.g. some breads) and the use of the preposition 'on' when referring to vehicles (e.g. on the car) (Mitcalfe, 1967; Benton, 1965).

Despite the difficulties in producing a universally accepted, complete and definitive list of features of current ME, Table 1.1 presents a summary of the features which have been described in the literature.

Features derived from Māori language and culture:

According to Bell (2000), the close front KIT vowel in ME seemed to have developed directly from the Māori language, as it was only used by older speakers who had maintained fluency in Māori. Bell suggested that this decentralisation of the KIT vowel by a young ME speaker may have signaled a "revival of an ethnically marked feature" (p. 242). However, this suggestion was based on one speaker. An investigation with a greater number of Māori speakers showed that the KIT vowel has become more retracted and lowered for EM speakers over time (Watson, Maclagan, King, Harlow and Keegan, 2008). It is likely that the decentralised KIT vowel was a feature derived from the Māori language, which was lost due the influence of PE.

Final /z/ devoicing is another phonological feature which has been suggested as a feature of ME and this feature also seems to have its origins in the phonology of the Māori language. Holmes (2005) acknowledged the absence of voiced fricatives in Māori and explained:

> While the voicing of [z] is not likely to present a pronunciation problem for modern Māori, who almost universally learn English as a first language in the home, it is possible that the adoption of the voiceless variant as a symbol of Māori identity can be explained by the wider use of this variant by older Māori for whom English was a second language. (pp. 203-4)

It is suggested that the omission of linking /r/ is also related to the Māori language, as adjacent vowels are prevalent in Māori. Therefore, speakers of Māori do not perceive a need to introduce an /r/ to link them.

Turning to discourse features, the stylistic use of minimal feedback, omitting details in narratives and distinctive 'Māori' humour are cultural ways of marking the listener as part of the Māori community where common understandings are implied (Holmes, 2005, pp. 110-111). This cultural (rather than linguistic) background accounts for the origins of features such as the tag 'eh', the greater use of 'y'know' and the greater use of the high rising intonation contour.

It has been suggested that the tag 'eh' serves a similar function to the Māori use of 'nē' and therefore may be derived from this Māori word (Holmes, 2005). These tags seek to engage and maintain connections with the addressee. The greater use of 'y'know' by Māori compared with Pākehā speakers (Bell, 2000) is likely to serve the same purpose of establishing and maintaining links with the addressee throughout a conversation.

Britain (1992, p. 80) has identified a similar function for the use of the characteristic high rising terminal intonation pattern, frequently used by Māori speakers. He claimed that it is used to encourage the addressee to "participate vicariously and empathetically in the production of the talk" and that these high rising terminals emphasize "the in-group nature of the relationship between speaker and hearer." While the use of this intonation pattern is now also a feature of PE, it has been more commonly associated with Māori speakers since Benton (1965, p. 71) first observed this "distinctive rising intonation", in the speech of Māori children. Interestingly, the areas in which this feature was most commonly observed tended to be the areas where the children had "negligible" knowledge of Māori, indicating the cultural, rather than linguistic origins of this feature.

He also noted that in these areas, "any European children attending the schools seemed to follow the Māori children's speech pattern."

Regarding the origins of the semantic features of ME, the use of Māori words in a broader sense than their usual English translations is clearly dependent on an adequate level of proficiency in the Māori language. Similarly, this knowledge would be required to use and understand metaphors based on Māori knowledge.

The greater use of Māori lexical items is, self-evidently, derived from the Māori language. Holmes (2005) observed that Māori words are more commonly used when discussing Māori topics and King (1995) noted that the use of Māori words functioned as a solidarity marker, especially within the kōhanga reo movement.

Features which mirror developments in PE:

It was noted above that a retracted, lowered KIT vowel is not a distinctive feature of ME, but rather a feature of broader NZE, which includes the ME variety. Similarly, GOOSE vowel fronting mirrors comparable developments in PE (Watson, Maclagan, King & Harlow, 2008).

Features found commonly in international vernacular dialects:

The stopping or affrication of [θ] and [ð] are characteristic of many vernacular varieties rather than being specific to Māori (Benton, 1965), as is the deletion of the auxiliary 'have' in 'have got' (Bell, 2000).

Features with unknown origins:

While the origins of the phonological features of ME described above have been shown to derive from the phonology of Māori or to mirror similar PE changes, the origins of the monophthongisation of the GOAT and FACE vowels have not been identified. Similarly, the origins of the overall higher mean pitch, have not been established.

The origins of the distinctive syllable-timed rhythm of ME have been assumed, but not actually examined. This 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 Part One of the present study is to investigate the origins of the distinctive syllable-timed 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 of Māori speakers was Benton (1965), 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" (p. 71).

Other researchers have also paid some attention to the stress patterns of Māori speakers and links have been made between the greater use of full vowels (Holmes, 1997), the syllable-timed rhythm of ME (Szakay, 2008) and the mora-timed rhythm of Māori (Bauer, 1981). These relationships were summarised by Holmes (2005):

> [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. (p. 96)

It seems logical, therefore, that the syllable-timed rhythm of ME has its origins in the mora-timed rhythm of Māori. Holmes (1997, p. 94), found that a Māori newsreader, presenting in English on a Māori radio station, used more full vowels than the newsreaders on other Pākehā English stations. She 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." She suggested that this "direct and indirect contact with the Māori language experienced by Māori people" accounted for the syllable-timing of ME.

This assumption that the syllable-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 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 and many have learnt it from adults who, themselves, learnt Māori as a second language. Conversely, King (1993) reported that the 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 recordings of these speakers are the same recordings used in the present study.

The social context in which these speakers lived should be taken into account, although this does not entirely account for the apparent discrepancy between the use of syllable-timed speech and familiarity with the Māori language. In the 1940s when these recordings were made, the pervading attitude was that the variety of British English known as Received Pronunciation (RP) was considered the 'correct' way to speak. Prestige was accorded to other varieties based on the perceptual closeness to RP, and from a New Zealand perspective, the prestige of the varieties of NZE would have been ranked from PE1 at the top, followed by PE2 and ME1, with ME2 at the bottom (Richards, 1970, p. 125). ME1 was used in formal settings, often with a Pākehā audience, whereas ME2 was used in more casual settings, with a predominantly Māori audience. As the available recordings of the early Māori speakers were made for radio broadcast, which would have been heard by predominantly Pākehā listeners, it is likely that the speakers would have adopted a relatively formal, ME1 variety of speech. 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).

The effect of this context does not entirely account for the differences in rhythm between the recordings of the older Māori speakers and today's ME speakers. There were comparable effects in the recordings of the other groups of speakers as they also knew they were being recorded for the purposes of academic research by predominantly Pākehā researchers.

Therefore, a discrepancy remains. The syllable-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 syllable-timed rhythm is not related to fluency in Māori. Consequently, Part One of the current study addresses the question: Has the distinctive rhythm of modern ME developed from the mora-timed rhythm of the Māori language?

1.2 Introduction to Part Two

Part Two of the present study, like Part One, was concerned primarily with investigating the use of rhythm by Māori speakers. As a higher mean pitch was found to be another salient feature of ME, it was also considered in this part of the study. Part One investigated the use of rhythm patterns by different speakers, which can be labeled 'interspeaker variability'. This is contrasted with Part Two, which studied 'intraspeaker variability', or the variation that speakers make with the usage of linguistic features in different contexts.

When listening to the recordings in Part One of the study, it was clear that the speakers sounded 'more Māori' in some parts of the recordings compared with other parts. That is, the features of Māori English, described in Table 1.1, were more evident when the speaker was addressing some topics than others. The relationship between topic and the variation in use of linguistic features is the subject of Part Two of the current study. This is divided into the following sections in this chapter:

1.2.1: Audience design.

1.2.2: Exemplar theory.

1.2.3: Examples of studies of variation by topic.

1.2.4: The role of identity and affinity in variation by topic.

1.2.5: The present study.

1.2.6: Summary

While McLemore (1991) commented on the role of controversial topics in the interpretation of the meaning of a particular intonational contour, there have been no studies which have measured the effect of topic on prosodic features. Thus, the question posed in Part Two of the study is: Are rhythm and mean pitch influenced by topic?

1.2.1 Audience Design

Recipient design was first described by Sacks, Schegloff and Jefferson (1974), and was further developed into the audience design framework by Bell (1984). According to this theory, audience is the most important influence on intraspeaker variability. However, Bell explained that the degree of intraspeaker variation will never be as great as interspeaker variation (p. 158):

> Intraspeaker variation is a *response* to interspeaker variation, chiefly as manifested in one's interlocutors. The fact that style shift falls short of social differentiation…reflects the fact that speakers cannot match the speech differences of all their interlocutors – but they can approach them.

Bell devised a framework of intraspeaker variation (Figure 1.1), which is divided into responsive and initiative variation.

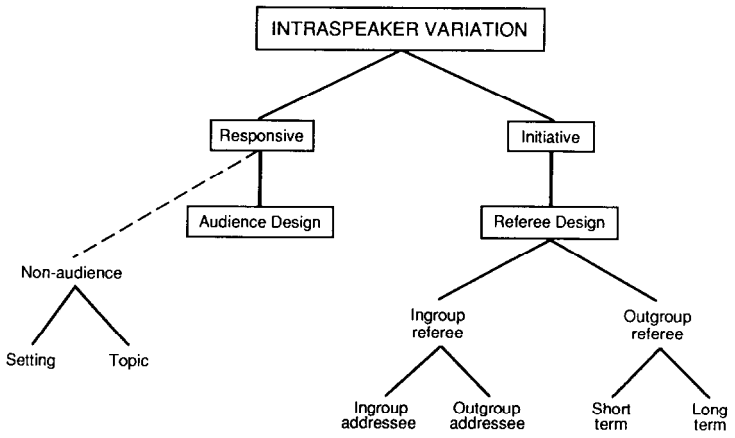

Figure 1.1: Response and initiative: categories and characteristics of audience and referee design (Bell, 1992, p. 327)

Bell (1984) argued that speakers switch their language or style to match that of their audience. He labeled any adaptations towards the style of the addressee, 'direct audience design' and observed that this convergent adaptation is the norm. He contrasted this with 'referee design', whereby the speaker adopts a different register to signify links to an absent group. He stated that divergence away from the addressee and towards an absent group is less common and is "always an initiative shift, a reaction against the addressee" (p. 185).

The effect of audience design on the use of dialects has been well documented in the literature. For example, Giles and Coupland (1991, p. 63) reported that addressee adaptation has been observed with "a wide range of linguistic/prosodic/non-vocal features including speech-rate, pausal phenomena, and utterance length, phonological variants, smiling, gaze and so on."

The audience may not only influence the (usually unconscious) decision by a speaker to select a particular code, but may also have more of an effect on some groups than others. Empirical evidence for this came from Holmes (1997) who compared Māori and Pākehā speakers' devoicing of final [z] in a formal interview setting and an informal conversational setting. Not only did Māori speakers devoice the final [z] sounds more often than Pākehā speakers, but they showed a greater difference between the two settings than the Pākehā speakers. Similarly, Douglas-Cowie (1978) found that vernacular speakers in Northern Ireland showed greater addressee-designed variation compared with the speakers of the more standard variety.

In the context of Bell's audience design framework, speakers have not only been observed to make linguistic shifts towards an audience or a referee, but also to show variation according to non-audience factors (Figure 1.1). He acknowledged that many such factors could influence style and summarised these into two main categories of factors: setting and topic. Bell noted that setting is an almost impossible variable to control, as a change in setting typically involves a concurrent change in audience and topic, but noted several studies which have been completed on variation according to topic.

Bell suggested that variation according to topic is a reflection of the variation made by speakers towards addressees. He made three hypotheses about variation according to topic, which were summarised by Rickford and McNair-Knox (1994) as follows:

(i) Variation according to topic … presupposes variation according to addressee.

(ii) The degree of topic-designed shift will not exceed that of audience-designed shift.

(iii) Speakers associate classes of topics or settings with classes of persons. They therefore shift style when talking on those topics or in those settings as if they were talking to addressees whom they associate with the topic or setting. (p. 25)

Rickford and McNair-Knox then tested these hypotheses against data they had collected from recorded interviews with Foxy Boston, a pseudonym for an African American teenaged girl. They had recorded two language samples, eight months apart with three different interviewers. Investigations of five variables of African American Vernacular English (AAVE) from these recordings supported all three hypotheses. Referring to the first hypothesis, they noted variation by addressee in Foxy's use of these variables, which was consistent with the variation Foxy made by topic. The second hypothesis was not initially supported, due to the effect of outliers. After topics with fewer than thirty tokens of the variables were eliminated, the degree of topic-designed shift in the remaining topics supported the hypothesis. The data regarding copula use supported the third hypothesis; Foxy showed greater use of zero copula and invariant *be* (features associated with AAVE) when discussing peers and relationships (e.g. wives and slamming partners) compared with more formal topics (e.g. school, college/career plans). This reflected the situations she was recounting, as her speech would have been more vernacular when conversing with her peers and more standard when speaking to a teacher or employer.

Rickford and McNair-Knox also noticed some other aspects of Foxy's communication style, which differed when comparing the most formal with the most vernacular topics. When talking about education and career, she used a "detached information-presenting style, the kind that one might use when talking to a teacher or a stranger" (p. 261). When discussing wives and slamming partners, the most vernacular of her topics, Foxy was

more animated and frequently used quotes. In this way, Rickford and McNair-Knox commented that, "Foxy is not just behaving *as if* speaking to teenagers; she is, through extensive quotations, dramatically reenacting the speaking *of* teenagers" (p. 261). These concepts of formality and its relationship with solidarity and distance will be discussed in more detail in Section 1.2.4. The influence of quotes on rhythm and pitch will also be considered in the results of Part Two of the current study, as detailed in Section 7.2 (iv).

1.2.2 Exemplar Theory

Put simply, audience design theory explains what people do in relation to variation by topic, and to what degree. Exemplar theory, on the other hand, can be seen as explaining the cognitive linguistic processes involved in variation. Pierrehumbert (2001) described the application of this theory from the field of psychology to the study of linguistics and explained that while it was initially only a model of perception it was later extended to include production. According to the perception aspect of this theory, every heard token of a particular phoneme or word is stored as an exemplar. Pierrehumbert noted that exposure to these tokens must also be accompanied by cognitive factors, such as attention and memory, in order for the token to be stored. These stored exemplars combine to form a cognitive 'map', with more similar exemplars stored more closely together. In this way, phonemes are represented by cluster areas with higher densities of tokens. Thus, in the perceptual model, when an acoustic signal is heard, the perception of the sound as one phoneme or another is calculated based on the high density cluster it is most similar to.

As the acoustic signals vary between people of different genders, ethnicities, age and social status, listeners store different overlapping 'clouds' of exemplars for each variation and index these exemplars to the related social information. Hay and Drager (2010) demonstrated how listeners use external cues to aid interpretation of the KIT vowel. The presence of a stuffed kangaroo or koala or a stuffed kiwi in the room activated the concepts of Australia or New Zealand and led the listeners to interpret the sounds as if they were produced by an Australian English speaker or a New Zealand English speaker. In perception, therefore, the listener uses both the acoustic signal and the context of social information to identify the most likely exemplar.

In production, the speaker draws on this correlation between stored social information and exemplars. Pierrehumbert explained that "each listener perceives and categorizes the speech produced by others. When it comes to be their turn to speak, they adopt the familiar patterns as production goals" (p. 517). This corresponds to the audience designed shift described by Bell. The listener takes in the social information about the speaker, compares this with the information indexed to the exemplars being used and then attempts to replicate these patterns.

Pierrehumbert (2006) explained that a speaker must have more than just exposure to the linguistic features in order to include them in their stored distribution of exemplars for production. Affinity is also a necessary factor:

> The cognitive and social systems are tied to each other … by the role of social affinity in language learning. Although detailed quantitative longitudinal data on language learning are not available, qualitative results appear inconsistent with the hypothesis that sheer frequency of exposure is sufficient to explain the acquisition of socially differentiated patterns. Nobody can learn patterns in the absence of relevant exposure, but with such exposure, acquisition appears to depend on social identification. (p. 527)

While variation according to topic has not been addressed in the exemplar theory literature, one can extrapolate. In the same way that the presence of a stuffed toy in the room influenced the set of exemplars that the listener used to interpret the acoustic information, the reference to a particular person, time or place in a topic may also influence the set of exemplars that a speaker is drawing from in their production. Equally, it could be considered that topic itself is an environmental factor which would influence the set of exemplars used. For example, a speaker may consider it more appropriate to use a more formal register when discussing a formal work-related topic than when relating gossip.

1.2.3 Examples of Studies of Variation by Topic

Both Bell's audience design framework and exemplar theory provide a theoretical background to intraspeaker variation in a broad sense. Specifically focusing on variation

according to topic, Giles and Powesland's (1975) review of studies in this area concluded,

> ...an individual tends to modify his language, dialect, utterance length, speech rate and so forth, according to the topic he is speaking about, the context in which [he] speaks and the mood in which he finds himself. (p. 135)

These and other linguistic features have been studied with a specific focus on variation by topic. An outline of these studies and their findings is summarised below.

Code-shifting or style-shifting:

Bell (1984) noted that bilingual code-switching was too limited by addressee to be as affected by topic as monolingual code-switching is, but remarked, "We can expect, however, that bilinguals may style-shift within one or both of their languages in response to topic change." (p. 180). Interestingly, in the present study, some code-switching did occur in some topics, due to the bilingualism of both interlocutors in the interviews.

Mean utterance duration:

Giles and Powesland (1975) reviewed a number of studies and concluded that speakers used longer utterances when discussing topics which had a higher degree of saliency for them.

Lexical selection:

How efficiently information can be transferred is a factor underlying the selection of register according to Lee (1992). He argued that meanings are not fixed and that certain ideas can be better (or only) expressed through a particular register or code. This relates to Holmes' (2005, p. 98) observation that "there is more Māori vocabulary in the Māori interactions than the Pākehā. But it is equally true that 'Māori topics' are more frequent in these interactions." She further observed that the meanings of some words in Māori, such as *tapu, tangi, mana* and *wairua* are more complex than their common English translations of 'sacred', 'funeral', 'prestige' and 'spirit' respectively, imply.

Phonology:

Gordon, Campbell, Hay, Maclagan, Sudbury, & Trudgill (2004, p. 182) found a greater use of post-vocalic /r/ by New Zealanders born in 1851-1904 in words associated with mining and farming. They found that post-vocalic /r/ was a feature used more by New Zealanders born in 1851-1875 than those born in 1875-1904, and these topics were more associated with the old lifestyles of early settlers.

Register:

Blom and Gumperz (1972) demonstrated that for a group of bilinguals in Norway, a change in topic resulted in code-switching between the phonology, lexicon and syntax associated with the two local varieties.

In Douglas-Cowie's (1978) study, described earlier, the speakers' use of phonological and lexical vernacular features were measured both when speaking to each other and when speaking to an unfamiliar English interviewer. She found that talking about topics other than occupation and education increased the use of the vernacular features.

1.2.4 The Role of Identity and Affinity in Variation by Topic

The common theme connecting these studies is that speakers vary their style by topic to reflect the style that would be appropriate for the interlocutors in the context being described. The formality of the situation, the time period being described and, perhaps most importantly, the referents involved in the topic are all influences on the register used. It has also been argued that the styles used by the interlocutors in the context being described will only be reflected by the speaker if there is a degree of identity with or affinity towards these influences.

The relationship between identity and register has already been alluded to in the discussion of audience design and exemplar theory. Bell's (1984) observation that speakers accommodate towards their audience indicates that speakers are trying to establish a commonality. When speakers accommodate towards an absent referee, Bell reported that this is a reaction against the addressee. In this way, speakers are exaggerating the differences between themselves and their addressees. Bell argued that

variation by topic is derived from variation by audience. Speakers use a style appropriate to the addressee associated with a given topic. Therefore, it is not only important to know the style used by the referent, but also the speaker's attitude towards the referent and whether the speaker identified with the referent or not.

Pierrehumbert (2006) also noted that affinity is a necessary condition for the acquisition of linguistic patterns, particularly those associated with different social groups. Speakers who identify with particular social groups are likely to try to match their production to the exemplars produced by other members of the groups. Equally, these speakers will identify with the various environmental settings in which they associate with these groups and will modify their speech production in accordance with the various exemplars produced by the group members in those environments. It is possible, and in fact likely, that speakers identify with more than one social group, and therefore, will draw from a different set of exemplars based on which is most appropriate at any given time.

Coupland (2001, p. 200) argued that speakers construct their social and personal identity through their speech and he labeled this construction 'dialect styling'. He concluded that the communicative purposes of dialect style were, "primarily in the expression of *identity and relational goals*" (p. 190, emphasis in original). In reference to Bell's audience design framework, he argued that speakers not only adapt towards an addressee or a referee, but also to their own self-perceptions of their identity "with different degrees of confidence and plausibility". This projection of self-perceptions of identity was demonstrated in Douglas-Cowie's (1978) study. She studied speakers from the same community within Northern Ireland, but was aware that some speakers were described as "more socially ambitious" than others. These speakers linguistically distanced themselves from the other members of the community through their limited use of the vernacular. Through their use of a more standardised form of speech, they were demonstrating their affinity with what they perceived as a more prestigious group, who used a more standardised variety of English.

In his discussion of relational goals, Coupland referred to the work on solidarity vs distance by Brown and Levinson (1978) and Holmes (1990). Brown and Levinson argued that speakers can show solidarity towards their addressee through the use of what they

term ‘positive politeness’, such as sharing friendly greetings. Conversely, speakers can socially ‘distance’ themselves from their addressee through the use of ‘negative politeness’. That is, treating someone the speaker knows well with the politeness that might be accorded a stranger. In this way, speakers choose their code not only to reflect the setting, but also to create a setting. Giles and Powesland (1975) reported that the formality of a topic could be manipulated by speakers in order to effect a shift in register, as reflected in syntax and phonology. In most studies, formal topics have generally included references to work or education, while informal subjects have generally related to gatherings with peers.

Holmes explained how these shifts can occur within an interaction, through her quadrant model (Figure 1.2). She based this model on Brown and Levinson’s concepts of positive and negative politeness (the ‘affective axis’) considered against the informative purpose of the speech act (the ‘referential axis’).

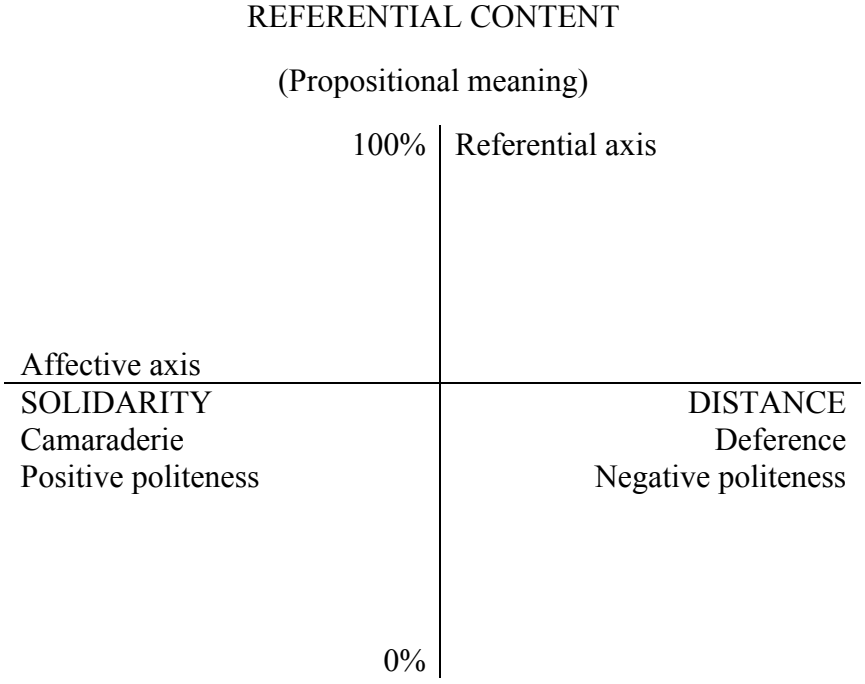

Figure 1.2: Model of Interaction (Holmes, 1990, p. 254), in which the vertical axis represents the amount of information conveyed and the horizontal axis represents the degree of solidarity or distance expressed.

In a given interaction, a speaker may move from one quadrant to another, for example a boss may start with a friendly greeting (i.e. lower left quadrant: low content, high positive politeness) then move on to a request for a specific item of work to be completed (i.e. upper right quadrant: high content, high negative politeness). By adjusting their style, speakers can realise their objectives with regard to creating solidarity or distance and to transferring information.

1.2.5 The Present Study

The literature indicates that subject, referent, time, location and attitude are all potential influences on variation by topic and these will be investigated in Part Two of the present study. The recordings of the Tūhoe Kaumātua[2] speakers used in Part One of the study will be analysed in greater detail for Part Two of the study.

Bell's hypotheses, as summarised in Rickford & McNair-Knox, were considered in relation to the present study. These were:

(i) Variation according to topic … presupposes variation according to addressee.

(ii) The degree of topic-designed shift will not exceed that of audience-designed shift.

(iii) Speakers associate classes of topics or settings with classes of persons. They therefore shift style when talking on those topics or in those settings as if they were talking to addressees whom they associate with the topic or setting.

With regard to the first hypothesis, variation in the use of rhythm and pitch in ME has not been formally investigated and it is possible that there may be no meaningful intraspeaker variation in mean pitch. Breitenstein, van Lancker and Daum (2001), showed that listeners associate highly variable pitch with different emotions from those they associate with minimally variable pitch. Pitch is also likely to vary in order to mark emphasis or questions. With regard to rhythm, however, Benton (1991, p. 196) observed that the use of ME, and therefore, possibly, the use of a syllable-timed rhythm, as the most salient

[2] Kaumātua is the Māori term for tribal elders, held in high esteem by members of the iwi (tribe). These particular kaumātua belong to the Tūhoe iwi whose land encompasses parts of the eastern Bay of Plenty, specifically around the Urewera Ranges.

feature of ME, varies, "according to the setting... It would more commonly be encountered in settings in which most or all of the interlocutors were Māori, than where the majority were Pākehā." This adaptation towards the addressee was also evident in the speech of a young Māori male whose speech was analysed in Part One of the present study. He was observed to use a more syllable-timed rhythm with a Māori male than he did with a Pākehā female.

In terms of degree of topic-designed shift, it is not possible to compare this against the degree of audience-designed shift, without formalised measurements of the audience-designed shift. We can, however, assume that any topic-designed shift is likely to be reasonably subtle. It should be remembered that the interviewer in all four recordings used in Part Two was a Pākehā female, and the interviews were conducted in the speakers' homes. Bell explained that "incongruencies of addressee with setting or topic will thus operate very like incongruencies among addressee, auditor, and overhearer. Their conflicting demands may be more than the speaker can satisfy." (p. 181). Consequently, the effect of interviewer and setting cannot be underestimated on the degree of variation by topic.

The third hypothesis indicates that the addressee related to the topic is likely to have the greatest influence on any variation by topic. Since accommodation towards the addressee is the norm, it can be assumed that variation by topic would usually signify an accommodation towards the addressee in that topic. The work of Pierrehumbert suggests that this would only be the case if the speaker felt a degree of affinity towards that addressee. The work of Coupland also indicates that the speaker's self perception of identity may influence their adaptation towards the referent of the topic.

The perceived formality of a topic is also likely to influence the speakers' choice of register. In the context of the present study, however, this is more difficult to define, since the traditionally more formal topics, such as career, and the traditionally less formal topics, such as interactions with peers, do not necessarily hold for this population. The careers of these particular speakers include farming and loading freight at the docks and these work environments might be considered less formal than, for example, spending time on the marae, which involves adherence to formal protocol.

Other influences on variation by topic, which may affect this population differently to other groups, include time and location. With regard to time, it is likely that a reference to the speaker's childhood will evoke an incident in which not only the speaker but also all of the interlocutors involved, were Māori-speaking.

Location is also particularly relevant to this population, due to the geographical factor in language use for the Tūhoe Kaumātua. These kaumātua are all originally from the Ruātoki Valley, which is a unique linguistic environment in which Māori continues to be the community language especially for adults approximately forty years or older (J. King, personal communication, April 20, 2012). Only a few kilometers away, this linguistic environment changes to reflect the environment of many other Māori communities, in which English is the language used in almost all interactions and the Māori language contexts are restricted. Exemplar theory would suggest that bilingual speakers would be more likely to speak Māori in the Ruātoki Valley than in neighbouring areas. There is also a possibility that the speakers may select exemplars more similar to the Māori language when speaking in English about an event which occurred in the Ruātoki Valley.

1.2.6 Summary

Topic has been shown to influence phonology, syntax and lexicon, however the effect on prosody has not been investigated. Variation in prosody in relation to addressee and setting has been demonstrated (Giles & Coupland, 1991), and therefore, according to Bell, it would be expected that similar variation would be seen in topic changes, albeit to a lesser degree.

The influences on linguistic variation according to topic, have included subject and time (Gordon et al., 2004), formality of subject matter (Douglas-Cowie, 1978; Giles and Powesland, 1975) and referent (Rickford & McNair-Knox, 1994). There are also indications that identity and affinity would be influencing factors. Accordingly, it is hypothesized that the following topics would have the potential to influence the prosody of the EM speakers, with the predicted effect being a more syllable-timed rhythm and possibly a higher mean pitch:

- Talking about Māori language.
- Talking about distinctive aspects of Māori culture, such as spending time on the marae.
- Talking about issues the speaker's iwi has with outside groups.
- Talking about events that took place in the Ruātoki Valley.
- Talking about a time when the speaker was using Māori or ME or was interacting with other Māori.
- Talking about topics where the speaker indicates affinity towards a group of Māori.

In summary, the research focus for this study is: The English of Māori speakers: changes in rhythm over time and prosodic variation by topic. This is divided into two parts, the first of which addresses the question: Has the distinctive rhythm of modern ME developed from the mora-timed rhythm of the Māori language? Part Two addresses the question: Are rhythm and mean pitch influenced by topic? The investigation of these two questions will be described in the following chapters:

Chapter 2: Background information about the various measurements used in both Part One and Part Two of the present study.

Chapter 3: The methodology specific to Part One.

Chapter 4: The results of Part One.

Chapter 5: A discussion of the results of Part One.

Chapter 6: The methodology specific to Part Two.

Chapter 7: The results of Part Two.

Chapter 8: A discussion of the results of Part Two.

Chapter 9: Conclusion.

CHAPTER 2

BACKGROUND TO RESEARCH METHODS

2.1 Speakers and Recordings (ONZE and MAONZE projects)

The Origins of New Zealand English project (ONZE: Gordon, Maclagan & Hay, 2007) has gathered a corpus of New Zealand English speakers, from those born in 1851 to modern speakers. The earliest speakers were recorded by the Mobile Unit (MU) from 1946 to 1948, on behalf of the New Zealand National Broadcasting Service for the purpose of radio broadcast. The subject of the broadcast was recollections of early settler life in New Zealand and the speakers were recorded in a variety of contexts: independently or in groups, formally reading from notes or informally in spontaneous conversation.

A second group of speakers formed the Intermediate Archive (IA). These speakers were born between 1890 and 1930 and were recorded in the 1990s by four different groups of researchers. These recordings consisted solely of individuals engaged in spontaneous speech.

The Canterbury Corpus (CC) forms the most recent group of recordings. These were collected annually between 1994 and 1997 by students in the LING 303 course (New Zealand English) at the University of Canterbury. This group comprises a balanced mixture of gender, age and socio-economic groups. Each speaker's recording includes the reading of formal word lists and approximately half an hour of spontaneous speech.

The Māori and New Zealand English project (MAONZE: King et al., 2011) was developed as a sister project to ONZE. The recordings of all ten male Māori speakers from the MU group formed the foundation of this project, whose primary aim was to investigate the change in pronunciation of the Māori language over time.

In the initial stages of the MAONZE project, recordings in Māori and English were made with two further groups of men; the elder, or kaumātua group (K) and two young groups, L1Y (first language Māori) and L2Y (second language Māori). There were approximately fifty years, or two generations, between each group of recordings, resulting in a total span in birth years of approximately one hundred years[3]. The next group of recordings came from women who were matched as closely as possible to the men in terms of tribal background, year of birth and Māori language background. The most recent group to be added to the corpus is the Tūhoe kaumātua group (TK). This corpus comprising recordings in Māori and English with five men and five women from the Tūhoe tribe was compiled because of the speakers' background of living 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).

2.2 Transcriptions

The MU recordings were made on fourteen-inch acetate disks, while the more recently added recordings were either acquired on CD from the Radio New Zealand Sound Archives / Ngā Taonga Kōrero, on DVD from the TVNZ archive or recorded digitally by the MAONZE team. LaBB-CAT (http://onzeminer.sourceforge.net/) was developed by Fromont and Hay (2008) and provides on-line access and search functions for the ONZE recordings in .wav form. An equivalent database was developed for the MAONZE recordings, known as MAONZE Miner. Both the LaBB-CAT and MAONZE databases can be accessed and searched by bona-fide researchers with links to either project.

The first step in the transcription process was time-aligning the recordings using the 'Transcriber' software (http://trans.sourceforge.net/en/presentation.php). These transcriptions were language-tagged at this stage in order to facilitate accurate

[3] There is a real time difference between the MU speakers and the TK and K speakers because they were recorded 50 years apart. However, there is an apparent time difference between the TK and K speakers and the Y speakers because they were recorded at the same time. Any differences found between the MU speakers and the TK and K speakers will indicate genuine changes over time but any differences found between the TK and K speakers and the Y speakers may actually underestimate the differences that will exist when the Y speakers are the same age as the TK and K speakers.

interpretation of the written Māori words at the later forced-alignment stage. For example, in English speech, the word ‘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/. Topic tags were also added to the TK recordings at this stage for Part Two of the study.

The transcripts were then loaded onto MAONZE Miner, which also converted the transcriptions into textgrids using Praat version 4.125 or higher (Boersma & Weenink, 2009). The textgrids were constructed with tier-levels for phrases, topics (in Part Two) and words (Figure 2.1).

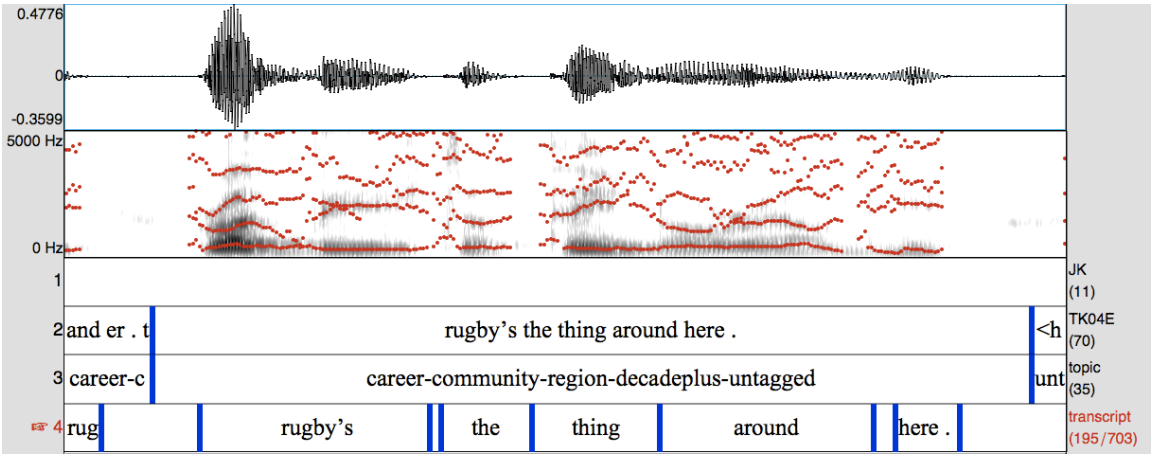

Figure 2.1: Textgrid with speaker, topic and transcript tiers.

The conventional spellings in these textgrids were interpreted using LaBB-CAT’s on-line dictionary (developed from the CELEX database: Baayen, Piepenbrock & Gulikers, 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/). These phonemes were transcribed using the DISC conventions from the CELEX database to enable consistent appearance across users’ different keyboards. This alignment of the sound file and phonemic transcript generated the ‘segment’ tier when the transcripts were converted again into textgrids (Figure 2.2). 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, although a separate Māori dictionary has not yet been developed which would allow for automatic phoneme alignment in Māori language recordings. The first steps are, however, being made towards this (King et al., 2011). In the current study, any Māori words or sentences were aligned according to 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 (NZILBB).

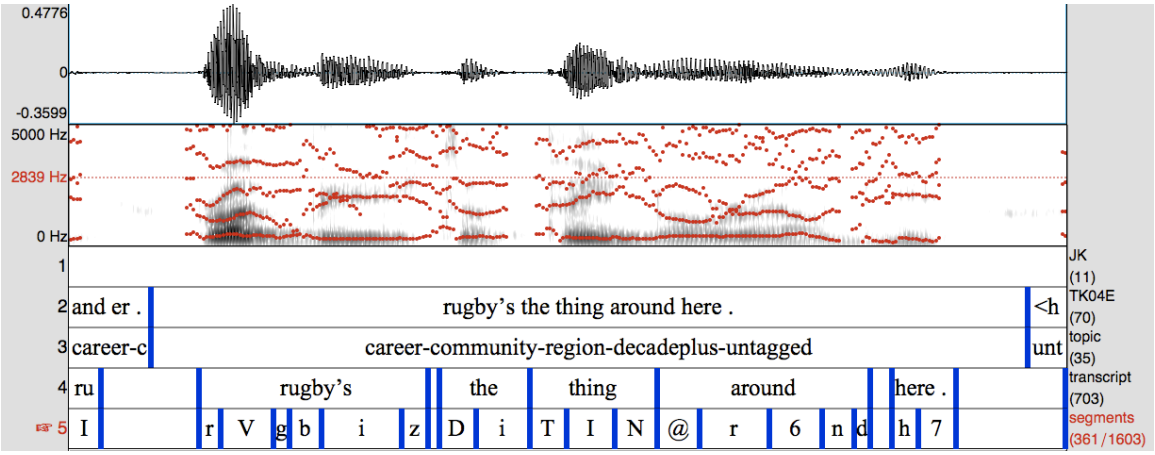

Figure 2.2: Textgrid with speaker, topic, transcript and segment tiers.

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 phonemic boundaries and removing the coding for any unwanted noise or speech at the segment level, so it would not be analysed (see Table 2.1). The corrected textgrids were then reloaded to the MAONZE database.

2.3 Measuring Rhythm

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.

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 and 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.

Table 2.1: Segments omitted from hand-corrected textgrids.

Omitted	**Reason**
Fillers, e.g. 'ah', 'um'	Non-words are likely to affect the speaker's rhythm.
Extended words when the speaker was thinking of what to say.	Extended words are likely to affect the speaker's rhythm.
Part words, such as 'th~' in: "th~, that one"	Part-words are likely to affect the speaker's rhythm.
Sentences of Māori (but not single words such as 'Pākehā' or short phrases familiar to most NZE speakers such as 'kura kaupapa Māori'). Also extended reports of whakapapa containing multiple Māori names.	The focus of this study is on ME, not Māori.
Words containing overlapping speech	The other speaker's voice interferes with the target speaker's phoneme boundaries, which cannot be separated by the HTK toolkit.
Laughter, coughing or background noise (e.g doors slamming)	Non-speech sounds are irrelevant to this study of speech rhythm.
Words fully or partially overlapping with above non-speech noises	The noises interfere with the speaker's phoneme boundaries, which can not be separated by the HTK toolkit.
Non-words such as 'ra ra ra'	Non-words are likely to affect the speaker's rhythm.

Based on this observation, Grabe and Low focused on the variability in vowel length in order to measure the syllable- or stress-timed nature 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

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

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.

This is particularly relevant in the context of Māori English. While PE is generally considered to be more stress-timed and ME more syllable-timed there is currently a general trend towards more syllable-timed speech in PE, especially among younger speakers (Nokes & Hay, 2012). Despite this shift for PE speakers, rhythm remains the main distinguishing characteristic of ME (Szakay, 2008). nPVI is, therefore, an ideal method for measuring the relative differences between the English speech of different generations of Māori speakers and between sections of speech within a particular speaker's recording. While the reliability of nPVI has been questioned as a comparative measure between languages, it is an accepted means of comparing rhythm within a given language (Arvaniti, 2009).

The Praat script[4] used in the present study to measure nPVI differs from the traditional method documented by Grabe and Low (2002), which measured the variability between adjacent vowel intervals. In this method immediately adjacent vowels, for example in the word 'doing', were grouped together in one vowel interval, transcribed as 'CVC'

[4]These scripts were kindly developed by Jacqueline Nokes, Manager of ONZE and PhD student at the University of Canterbury.

(Consonant-Vowel-Consonant, Tier 6 in Figure 2.3). Similarly, 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, which measured the variability between adjacent separate vowels. Using the example above, and based on the DISC phonemes, Tier 5 in Figure 2.3 shows that 'doing' was transcribed as 'duIN' (/duɪŋ/) and 'we're actually' was transcribed as 'w7{kJ@lI' (/wɪəæktʃəlɪ/).

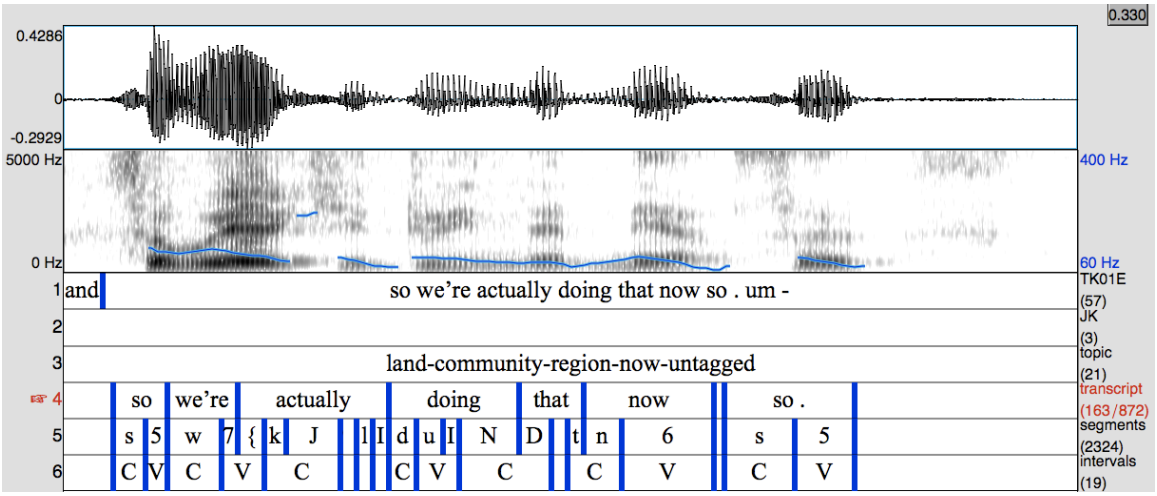

Figure 2.3: Textgrid with DISC phonemes marked on the segments tier and traditional CVCV intervals marked on the intervals tier.

The values in Grabe and Low's charts of other languages and dialects are calculated using intervallic nPVI and therefore they cannot be compared against the values generated using the segmental nPVI calculations. However, due to the substantial increase in ease and efficiency provided by forced-alignment, it is highly likely that intervallic calculations will be universally replaced by segmental 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.

Part One of this study uses segmental nPVI as the most efficient means of comparing the rhythm of multiple recordings from several speakers. Part Two compares both segmental and intervallic nPVI values.

2.4 Measuring Mean Pitch

Part One of the current study is concerned with the origins of rhythm and therefore mean pitch was not calculated for these speakers. The aim of Part Two is to identify topics associated with 'more Māori' speech, which would not only be characterised by a lower nPVI, but also by a higher mean pitch (Szakay, 2006).

Two methods were used for measuring mean pitch in Part Two. For the topic tagged sections, a Praat script was used which found the mid-point pitch value for each vowel. Excel was used to average these values for each topic tag or combination of topic tags being investigated.

For the other calculations, which included overall mean pitch for each speaker and mean pitch for quotes, the 'Get pitch' function in Praat was used to obtain an average pitch level for the whole of the relevant stretch of speech. The formant tracker errors, as seen with the 'J' phoneme in Figure 2.3 above, occurred very infrequently. There was no apparent effect on means or standard deviations (see Tables 6.2 to 6.5) and therefore no attempts were made to correct them.

CHAPTER 3

PART ONE METHODOLOGY

3.1 Speaker Selection

For Part One of this study, groups of Māori (EM) and Pākehā (PE) speakers 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).

In Section 3.1.1 the rhythm of Māori speakers 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 3.1.2 the speech of each group of Māori speakers will be compared with age-matched Pākehā speakers. 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 (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'.

3.1.1 EM Speakers

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. The K speakers had a comparable background to the MU

speakers in their youth, having grown up in rural, Māori-speaking areas. However, 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 quite a different experience. For these speakers, who spent most 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. While the L1Y group also learned Māori as a first language alongside English, these speakers' degree of socialisation in Māori is notably less than that of the older groups (MU, K and TK). In some homes, only the speakers' grandparents were L1 speakers of Māori, while their parents were L1 speakers of English. Throughout their lives, the L1Y group of speakers have needed fluency in English in order to participate with the wider community beyond their family and school. The L2Y group, in contrast, learned English first and Māori as a second language. 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 (J. King, personal communication, March 30, 2012). The linguistic backgrounds of the L1Y and L2Y speakers (collectively known as Y speakers) is representative of the background of many EM and ME speakers today.

Twelve speakers were selected from the MAONZE corpus. The four TK speakers analysed in Part Two of the present study 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 3.1.

Table 3.1: 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

Each speaker was interviewed in Māori and English, for approximately 45-60 minutes in each language. Each recording was divided into sections of approximately five minutes, with breaks occurring in the speakers' natural pauses. After transcription in Transcriber, textgrids were created in Praat to enable analysis.

The focus of the current study is EM, rather than Māori, 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. Accordingly, only the textgrids listed in Table 3.2 were selected for each speaker, while those consisting primarily of Māori language or read material were omitted.

Table 3.2: Textgrids containing spontaneous, predominantly English speech for EM speakers.

Speaker	Text grids selected	Time analysed
MU01E	MU01E-02, MU01E-03	10 min 52 sec
MU05E	MU05E-01, MU05E-03	10 min 53 sec
K01E	K01E-01 to K01E-05	28 min 11 sec
K05E	K05E-01 to K05E-05	24 min 24 sec
TK01E	TK01E-02 to TK01E-14	52 min 53 sec
TK02E	TK02E-02 to TK02E-12	44 min 36 sec
TK03E	TK03E-02 to TK03E-13, except TK03E-11	43 min 57 sec
TK04E	TK04E-02 to TK04E-15, except TK04E-14	50 min 44 sec
L1Y01E	L1Y01E-02 to L1Y01E-06	14 min 21 sec
L1Y03E	L1Y03E-02 to L1Y03E-07, except L1Y03E-04	26 min 16 sec
L2Y01E	L2Y01E-01 to L2Y01E-05	29 min 15 sec
L2Y02E	L2Y02E-01 to L2Y02E-04	25 min 55 sec

3.1.2 PE Speakers

In order to draw conclusions about the use of syllable-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[5]) as part of the ONZE project, and this greater number of speakers was used to enable a

[5] Permission to use these data was given by Jacqueline Nokes and Jennifer Hay of the ONZE project.

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 MU, Intermediate Archive (IA) and Canterbury Corpus (CC) groups from the ONZE database (Gordon, Maclagan & Hay, 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.

Table 3.3: 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			mon95-1a	1932	1995	63		myp01-7a	1980	2001	21
TC	1876		mon94-	1934	1994	60		myp02-7	1980	2002	22
TM	1876		mon94-	1935	1994	59		myp05-4	1980	2005	25
JS	1876		mon99-	1937	1999	62		myp99-16b	1979	1999	20
HS	1877		mon95-7b	1939	1995	56		myp00-1b	1978	2000	22
CK	1877		mon94-	1940	1994	54		myp02-6b	1978	2002	24
JD	1880		mon97-7a	1940	1997	57		myp99-25	1978	1999	21
GW	1884		mon99-1b	1940	1999	59		myp00-18a	1973	2000	27
VY	1885		mon94-	1942	1994	52		myp03-7c	1973	2003	30
RT	1887		mon98-	1942	1998	56		myp95-20a	1973	1995	22
AW	1888		mon01-2b	1943	2001	58		myp99-27	1973	1999	26
			mon01-14	1944	2001	57		myp95-17	1972	1995	23
			mon94-	1944	1994	50		myp96-4	1972	1996	24
			mon02-15	1945	2002	57		myp96-7b	1972	1996	24
			mon95-	1945	1995	50		myp01-16a	1971	2001	30
			mon95-	1946	1995	49		myp98-9b	1971	1998	27
			mon98-	1946	1998	52					
			mon03-5c	1947	2003	56		**IA**			
			mon95-4b	1947	1995	48		BG	1924	1995	71
			mon99-3	1947	1999	52		GG	1924	1993	69
			mon97-	1948	1997	49		LA	1926	1993	67
			mon00-16	1949	2000	51		SF	1928	1994	66
			mon95-15	1949	1995	46		JW	1929	1993	64
			mon99-14	1949	1999	50					

The details of the PE speakers are provided in Table 3.3. The year of recording was not available for the MU speakers, so these are not included in the table. They were recorded between 1946 and 1948, therefore their ages at the time of recording ranged from 58 to 72 years.

CHAPTER 4

PART ONE RESULTS

The question posed in Part One of the present study is: Has the distinctive rhythm of modern ME developed from the mora-timed rhythm of the Māori language? Two aspects were investigated in order to address this question. 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 4.1 shows the mean nPVI of the EM speakers arranged in chronological order, by year of birth. This shows a general trend of lower nPVI values over time, with some notable exceptions.

Perceptually, it was noted in the recordings that the speech of L2Y01E sounded the least like ME and was the most PE-like of the speakers in the two Young groups. This perception was reflected in the results which showed that his speech was less syllable-timed than that of the other Young EM speakers. It was observed that L2Y01E's speech when recorded speaking over the phone to another Māori male during the recording, was notably more syllable-timed than when speaking with the female Pākehā interviewer. This addressee effect has been widely reported in the literature and will be examined in more detail in Part Two of this study. What is evident, however, is that the addressee effect was greater for this speaker than the other L2Y speaker. King (1993, p. 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.

Table 4.1: 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

Although the trend is not statistically significant (R^2=0.45554) the shift towards a more syllable-timed rhythm is shown in Figure 4.1. The three speakers with the highest nPVI values were MU01E, K01E and K05E. The social histories of these speakers indicate that they had more interaction with PE speakers than their age-matched peers.

The speakers were grouped together in order to make comparisons between their different linguistic backgrounds (Table 4.2). 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 two K speakers. What is most notable is the comparison between the Kaumātua and Tūhoe Kaumātua groups, who were born at similar times. The Kaumātua group's significantly higher nPVI ($t = 5.38$, $df = 4$, $p < .01$) 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. The

rhythm of the Tūhoe Kaumātua speakers, by contrast, is similar to the whole groups of young EM speakers (t = 1.70, df = 6, p = .07). Since the TK speakers have had comparatively little interaction with PE speakers, their rhythm provides a link between the rhythm of today's young EM speakers and older EM speakers.

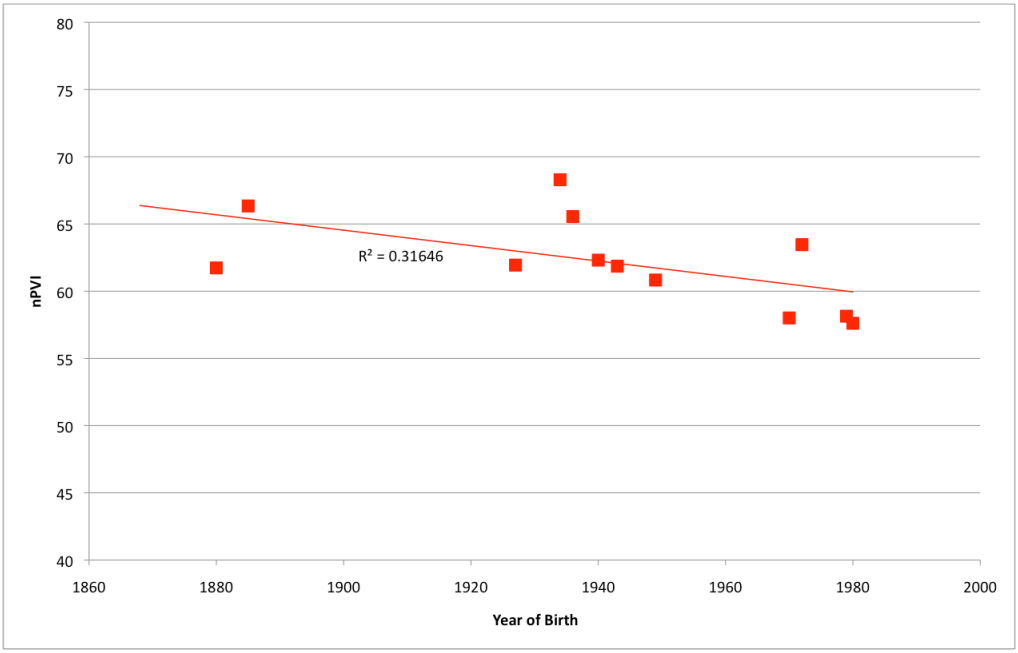

Figure 4.1: Scatterplot showing nPVI of EM speakers over time with trend line and R^2 regression shown.

Table 4.2: 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 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 results for L2Y02E contrast with Holmes and Ainsworth's (1996) finding that syllable-timing is more prevalent among Māori who have greater contact with the Māori language. A greater number of speakers would need to be investigated in order to establish if contact with the language or integration in Māori society would be a more significant predictor of the use of ME (See Szakay, 2008 for a discussion of the use of a Māori Integration Index)

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 was made in order to investigate the question of whether a greater degree of syllable-timing has always been a feature of EM, as distinct from PE. Table 4.3 provides the data to address this question.

The PE results confirm previous findings that there has been a trend over time in PE towards more syllable-timed speech (Nokes and Hay, 2012).

Furthermore, these results show that EM has always been more syllable-timed than PE, which suggests that rhythm may have always been a feature of the way Māori speak English, even before Māori English was identified as a separate variety. Although the differences between these values are often less than one standard deviation from the mean, and statistical significance is not consistently reached, the trend is clear.

Table 4.3: 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				

Notably, the nPVI values for K01E, K05E and L2Y01E fit more closely in the PE range than the EM range. For the K speakers, this seems to be a reflection of the increased socialisation they had with PE speakers, compared with the TK speakers. It is likely that this socialisation has provided these speakers with the option of a PE register, which they could choose to employ as appropriate, given factors such as setting, interviewer and perceived formality of the occasion. 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 suggestion is particularly reinforced by the observation that L2Y01E used a markedly more syllable-timed rhythm when speaking to a Māori male on the telephone during the recording session.

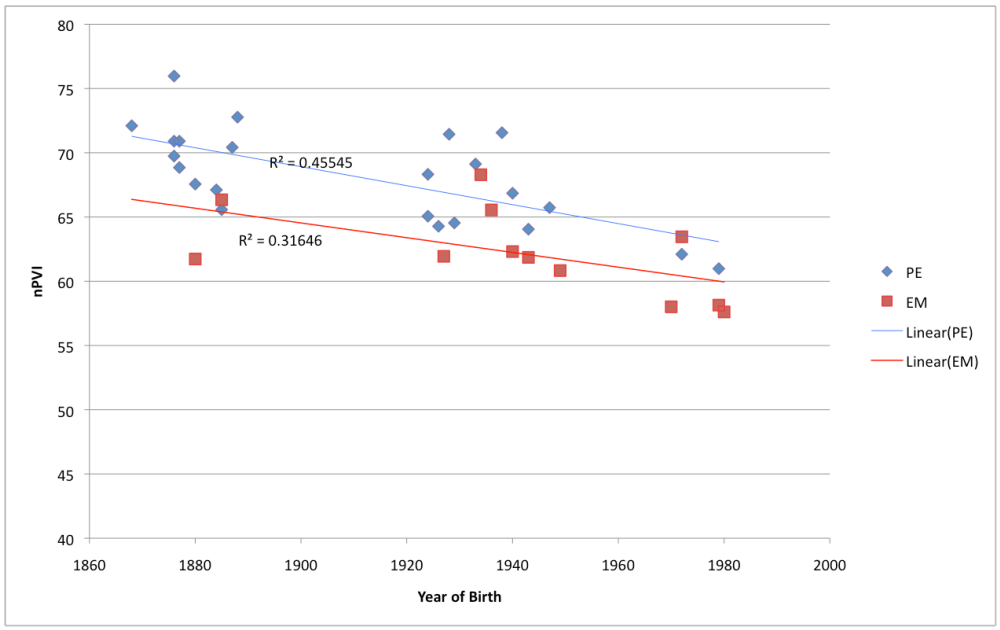

Figure 4.2: Scatterplot showing the mean nPVI of speakers over time with trend lines and R^2 regression.

The results shown in Figure 4.2 suggest that syllable-timed rhythm has always been an ethnic marker for Māori speaking English and that as PE has become more syllable-timed, EM has become even more syllable-timed in order to maintain this distinction. However, the trend in these results does suggest that this distinction is decreasing.

One possible reason for the decreasing gap between PE and EM rhythm is that Māori identity may be becoming a bigger part of New Zealand identity. 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 recent Rugby World Cup opening ceremony and games. This phenomenon was described in a recent poll published in the NZ Herald (Harper, P., 2012, March 15), 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

more syllable-timed rhythm. However, the importance of ME as a solidarity marker has led to EM speakers becoming more syllable-timed to maintain the distinction.

CHAPTER 5

PART ONE DISCUSSION

A number of relationships were demonstrated in the results of Part One, which will be discussed in this chapter. To summarise, the results show that:

- The rhythm of EM has become more syllable-timed over the generations, comparable to changes in the rhythm of PE.
- The trend in the rhythm of EM speakers shows that the rhythm of the TK group of speakers falls between the rhythm of the MU and Y groups of speakers.
- The rhythm of the TK speakers was significantly more syllable-timed than the rhythm of the K speakers.
- The rhythm of EM in a given time period has always tended to differ from the rhythm of PE in the same time period.

5.1 The Rhythm of EM Over the Generations

Previous studies have shown that both PE and ME have become more syllable-timed over the last 100 years (Szakay, 2006; Nokes & Hay, 2012). The results of this study are consistent with this finding.

5.2 The Rhythm of the English Speech of the TK Group of Speakers

In Section 1.1.5 it was noted that younger ME speakers have been found to use a syllable-timed rhythm, thought to have developed from the mora-timed rhythm of the Māori language (Holmes, 1997). This is clearly not a direct effect, however, as these younger speakers were less fluent in Māori than earlier generations were, and yet the older speakers, who had the greatest level of fluency were not perceived to have such a distinctive syllable-timed rhythm in their English speech.

The results of the present study suggest that the Tūhoe Kaumātua speakers are the 'missing link' between these two groups. These TK speakers have spent almost all of their lives in and around the Māori-speaking community of Ruātoki Valley. Although the current linguistic situation in New Zealand necessitates fluency in English for participation in society outside of this small community, the TK speakers are in a unique position compared with most Māori speakers of their generation, in that they have maintained the social functions of Māori within the community, throughout their adult lives. In this way, their linguistic background falls between the situation of the MU speakers, who functioned almost exclusively in Māori, with English only used in certain environments, and the situation of the Young groups of speakers who function almost exclusively in English, with Māori only used in certain environments.

The trend line linking the MU, TK and Y speakers does suggest that as fluency in English has increased and fluency in Māori has decreased, Māoriness has been shown through rhythm of English speech. Support for this comes from a comparison of the TK and K speakers.

5.3 The Rhythm of the TK and K Groups of Speakers

In terms of social background, the TK and K speakers were comparable as they were of a similar age and all of them spoke Māori as their first language. The main difference between these groups was that the K speakers spent their adult lives in the cities, interacting predominantly with Pākehā and speaking predominantly English, whereas most of the TK speakers spent the majority of their adult lives in and around the Ruātoki Valley, where Māori is still the language of interaction for almost all adults.

The significant difference between the rhythm of the TK and K speakers indicates that the use of more syllable-timed speech in the English of the TK speakers has most probably developed from the continued use of the Māori language, as this is the distinguishing characteristic between the groups. The K speakers, who were more influenced by PE than the TK speakers, spoke with a rhythm almost indistinguishable from the age-matched PE speakers of the time. This perhaps reflects speakers' perceptions of the prestige associated with being Māori. 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, n.d.). It is suspected that these speakers were trying to assimilate as much as possible with Pākehā. The TK speakers spent most of their lives in Māori-speaking communities and the Y speakers grew up during the language revitalisation efforts of the early 1980s. Therefore these two groups were socialized in environments in which there was a greater prestige associated with being Māori which is then reflected in the use of a more Māori-sounding rhythm in English.

5.4 The Relationship of EM and PE Over Time

Historically, a greater degree of proficiency and socialisation in the Māori language was associated with more syllable-timed speech in English (Holmes, 1997). With the changing linguistic demographics in New Zealand since the 1960s and 1970s, familiarity with the Māori language is not such a significant predictor of syllable-timing in English. Very few young Māori today speak the language with native fluency (King et al., 2011) and it is suggested here that these speakers use the distinctive syllable-timed rhythm of ME to mimic the rhythm of the Māori language and to signify their identity with the language and Māori society.

This concept of identity is very important to the investigation into the use of a more syllable-timed rhythm by EM speakers. The similarity of the K speakers to the PE speakers of the time, at least in the environment of the analysed recordings, and the similarity of L2Y01E to his age-matched PE peers when speaking to a Pākehā interviewer, indicates that these EM speakers have the option of signifying their identity with the wider New Zealand community. Depending on the degree of identity that these speakers felt towards the Māori community, it is likely that they would use a more syllable-timed rhythm to signify their Māori identity. This was observed when L2Y01E was speaking in English with a Māori male on the telephone during the recording of his interview in the Māori language.

Identity may also account for the ‘cat-and-mouse’ pattern in the shift towards more syllable-timed speech across the two NZE varieties. Pākehā New Zealanders seem to be incorporating the influence of Māori culture into their own identities. Meanwhile,

ethnically Māori New Zealanders are trying 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 more syllable-timed over the generations.

5.5 Summary of Part One

From these results, it seems certain that the distinctive rhythm of modern ME has developed from the mora-timed rhythm of the Māori language. Māori speakers as a whole have always used a more syllable-timed rhythm than PE speakers, although individual speakers have demonstrated the ability to select a more 'PE-sounding' register. The use of syllable-timed speech in English is now an ethnic marker (Szakay, 2006), 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. It is suggested here that these young, English-speaking Māori use this rhythm to approximate the mora-timing of the Māori language and thus signify their Māori identity.

The rhythm used by the K speakers and L2Y01E indicates that speakers have the ability to select their register (consciously or unconsciously) and it is likely that they selected their most 'Pākehā' register in the analysed recordings, due to their awareness of addressing a Pākehā interviewer. It is entirely possible, and indeed probable, that the informal English speech of these speakers would be more syllable-timed in other, more Māori settings. The variation in the rhythm of Māori speakers is the focus of Part Two of the present study. Consideration will be given to variation according to addressee, but will focus on variation by topic.

CHAPTER 6

PART TWO METHODOLOGY

Part Two of the present study is concerned with variation by topic. In order to address the question, 'Are rhythm and mean pitch influenced by topic?' the recordings of four Tūhoe Kaumātua were investigated. Both rhythm and mean pitch were included in this section as they are salient features of Māori English and therefore likely to be associated with Māori topics. This chapter outlines the reasons for studying this population, the statistical considerations made, the topic tags used and the methods of comparisons.

6.1 Speaker Selection

The Tūhoe Kaumātua (TK) speakers were selected for analysis because of their unique linguistic background. They not only grew up in a Māori-speaking community but also continued to live there for the majority of their adult lives. This distinguished them from the K group of speakers, who spent their adult lives in predominantly English-speaking environments in the cities. The TK speakers did have some exposure to Pākehā English, with all speakers having spent some time out of the Ruātoki Valley, yet their rhythm was more similar than might be expected to the Y speakers who had the most exposure to English of all the groups.

If, as suggested by the literature, variation by topic is likely to reflect the registers appropriate in the situations being described, then this group of speakers has the potential to draw from a wide range of linguistic styles. Topics related to childhood or to interactions with members of the Ruātoki Valley community are likely to recall the use of the Māori language. Topics related to work outside the community or to interactions with official bodies recall interactions with Pākehā English speakers and the TK speaker may indicate accommodation towards or divergence away from this variety. Topics related to

interactions with Māori individuals or groups from outside the Ruātoki Valley may recall the use of the Māori language, ME or a different variety of EM.

The features examined in the present study were rhythm and mean pitch, for two reasons. Firstly, they have been found to be the most salient of the features of ME (Szakay, 2008). Although the variety of speech used by the TK group of speakers does not fit classical definitions of Māori English, Part One of this study showed that rhythm distinguished TK speakers from other K speakers their age who had a greater exposure to PE in their linguistic background. Consequently, it has been suggested that rhythm was a Māori identity marker for the TK speakers and mean pitch may follow the same pattern. Secondly, variation in prosody by topic has not been studied previously.

Douglas-Cowie (1978) found that speakers who use non-standard registers show more variation in its use. Rickford and McNair-Knox (1994, p. 261), however, observed smaller shifts between standard and non-standard registers when the addressee was also using a non-standard register. In the present study, speakers of a non-standard register (EM) are being interviewed by a speaker using the standard register (PE), which should maximize variation. As the use of non-standard dialects is most evident in informal, conversational settings, the same textgrids with spontaneous speech were used in Part Two as in Part One (Table 6.1).

Table 6.1: Details of recordings used in Part Two.

Speaker	Text grids selected	Time analysed
TK01E	TK01E-02 to TK01E-14	52.89 mins
TK02E	TK02E-02 to TK02E-12	44.60 mins
TK03E	TK03E-02 to TK03E-13, except TK03E-11	43.95 mins
TK04E	TK04E-02 to TK04E-15, except TK04E-14	50.73 mins

6.2 Topic Tagging

In order to investigate the effect of topic on rhythm and pitch, the recordings of the TK speakers were topic tagged. Two different sets of tags were used: Set One had five categories and Set Two had just one category. Details of these tags follow in sections 6.7.1 and 6.8 respectively.

Tags from the first set were assigned using Transcriber. The corresponding tag from each of the five categories was selected and applied to consecutive lines of transcript until one or more of the categories changed. A new tag was then created to reflect the change. The tagged transcripts were then uploaded to MAONZE Miner and were forced-aligned. Textgrids were created and hand corrected in Praat.

Tags from the second set were assigned to the existing textgrids by altering the boundaries in the topic tier using Praat. Topics with this second set of tags were considerably longer in duration than the topics with the first set of tags.

6.3 Measuring Rhythm

Both intervallic and segmental nPVI values were calculated for the data with the first set of topic tags. According to Jacqueline Nokes (personal communication, December 29, 2010), in relation to the study she completed with Jen Hay (Nokes & Hay, 2012), the overall mean and variance are higher for intervallic nPVI than segmental nPVI, however the statistical patterns for intervallic data hold for segmental data. For simplicity, only segmental nPVI values were calculated for the data with the second set of topic tags.

6.4 Means and Standard Deviations

The means and standard deviations of intervallic nPVI, segmental nPVI and pitch were calculated for each speaker. The values for 1.96 SD and 2.58 SD were also calculated, to find the 95% and 99% confidence intervals respectively. These are listed in Tables 6.2 to 6.5.

Table 6.2: TK01E means and standard deviations

TK01E:	Mean	SD	1.96 SD	2.58 SD	95% confidence intervals	99% confidence intervals
Intervallic nPVI	63.02	13.18	25.83	34.00	88.85 to 37.19	29.02 to 97.02
Segmental nPVI	60.83	2.45	4.80	6.32	56.03 to 65.63	54.51 to 67.15
Pitch	95.44	1.60	3.14	4.13	92.30 to 98.58	91.31 to 99.57

Table 6.3: TK02E means and standard deviations

TK02E:	Mean	SD	1.96 SD	2.58 SD	95% confidence intervals	99% confidence intervals
Intervallic nPVI	61.76	14.08	27.60	36.33	89.36 to 34.16	98.09 to 25.43
Segmental nPVI	61.86	1.61	3.16	4.15	58.70 to 65.02	57.71 to 66.01
Pitch	127.50	3.12	6.12	8.05	121.38 to 133.62	119.45 to 135.55

Table 6.4: TK03E means and standard deviations

TK03E:	Mean	SD	1.96 SD	2.58 SD	95% confidence intervals	99% confidence intervals
Intervallic nPVI	61.90	13.07	25.62	33.72	87.52 to 36.28	95.62 to 28.18
Segmental nPVI	62.31	3.00	5.88	7.74	56.43 to 68.19	54.57 to 70.05
Pitch	164.18	10.35	20.29	26.70	143.89 to 184.47	137.48 to 190.88

Table 6.5: TK04E means and standard deviations

TK04E:	Mean	SD	1.96 SD	2.58 SD	95% confidence intervals	99% confidence intervals
Intervallic nPVI	60.67	14.73	28.87	38.00	89.54 to 31.80	98.67 to 22.67
Segmental nPVI	61.94	1.93	3.78	4.98	58.16 to 65.72	56.96 to 66.92
Pitch	149.51	4.58	8.98	11.82	140.53 to 158.49	137.69 to 161.33

The intervallic nPVI means and standard deviations were calculated as averages of the values from each of the tagged sections of speech. A separate value was calculated each time one of the category tags changed and consequently many values were based on a small number of vowel segments. It is known that nPVI values for such short sections of speech are highly variable, and are often unreliable for particularly short sections. Therefore, the values outside the 95% or 99% confidence intervals for the intervallic data could be considered extreme values, or outliers.

Conversely, the segmental nPVI means and standard deviations were calculated using a different Praat script, which generated the overall nPVI for each textgrid. The variability between these whole textgrids was considerably smaller, as shown in the markedly lower standard deviations. Consequently, the values outside these confidence intervals for the segmental data are less likely to be extreme values and more likely to indicate a significantly different sample.

The pitch values, like the segmental nPVI values, were calculated for entire textgrids. Values outside the 95% or 99% confidence intervals can be considered potentially significant.

6.6 Omitting Outlier Values

Tables 6.2 to 6.5 showed that the standard deviations were much higher when the values were calculated for individual sections of speech than when they were calculated for whole textgrids. The individual sections of speech were more likely to have outlier values (particularly high or low nPVI values which were unlikely to be accurate), which would potentially impact the results. It was necessary to use these individual sections of speech in order to measure variation by topic, therefore a method of reducing the effect of these outliers was needed[6].

[6] Outliers were only eliminated for nPVI as it is a measure of variance and the calculations are known to be affected by short periods of speech. This was not done for mean pitch as there were extremely large differences between the results for tagged sections of speech due to natural conversational intonation changes.

The sections of speech corresponding to the outlying values were reviewed in Praat, which revealed that the sections of speech with very high or low nPVI values were all very short, often only a few words long. Consequently, there were relatively few vowel segments available for the nPVI calculations, thus creating the unusually high or low values. The scatter plots in Figures 6.1 to 6.6 were created from the nPVI values of all the speakers combined, in order to identify the minimum number of segments required to eliminate the outliers. Figure 6.1 shows that the very low (<30) and very high nPVI values (>100) were all derived from sections of speech with very few segments. The sections of speech with the largest numbers of segments were all in the middle range (approximately 45-75). Figure 6.2 shows that most of the extreme values were eliminated when the sections of speech with fewer than 10 segments were excluded. When the sections of speech with fewer than 20 segments were excluded in Figure 6.3, all the values below 35 and above 95 are excluded. Figures 6.4 to 6.6 show that the intervallic results are mirrored with the segmental results.

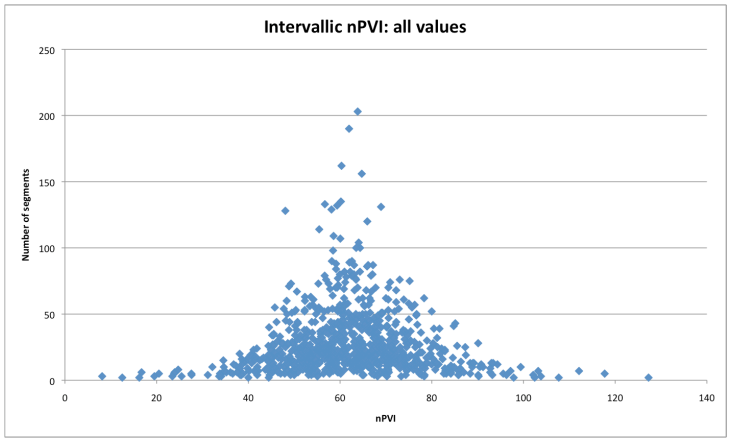

Figure 6.1: Intervallic nPVI by number of segments with all values included.

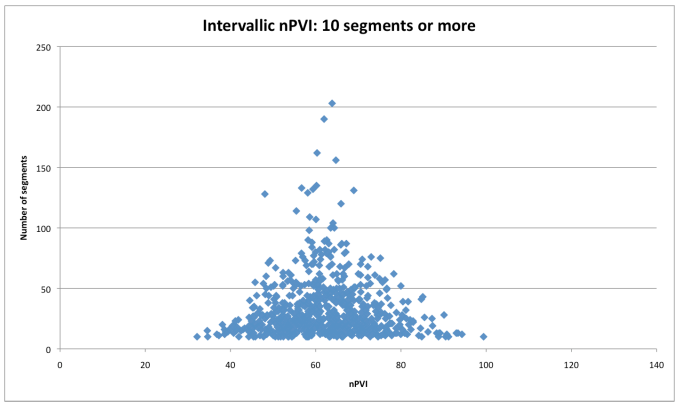

Figure 6.2: Intervallic nPVI with values based on fewer than 10 tokens omitted.

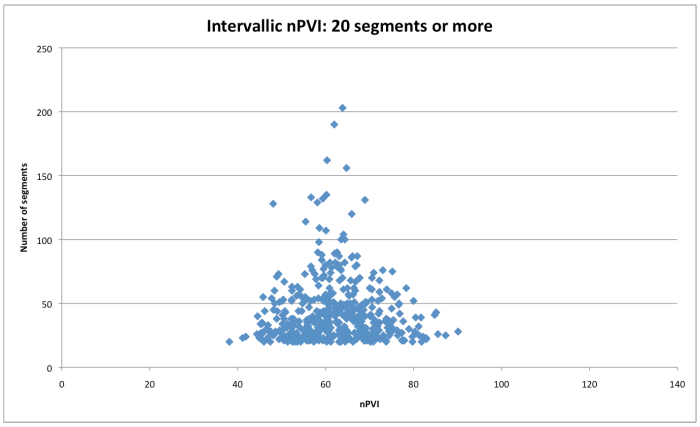

Figure 6.3: Intervallic nPVI with values based on fewer than 20 tokens omitted.

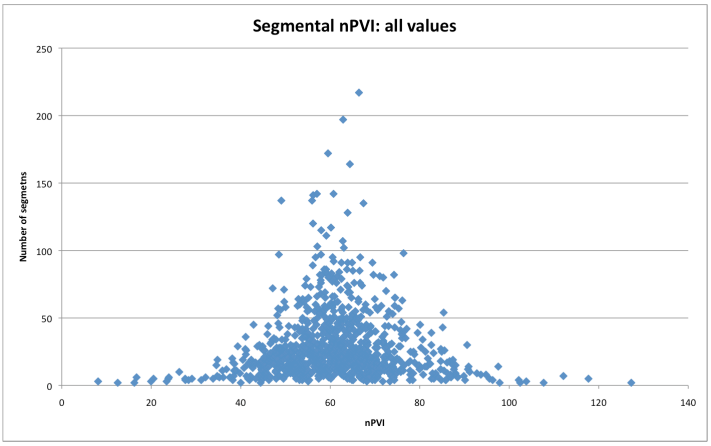

Figure 6.4: Segmental nPVI with all values included.

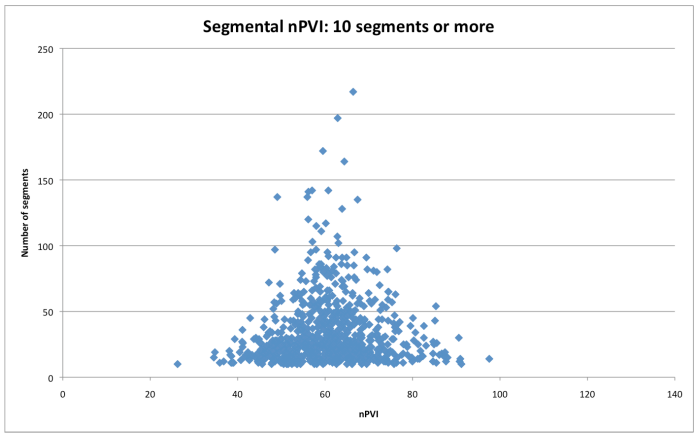

Figure 6.5: Segmental nPVI with values based on fewer than 10 tokens omitted.

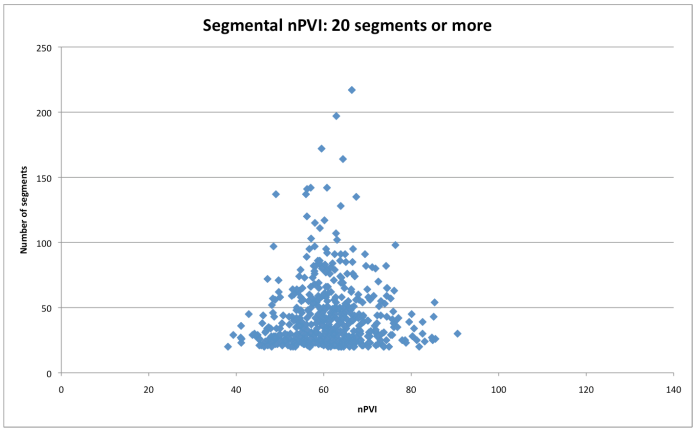

Figure 6.6: Segmental nPVI with values based on fewer than 20 tokens omitted.

The scatterplots in Figures 6.1 to 6.6 show that when the values based on fewer segments are omitted, the overall range of the nPVI decreases for both the segmental and the intervallic data. This confirms that the extreme values occurred in the very short sections of speech. When the values based on fewer than 10 segments were omitted, almost all of the extreme values were eliminated. Although even more of the extreme values were eliminated by omitting the values based on fewer than 20 segments, the impact this would have had on the number of values available for analysis would have been too great. Therefore, all calculations were based on values derived from 10 or more segments.

6.7 Set One Methodology

6.7.1 Topic Tags

Tables 6.6 to 6.11 provide the definitions of each tag in the five categories: Subject, Referent, Location, Time and Attitude. The appropriate tag from each category was selected and the corresponding five category tag was assigned to each of the segments from the time-aligned Transcriber files for each speaker.

Table 6.6: Subject tag criteria and examples

Tag	Criteria	Examples
Culture	The speaker is talking about Māori language or culture (or that of non-Māori in direct contrast).	Talking about use of languages in the Kōhanga Reo, the Ahurei event, the marae or threats to culture.
Land	The speaker is talking about the environment and its resources including water, bird and plant life. This is in an area broader than the speaker's own property.	Talking about river conservation, hunting, the use of 1080 or the changes in farming in the area.
Whānau	The speaker is talking about the interactions and relationships between his family members.	Talking about siblings or pointing out a family member's photo.
History	The speaker is passing on what he has heard about an event before he was born, or in his infancy.	Talking about a story involving an ancestor or a historical event.
Beliefs	The speaker is talking about his religious or philosophical beliefs.	Talking about the Ringatū faith.
Lifestyle	The speaker is talking about his experiences (excluding other topics), or the way people are, or should be.	Talking about travel, lifestyle habits, or experiences they have had with family members.
Career	The speaker is talking about work or 'occupations' in the broader sense of how people fill their time (excluding other topics). Also talking about 'stage of life' topics.	Talking about working in the army (but not talking about language role in kōhanga reo), being a biker, farming jobs, sports, or talking about own age.
Home	The speaker is talking about everyday life on his own property, or things which might affect that.	Describing renovations or property boundaries, or talking about fixing a bike at home.

Table 6.7: Referent tag criteria and examples

Tag	Criteria	Examples
You	The person involved is the interviewer.	Making a comment or asking a question about the interviewer.
Self	The person involved is the speaker.	Recounting something he has done.
Family	The person involved is a member of the speaker's family.	Recounting something someone in his family has done.
Community	The person or people involved are part of a wider group that includes the speaker.	Describing actions of someone in the local community, or the group of people he worked with.
MInd	The person involved is identified as a Māori individual, but not part of the local community.	Talking about a Māori visitor to a marae.
MGp	The people involved are an overtly Māori group but not all part of the local community.	Talking about Te Kōhanga Reo Trust.
NMInd	The individual involved is not specified as Māori and not part of the local community.	Talking about Elsdon Best or John Key or a neighbour.
NMGp	The group involved may have some ethnically Māori people in it, but it is not an overtly Māori group.	Talking about an official group such as the Regional Council or a group of soldiers in the army (especially when contrasted with a group of Māori soldiers).

Table 6.8: Location tag criteria and examples

Tag	Criteria	Examples
Village	The setting is the village or town in which the speaker is living, or the speaker is discussing the effects in the village of a decision made outside it.	Talking about something at home, describing an interaction with a neighbour or describing the local rugby team.
Region	The setting is outside the immediate village or town, but within the region.	Talking about the local bush area or the Hinemataroa river.
Neighbour	The setting is a neighbouring region or a wide area including the local and neighbouring regions.	Talking about ticks spreading to the Hawkes Bay.
Distant	When the setting is in a distant town or city, or nationwide.	Talking about someone in Auckland or talking about nationwide education policies.
Overseas	When the setting is outside New Zealand.	Talking about the war in Europe or family in Australia.

Table 6.9: Time tag criteria and examples

Tag	Criteria	Examples
Beforeborn	Talking about something that happened before the speaker was born, or when the speaker was an infant.	Talking about something an ancestor did.
Decadeplus	Talking about something within the speaker's lifetime, and more than 10 years ago.	Talking about when the speaker was a child or starting work.
Recent	Talking about something that happened within the last 10 years.	Talking about recent changes to laws, or recent interactions with people.
Now	Something that is happening now.	Talking about current attitudes or family routines.
Future	Talking about something that may happen in the future.	Talking about getting connected to the main sewage line or travel plans.

Table 6.10: Attitude criteria and examples

Tag	Criteria	Examples
Approval	Approval of something pro-Māori, especially in a competitive or confrontational situation.	Talking about the speaker's own English skills vs. those of someone from University.
DisM	Disapproval of a Māori person or group's actions, if perceived to be damaging to other Māori.	Talking about local Māori littering in the local river, or Māori parents not speaking Māori with their children.
DisNM	Disapproval of a non-Māori person or group's actions if perceived to be damaging to Māori.	Talking about the Regional Council's decision to refuse consents, or Labour's changes to Education.
Untagged	There is no clear approval or disapproval, or the approval/disapproval does not relate to a positive or negative situation for Māori.	Talking about father's career.

Table 6.11: Untagged speech criteria and examples

Tag	Criteria	Examples
All untagged	The section of text is unsuitable for tagging.	Someone other than the speaker is talking, two people are speaking simultaneously, there is specific background noise which obscures part of the speech, the speaker is not speaking in English, or the speaker is speaking about the current interview.

Figure 6.7 shows a selection of the textgrid when the topic tags had been assigned and the textgrids created and opened in Praat. The subject tags and time tags were changing as TK02E was recounting his son's performance in a speech contest.

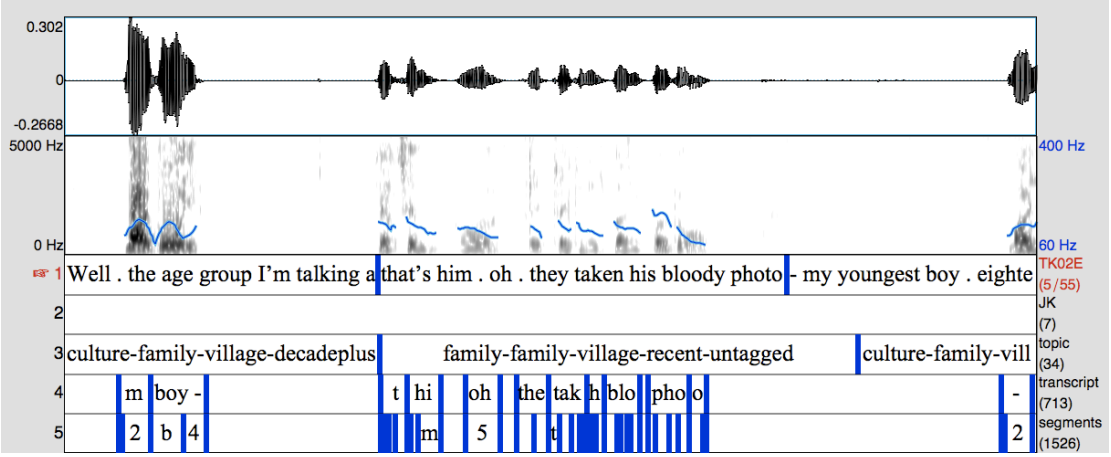

Figure 6.7: 7.5 second section of TK02E's recording with five category topic tagging shown on Tier 3.

6.7.2 Methods of Comparison

The first methodology was designed to investigate whether the predicted topics were associated with a more syllable-timed rhythm and a higher mean pitch. When this method did not produce any reliably significant results, another four methodologies were employed, which were similarly unsuccessful in producing significant results.

The consistent pattern in all of the groups of data was that the means were very similar. Consideration had been given to minimizing the effect of outliers, while retaining as many tokens of each tag as possible, however this balance was difficult to achieve. The number of segments for most values was still reasonably small and as a result, the standard deviation was high for most groups of data. Additionally, in many cases there were too few tokens of a given tag or combination of tags to enable a reasonable comparison. The combination of similar means with large variance was a feature of every method of comparison used.

The following five methods were employed in the ultimately unsuccessful search for consistent, statistically significant results:

(A) Predicted Topics: A comparison of data with topic tags or combinations of topic tags predicted to have lower nPVI and higher mean pitch. These comparisons were made for each speaker, using means and standard deviations and *t*-test scores.

(B) Differences between tokens: A comparison was made of the number of tokens of each tag in the low and high nPVI ranges. The tags with the greatest difference in the number of tokens in each range were compared for each speaker, using means and standard deviations and *t*-test scores.

(C) Distribution of tokens: An investigation of the distribution of tokens from each tag. The number of tokens in the high, middle and low nPVI ranges were compared for each tag. These were analysed for each speaker, using chi-squared test scores.

(D) CART and Regression Analysis: An examination of Classification and Regression Trees (CART) and regression analysis, for each speaker individually and for all speakers combined, using R (http://www.r-project.org/).

(E) Referent: A comparison of the sections of speech with Māori or non-Māori interlocutors or referents. These were made for each speaker individually, using means and standard deviations and *t*-test scores.

6.7.2 (A) Predicted topics

Based on topic design theory (Bell, 1984) and exemplar theory (Pierrehumbert, 2006; Hay & Drager, 2010), it was predicted that the following 'Māori' topics would be associated with a more syllable-timed rhythm and a higher mean pitch:

- Talking about Māori language
- Talking about distinctive aspects of Māori culture, such as spending time on the marae
- Talking about issues the speaker's iwi has with outside groups
- Talking about a time and place where the speaker was using Māori or ME or was interacting with other Māori
- Talking about topics where the speaker indicates affinity towards a group of Māori

Accordingly, it was predicted that the tags listed in Table 6.12 would be associated with a more syllable-timed rhythm and higher mean pitch:

Table 6.12: Tags likely to be associated with a more syllable-timed rhythm and higher mean pitch

Category	Tags likely to be associated with a syllable-timed rhythm and higher mean pitch	Reason
Subject	Culture, possibly Land	These topics unite Māori. The speakers may differ from non-Māori in their perspective on these issues.
Referent	MInd, MGp, Family, Self	These people were all EM speakers who may have been speaking Māori or ME.
Location	Village, Region	The area closer to home is where most people were EM speakers.
Time	Beforeborn, Decadeplus	The speaker was retelling stories that are likely to have been originally told in Māori. All of the speaker's interactions were likely to have been in Māori when he was younger.
Attitude	Approval, disNM	These tags show solidarity between Māori people.

These topic tags were compared individually and in combinations. For example, when comparing tagged sections in the 'Time' category, the values from lines tagged with the following were compared:

- beforeborn vs. all other tags (i.e. historical vs. not historical)

- beforeborn or decadeplus vs. all other tags (i.e. long ago vs. other)

The speakers did not use every tag in their recordings and as a result the comparisons were different for each speaker. A list of all the tag combinations that were compared can be found in Appendix A.

6.7.2 (B) Differences Between Tokens

While Section 6.7.2 (A) compared tags that were *likely* to have a higher or lower nPVI, Section 6.7.2 (B) examined the values which *actually* had a higher or lower nPVI. The number of tokens in the low nPVI range were compared against the number of tokens in the high nPVI range and the tags with the biggest difference between the number of low nPVI tokens and high nPVI tokens were identified for each category.

The bulk of the intervallic nPVI values for each speaker were in the 55-65 range, with almost all other values falling within the 45-75 range. Therefore, the low nPVI range was considered to be from 45 to 55, while the high nPVI range was considered to be from 65 to 75.

The original intention was to combine the tags from each of the five categories which showed the biggest differences. In practice, this was impossible to achieve. For some tags, the number of tokens was so small that there were no combinations with the target tags from the other categories. Even the tags with greater numbers of tokens were rarely present with all of the other four tags.

For example, the lowest nPVI tags for TK01E were identified as: culture – MGp – neighbour – recent – untagged. There were 38 lines tagged with culture, 21 tagged with MGp, 11 lines tagged with neighbour, 91 lines tagged with recent and 156 lines marked 'untagged' in the attitude category. However, there were no lines which were tagged with all five of these labels, or even with both culture and MGp. In fact, there were only three lines which were tagged with both MGp and recent, and of these, only one was tagged with neighbour and 'untagged' for attitude.

Attempts were made to find meaningful methods of combining the most different tags, however the results were unreliable due to the small numbers of tokens available. Consequently, the decision was made to investigate only the most or least Māori tag for each speaker and only those with at least ten tokens in each nPVI range were considered. The tag with the biggest difference in either a lower or higher nPVI direction was chosen for each speaker. This tag was then compared with the opposite tag from the same category. These are listed in the Table 6.13.

Table 6.13: Tags with the greatest representation in either the low nPVI or high nPVI ranges.

Speaker	Low nPVI tag	High nPVI tag
TK01E	MGp	Community
TK02E	Whānau	Culture
TK03E	Now	Decadeplus
TK04E	Career	Land

6.7.2 (C) Distribution of Tokens

In this section, the aim was to establish whether the lower nPVI or higher nPVI values were more prevalent in certain topics. As in Section 6.7.2(B), the lower range was considered to be between 45-55 nPVI and the higher range was considered to be 65-75 nPVI. For each tag, the number of tokens in the low, high and middle nPVI ranges were compared using the chi-squared test. Only the tags with at least 10 tokens in each category were investigated for each speaker.

6.7.2 (D) CART and Regression Analysis

Classification and Regression Trees (CART) were created from the segmental nPVI data for each individual speaker and all four speakers together. The data were split into branches to show the maximally different values, with no assumptions of normality. While these results are not statistically significant, they provide useful information about which results have the potential for statistical significance.

The first split in the CART tree for all speakers combined (Figure 6.8), was Referent. This suggests that the differences between tags in this category are the most likely to show some statistical significance.

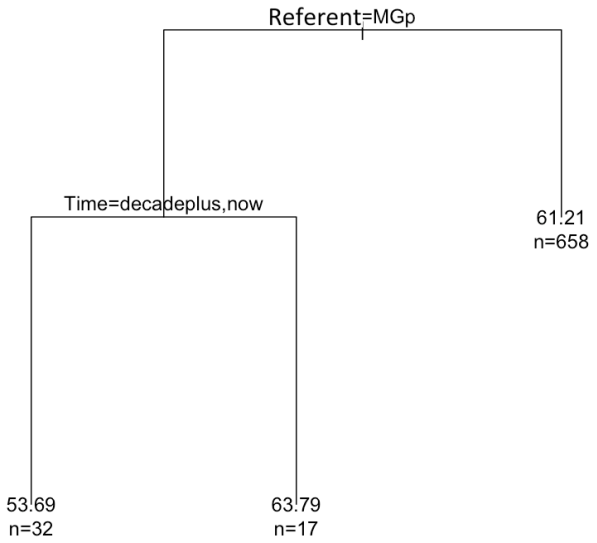

Figure 6.8: CART tree for the segmental nPVI values of all speakers.

Figure 6.8 shows that the first split in the CART tree is for Referent. This means that the differences in nPVI values is greatest between the MGp tags and the other Referent tags. This indicates that Referent would be the most promising area to study using regression analysis.

The statistical significance was measured using regression analysis, using individual tags and collapsed groups of tags. The Referent tags were compared individually, as the CART tree indicated that Referent tags were most likely to show significance. Meaningful combinations of tags were grouped together for Subject and Time, as there were too few tokens for some of the tags. The four new Subject tag groups were: career, culture, home & lifestyle and land. The Time tags were also collapsed into two new groups, one including the distant past time tags (‘beforeborn’ and ‘decadeplus’) and the other group containing the other time tags, not from the distant past (‘recent’, ‘now’ and ‘future’).

6.7.2 (E) Referent

As explained in Chapter 1, Bell (1984, p. 181) argued that "speakers associate classes of topics or settings with classes of persons. They therefore shift style when talking on those topics or in those settings as if they were talking to addressees whom they associate with the topic or setting". Therefore, it would be expected that the speakers would use a more syllable-timed rhythm when discussing a topic in which the interlocutors had also been using a more syllable-timed rhythm. While this was addressed to some degree with the Referent category of tags in sections 6.7.2(A) to 6.7.2(D), there was a shortcoming with the Set One tags, in that they changed more frequently than the speakers appeared to change their rhythm. For example, in the section of transcript in Table 6.14, the main point of TK04E's story was that there were people researching *poroporo* but they had identified the wrong plant. In explaining this, he added some background information to the main point of the story. There were three different Referent tags in this short section of the story and it is unlikely that the speaker's rhythm would have changed significantly from one tag to the other.

Table 6.14: TK04E transcription sample

Transcription	**Referent Tag**
They found poroporo - and er.	NMGp
I said no – that plant er that was –	Self
when er when we were young er there was one growing at a place called Ōkawa.	Community

The lack of consistently significant results with the Referent tags in the previous results suggested that longer topic sections were likely to correspond more reliably to changes in referent. Therefore, the sections of speech were reviewed and divided into three categories (Table 6.15).

The sections of speech which corresponded to each of these categories were grouped together and compared using means, standard deviations and *t*-test scores.

Table 6.15: Collapsed categories based on referent

Tag	Criteria	Examples
Māori	The speaker is talking about an interaction with an individual or group who have been identified as Māori.	Retelling about a time when addressing iwi. Talking about a Māori friend's visit.
Non-Māori	The speaker is talking about an interaction with an individual or group who have been identified as Non-Māori.	Talking about negotiations with the Crown. Talking about a Pākehā visitor to a marae.
Untagged	The speaker is not talking about an interaction, or has not identified the interaction partner as Māori or Non-Māori.	Talking about ideas for future directions for kōhanga reo. Retelling an event that involved both Māori and Non-Māori.

6.8 Set Two Methodology: Topic Tags and Analysis

A new set of tags was devised as a result of the perception that the speakers' style did not change as rapidly as the five category tags were changing. This had been partially addressed in Section (E), however the changes in referent still did not reflect the natural changes in topic.

The transcriptions were divided into broader sections with only one tag for each topic. The breaks between topics were made when the speaker finished talking about one subject and moved on to another. In most cases, this was easy to define and typically occurred when the interviewer asked a new question. At times, the speaker moved from one topic to another within his turn and a judgement of the point of topic change was made based on pauses. While most of the topics consisted of a single 'block' of speech, a small number of the topics were split around another topic. For example, one of the topics that TK02E discussed was the n/ng merger in the Tūhoe dialect of Māori. He introduced the topic, moved on to another, then later returned to the 'Tūhoe speech' topic. These new tags were assigned to the textgrids by changing the boundaries in the

topic line in Praat. Figure 6.9 shows the difference between the frequently changing Set One topic tags in Tier 3 and the single Set Two topic tag in Tier 4.

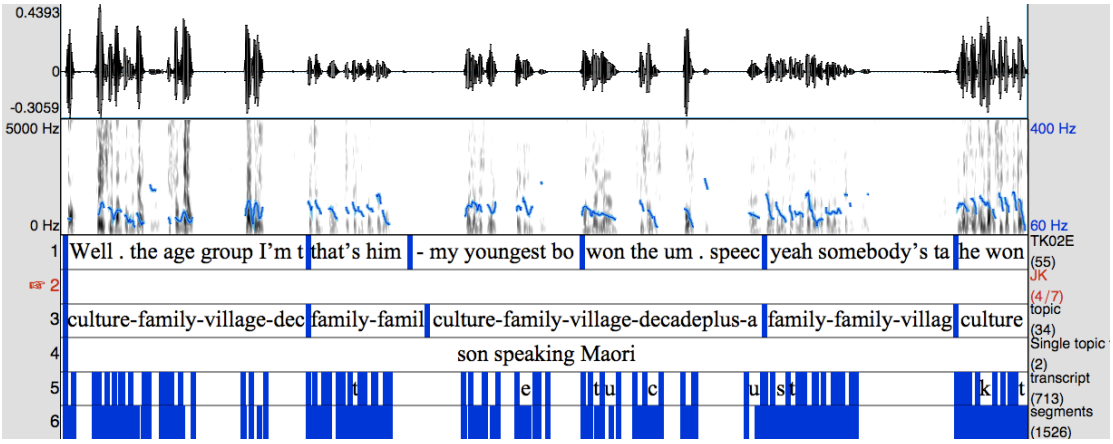

Figure 6.9: Comparison of five category tagging from Section 6.7.1 (Tier 3: topic) with single topic tagging (Tier 4: Single topic).

The labels assigned to each of these topic tags were used as reference points, rather than as a means of indicating any assumptions about the potential 'Māoriness' of the topic, or the potential of comparisons across speakers. Each speaker discussed different topics and had his own experiences related to the subject matter, therefore the topic tags were different for each individual speaker. The few examples of topics with the same tag but from different speakers should not be considered comparable topics.

The mean pitch and segmental nPVI values were calculated for each topic. The topics were then arranged in order from lowest to highest nPVI and highest to lowest mean pitch for each individual speaker.

The transcripts of these topics were examined with consideration given to the number of Māori words used and the affinity indicated towards the group or individual being referred to. Additionally, it was observed that direct quotes appeared more frequently in the more Māori topics than the less Māori topics and therefore the number and nature of quotes were studied in greater detail.

By their nature, the quotes used by these speakers were typically short. Many were only one sentence long, and therefore there were only a few segments available for calculating

the nPVI. Most of the extreme values (below 45 or above 75) came from quotes with up to 19 segments and therefore the decision was made to only compare quotes with values based on 20 segments or more.

The mean pitch values were all considered, regardless of the number of vowels they were based on. This is because pitch calculations are less influenced by the use of short periods of speech.

The methodologies described in this chapter were employed in Part Two of the study. The results of these investigations are described in Chapter 7.

CHAPTER 7

PART TWO RESULTS

The aim of Part Two of the current study is to address the question: Are rhythm and mean pitch influenced by topic? This question proved more complex than initially anticipated. Reliably significant differences were not found with the comparisons of topics which were expected to be most different. Subsequent comparisons were equally inconclusive. The overwhelming indication was that variations in rhythm based on topic are highly individualized and extremely subtle. The following sections present the results for the various analyses.

7.1 Set One Results

Several comparisons were made with the first set of topic tags, with no reliably significant results. This was due to two main factors. Firstly, the number of segments in many sections of tagged speech was relatively small. This resulted in many unreliable values and caused the overall standard deviations to be very high. Secondly, the same group of data was sampled multiple times in the process of investigating these comparisons. Benjamini and Hochberg (1995) explained that when a set of data is sampled multiple times, a correction must be made to the level of significance. For these data, the significance of the results could not be maintained after any correction was applied. Subsections (A) to (E) present the results obtained following each methodology.

(A) Predicted Topics: The data with topic tags predicted to have lower nPVI and higher mean pitch were compared against the data without these tags. The results of these comparisons (Appendix B) show no apparent pattern among the 'significant' results. The segmental and intervallic results showed similar, patterns in some, but not all comparisons. The pitch results were unrelated to the rhythm results.

(B) Differences between tokens: The tag with the biggest difference between the number of tokens in the low nPVI and high nPVI ranges was selected for each speaker. Some tags had more tokens in the low nPVI range, while others had more tokens in the high nPVI range. These tags were then compared against the tag from the same category with the next biggest difference in tokens, but in the opposite direction. Table 7.1 shows the t test results, were not consistently significant for all speakers.

Table 7.1: Comparison of the topic tags with the greatest representation in the low nPVI and in the high nPVI ranges. Statistically significant *t* test results ($p<0.05$) are indicated with *

Speaker	Low nPVI tag	High nPVI tag	Low nPVI tag mean	Low nPVI tag SD	High nPVI tag mean	High nPVI tag SD	p value
TK01E	MGp	Community	55.54	8.11	64.62	10.81	0.0002 *
TK02E	Whānau	Culture	56.91	6.66	62.72	14.66	0.035 *
TK03E	Now	Decadeplus	62.13	11.53	63.26	10.19	0.297
TK04E	Career	Land	58.95	14.40	60.67	10.30	0.33

(C) Distribution of tokens: The distribution of tokens from each tag was investigated in order to identify the tags which were more likely to have a low or high nPVI value. The bar graphs for each of these speakers (Appendix C) shows that the number of sections of speech in the high or low nPVI ranges was comparable for most topic tags. Unsurprisingly, therefore, the chi-squared results were not significant for three of the speakers, as shown in Table 7.2. The topic tags which showed the greatest difference for TK02E were the Subject tag ‘culture’ and possibly the Location tag ‘village’. Both of these tags had a greater number of tokens in the high nPVI range, which is the reverse of the predicted direction and neither of these tags showed significance in the subsequent regression analysis.

Table 7.2: chi-squared test values showing a significant difference for the distribution of the topic tags ($p<0.05$) for TK02E only

Speaker	chi-squared value	degrees of freedom	p value
TK01E	7.118	22	1
TK02E	23.776	14	0.049*
TK03E	19.534	22	0.6
TK04E	13.288	22	0.9

(D) It was hoped that the use of CART trees (Appendix D) and regression analysis (Table 7.3) might have identified the topic tags which were significantly different.

The CART trees indicated that the Referent tags were most likely to show significant differences and the regression analysis did show that the Māori Group (MGp) was significant. However none of the other categories tested reached significance. The box plots all showed the similarity of the medians for each tag, with comparatively large interquartile ranges. Figure 7.1 shows the box plot of the Referent tags which demonstrated the greatest amount of difference. The pattern of similar medians and large interquartile ranges was more pronounced in the box plots for other tags.

(E) Referent: A comparison was made of the sections of speech with Māori or non-Māori referents (Table 7.4) and, comparable to the other methodologies, all of the results did not reach statistical significance. However, it is noteworthy that all of the results were in the expected direction, which was a more consistent pattern than was evident in the previous methods of comparison.

Table 7.3: Results for the fixed effects from a mixed-effects regression analysis modeling nPVI with speaker as a random effect[7].

	Estimate	MCMC mean	HPD95 lower	HPD95 upper	pMCMC	Pr(>|t|)
(Intercept)	61.6304	61.9853	58.1445	65.616	0.0001	0
Subject: culture	0.4587	0.3288	-2.5272	3.131	0.8142	0.7437
Subject: home/lifestyle	1.7765	1.8271	-1.803	5.495	0.322	0.3461
Subject: land	-0.3237	-0.5319	-3.4218	2.273	0.7198	0.818
Referent: family	-2.1348	-2.0563	-4.589	0.679	0.1236	0.1045
Referent: MGp	-4.7167	-4.887	-8.2293	-1.429	0.004	0.0061
Referent: MInd	0.7072	0.5661	-4.8335	6.36	0.85	0.8063
Referent: NMGp	-0.912	-1.0033	-3.1467	1.044	0.3482	0.3926
Referent: NMInd	-1.1873	-1.2666	-5.9668	3.227	0.5886	0.6131
Referent: self	-1.1217	-1.1098	-3.4275	1.218	0.3426	0.3411
Location: neighbour	-0.6306	-1.0025	-5.599	3.433	0.6698	0.7843
Location: overseas	-7.2247	-7.5975	-16.9854	1.6	0.1114	0.1267
Location: region	-0.2489	-0.6287	-3.5544	2.113	0.6744	0.8553
Location: village	0.5084	0.5152	-2.5619	3.515	0.742	0.7414
Time: not distant past	1.1812	1.1735	-0.6069	2.853	0.1856	0.1813

[7] The default reference levels for each tag category were: career (Subject), community (Referent), distant (Location) and distant past (Time).

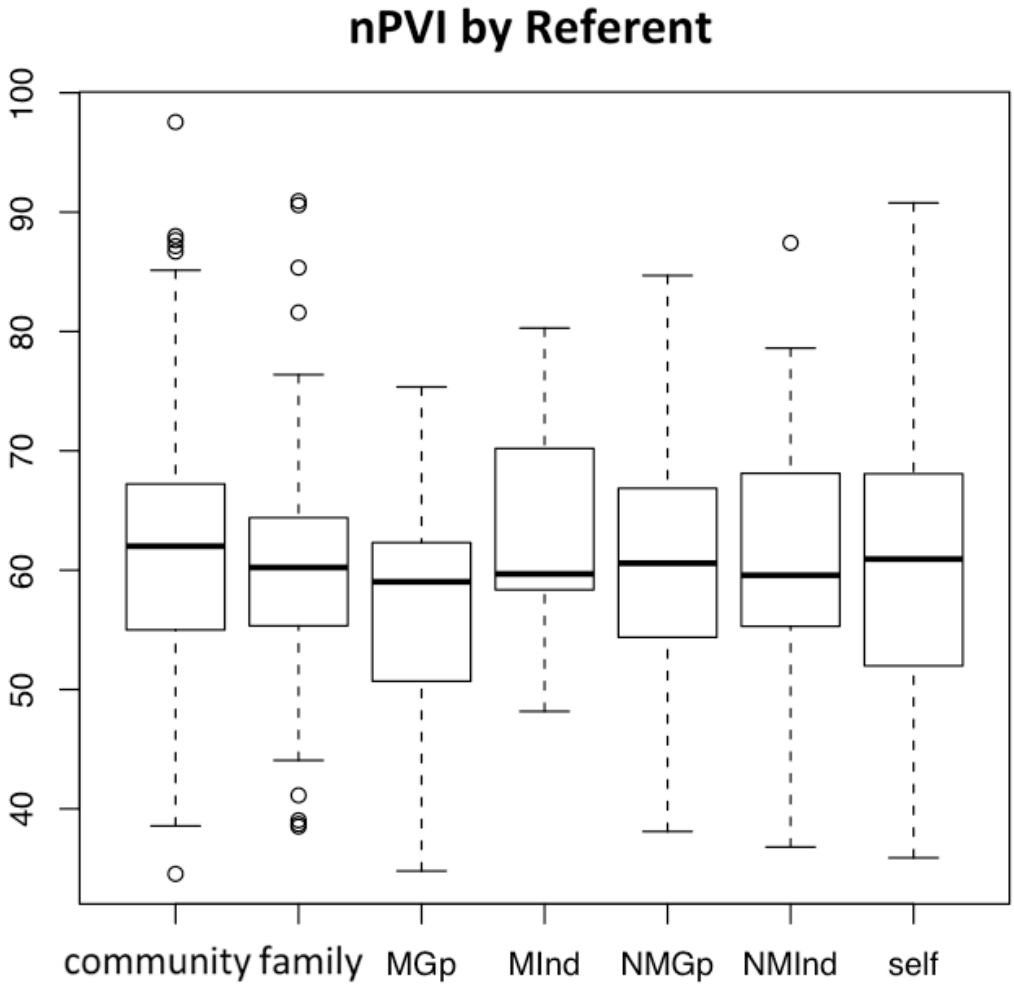

Figure 7.1: Boxplot of Referent tags across all speakers. This shows that the nPVI values for MGp were slightly lower than for the other tags, however the median values were very similar across all tags and there was considerable overlap in values of the boxes.

Table 7.4: *t* test p values for comparisons of sections with Māori and non-Māori referents.

		Māori Referent mean	Māori Referent SD	Non-Māori Referent mean	Non-Māori Referent SD	p values
TK01E	seg. nPVI	54.81	12.36	62.29	12.01	0.001*
	int. nPVI	56.55	12.64	64.56	12.11	0.001*
TK02E	seg. nPVI	58.60	10.56	64.20	13.63	0.09
	int. nPVI	60.44	10.45	65.02	10.94	0.20
TK03E	seg. nPVI	58.34	10.01	64.47	8.87	0.02*
	int. nPVI	58.63	10.82	64.08	7.97	0.06
TK04E	seg. nPVI	62.94	14.72	64.38	12.05	0.31
	int. nPVI	63.16	14.83	64.30	11.99	0.69

7.2 Set Two Results

In this section, all of the textgrids were retagged with single topic tags. Because of the observation that rhythm did not change as often as the five-category topic tags were changing, these single-category topic tags were allocated based on natural topic changes.

From the clues given in the context of the transcription, the referent was defined as Māori, Non-Māori or Unknown/Mixed (Tables 7.5 to 7.8). For example, for TK01E, the topic 'Ahurei' referred to the local festival celebrating the Tūhoe iwi and almost exclusively involved Māori participants and consequently this topic was marked as 'Māori'. Conversely, when he was discussing the 'Types of trees to plant' topic, he related several interactions with representatives of official bodies, such as the forest owner or Regional Council, which were international or predominantly Pākehā groups. This topic was therefore marked as 'Non-Māori'. When discussing 'Ōhinemataroa RMC', TK01E related interactions with both Regional Council and people from his own iwi who were members of the Ōhinemataroa River Management Committee. Therefore the referent in this topic was mixed, and marked 'Unknown/Mixed'. When the ethnicity of the referent could not be established from the content of the recording, the topic was

also marked as ‘Unknown/Mixed’. Given the socialisation of these speakers, it was not surprising that the number of topics with Māori referents was considerably higher than the number of topics with Non-Māori referents. This may have affected the results for the individual speakers, however when the results for all speakers were combined, there was a sufficient number Non-Māori referent tokens to make a reasonable comparison.

Table 7.5: TK01E topics associated with Māori, Unknown/Mixed or Non-Māori referents.

TK01E	**Referent**
Ahurei	Māori
Covenants	Māori
Employment for iwi	Māori
Iwi structure	Māori
Local pest eradication	Māori
Purpose of gravel extraction	Māori
Role of board	Māori
Settlement	Māori
Te Whānau ā Apanui pest eradication	Māori
Bird life	Unknown/mixed
Consultation	Unknown/mixed
Introduction to resource issues	Unknown/mixed
Iwi employment	Unknown/mixed
Iwi or outside contractors	Unknown/mixed
Ōhinemataroa RMC	Unknown/mixed
Old way of river management	Unknown/mixed
Pest eradication	Unknown/mixed
Police raids	Unknown/mixed
Resource consent	Unknown/mixed
Rights to forest	Unknown/mixed
Acclimatisation societies	Non-Māori
Confederation of Indian Tribes	Non-Māori
Didymo	Non-Māori
Tourism	Non-Māori
Tree harvesting	Non-Māori
Types of trees to plant	Non-Māori

Table 7.6: TK02E topics associated with Māori, Unknown/Mixed or Non-Māori referents.

TK02E	Referent
Camp now	Māori
Current faith	Māori
English for school	Māori
Grandson	Māori
Kete	Māori
Language in kōhanga reo	Māori
School for son	Māori
Siblings	Māori
Son speaking Māori	Māori
Tūhoe speech	Māori
Tūpuna	Māori
Victoria University	Māori
1080	Unknown/mixed
Bird life	Unknown/mixed
Faith background	Unknown/mixed
Friends	Unknown/mixed
Kōhanga reo admin	Unknown/mixed
Te reo and tīkanga	Unknown/mixed
Unclear topic	Unknown/mixed
Herbal medicine	Non-Māori
Old tourist treks at camp	Non-Māori
Own use of English	Non-Māori

Table 7.7: TK03E topics associated with Māori, Unknown/Mixed or Non-Māori referents.

TK03E	Referent
Family land	Māori
Farming	Māori
Grandchildren	Māori
Great grandmother	Māori
Home	Māori
Land issues	Māori
Milking cows	Māori
Name	Māori
Playing sport	Māori
Son	Māori
Travel with wife	Māori
Army life	Unknown/Mixed
Biking to work	Unknown/Mixed
Buying seeds	Unknown/Mixed
Cows and slaughter	Unknown/Mixed
Dogs	Unknown/Mixed
Job on the wharves	Unknown/Mixed
Marae funding	Unknown/Mixed
Road trips	Unknown/Mixed
Rubbish	Unknown/Mixed
Sewage	Unknown/Mixed
Bikie	Non-Māori
Council rates	Non-Māori

Table 7.8: TK04E topics associated with Māori, Unknown/Mixed or Non-Māori referents.

TK04E	Referent
Ahurei	Māori
Future of te reo	Māori
Horses	Māori
Huia sighting	Māori
Rugby	Māori
Son	Māori
Speaking Māori	Māori
Traditional fishing	Māori
Young boys hunting	Māori
1080 and water pollution	Unknown/Mixed
Bird life	Unknown/Mixed
Dad at war	Unknown/Mixed
Dad dipping and pig culling	Unknown/Mixed
Dad surveying	Unknown/Mixed
Deer culling	Unknown/Mixed
Dogs	Unknown/Mixed
Tangi	Unknown/Mixed
Homestead	Unknown/Mixed
Own marae	Unknown/Mixed
Pig hunting	Unknown/Mixed
Poroporo and koheriki	Unknown/Mixed
Possum damage	Unknown/Mixed
Regrets	Unknown/Mixed
Stag sighting	Unknown/Mixed
Fishing	Non-Māori
Urewera	Non-Māori

These referents were then ascribed a numerical value: 1 for Māori, 2 for Unknown/Mixed and 3 for Non-Māori. These values were plotted against the corresponding nPVI values for each individual speaker and for all the speakers combined (Figures 7.2 to 7.6). It was anticipated that topics with a referent value of 1 might correspond with a low nPVI value, while a referent value of 3 might correspond with a high nPVI value. This would have shown an association between Māori ethnicity of referent and the adoption of a 'Māori-sounding' rhythm, which would have reflected either the rhythm of the Māori language or the referent's variety of EM, likely to have been used in the interaction referred to in

the topic. The lack of such a relationship shows that such a straightforward correlation does not exist. It should be noted that despite the low number of Non-Māori referent tokens for individual speakers, the same lack of association was seen for individual speakers and all speakers combined. There are clearly additional factors which influence a speaker's register, other than simply the addressee of the topic.

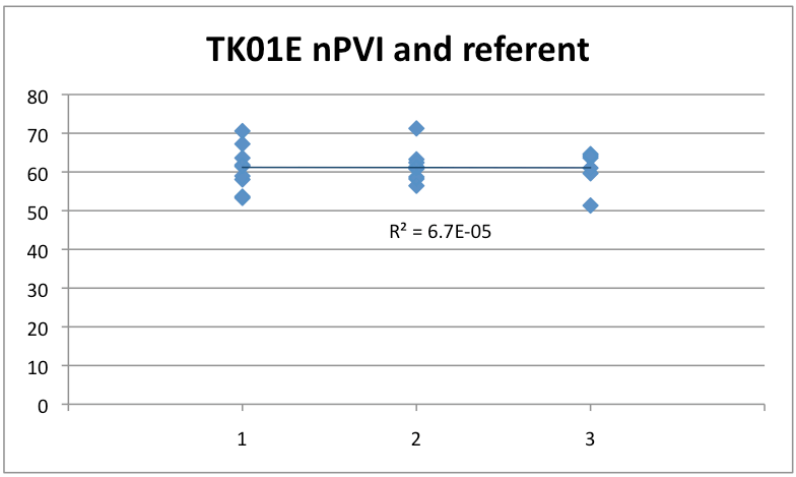

Figure 7.2: TK01E Topic nPVI and referent ethnicity, where 1 indicates Māori referents, 2 indicates unknown or mixed referents and 3 indicates Non-Māori referents.

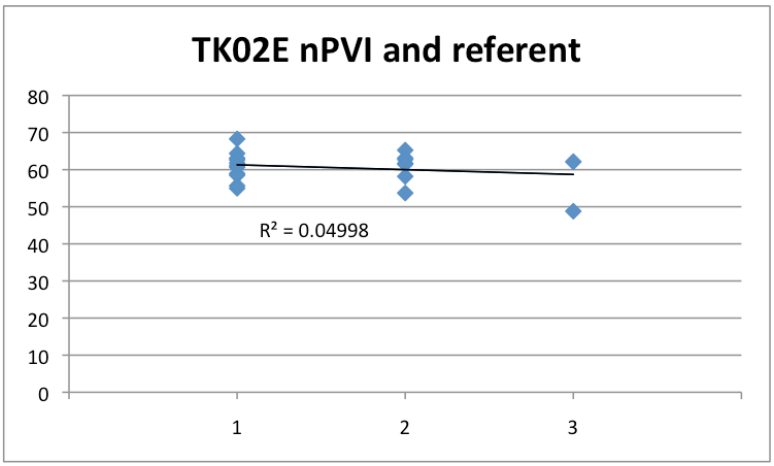

Figure 7.3: TK02E Topic nPVI and referent ethnicity, where 1 indicates Māori referents, 2 indicates unknown or mixed referents and 3 indicates Non-Māori referents.

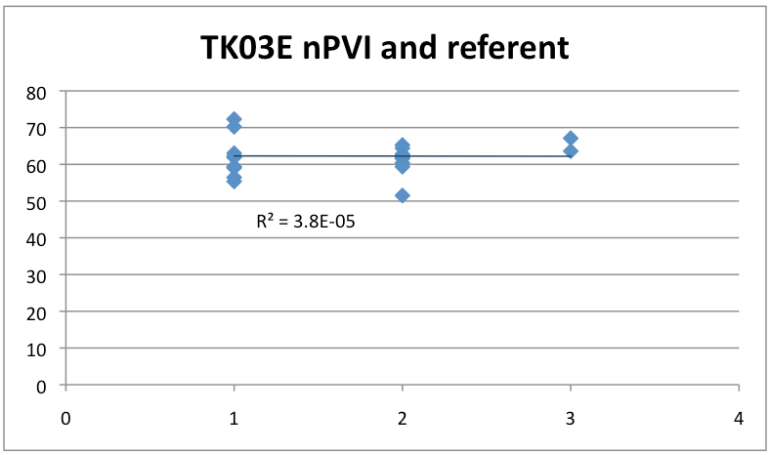

Figure 7.4: TK03E Topic nPVI and referent ethnicity, where 1 indicates Māori referents, 2 indicates unknown or mixed referents and 3 indicates Non-Māori referents.

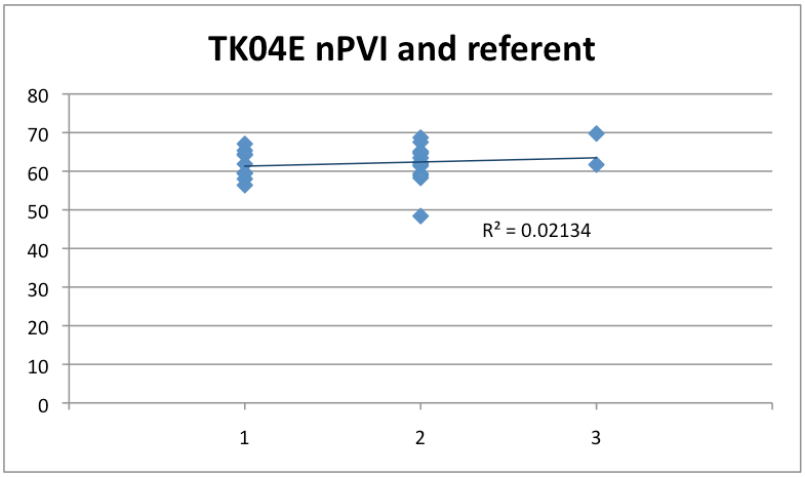

Figure 7.5: TK04E Topic nPVI and referent ethnicity, where 1 indicates Māori referents, 2 indicates unknown or mixed referents and 3 indicates Non-Māori referents.

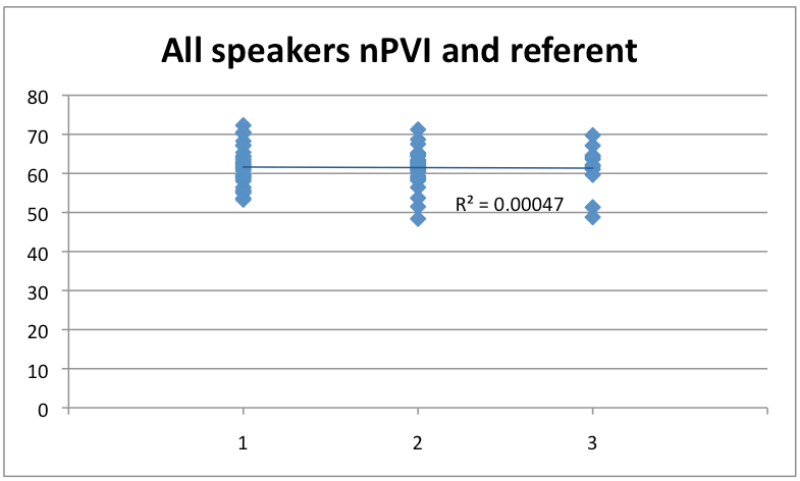

Figure 7.6: All speakers Topic nPVI and referent ethnicity, where 1 indicates Māori referents, 2 indicates unknown or mixed referents and 3 indicates Non-Māori referents.

The nPVI and mean pitch were calculated for each topic and were then ranked from lowest to highest. The low nPVI and high mean pitch values were ranked alongside each other, as these rankings would correspond to the most 'Māori-sounding' speech, while the high nPVI and low mean pitch would be the least 'Māori-sounding' speech (Figures 7.7 to 7.10).

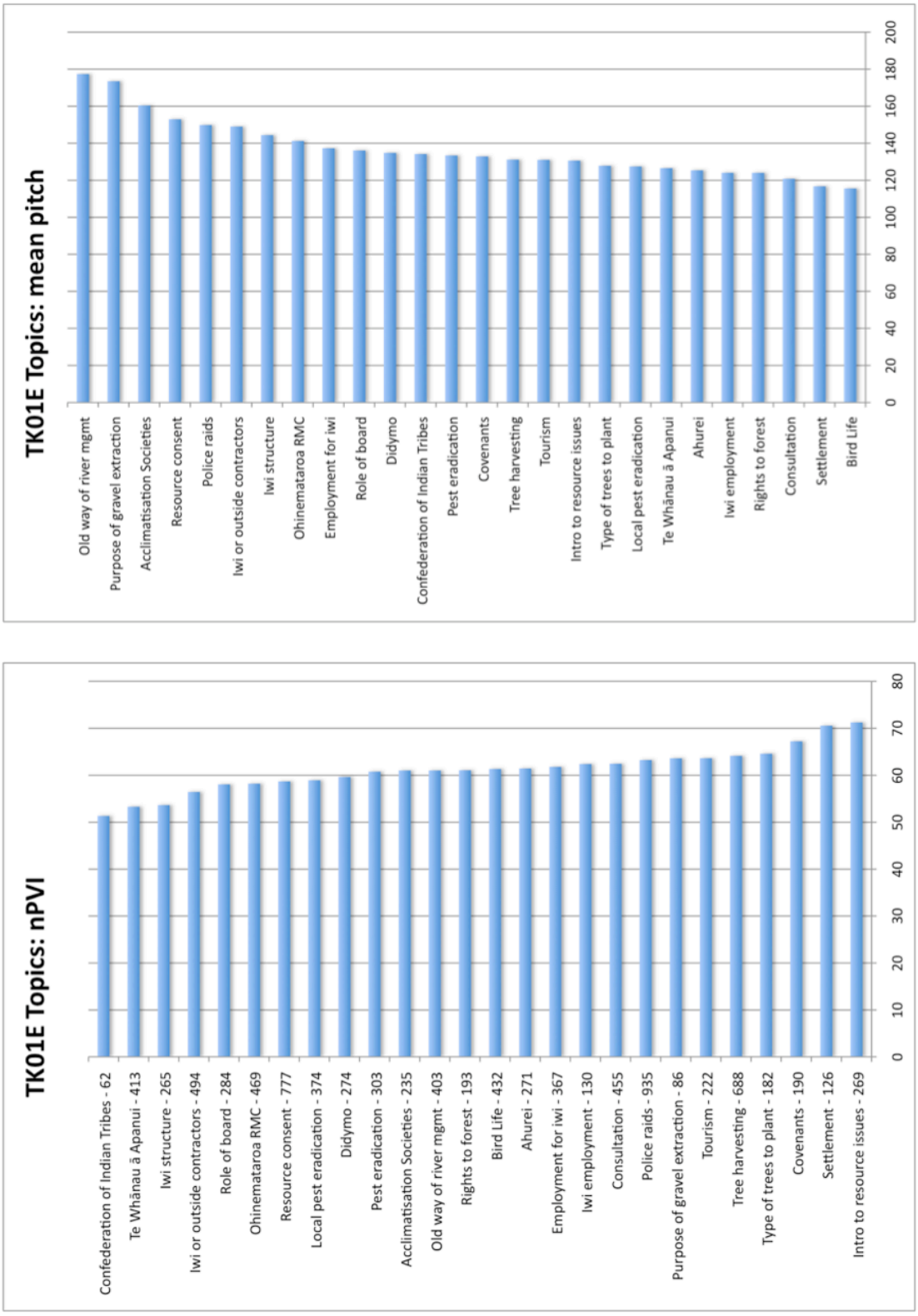

Figure 7.7: Barplots showing nPVI (with number of segments listed alongside the topic title) and mean pitch (in Hz) of TK01E topics.

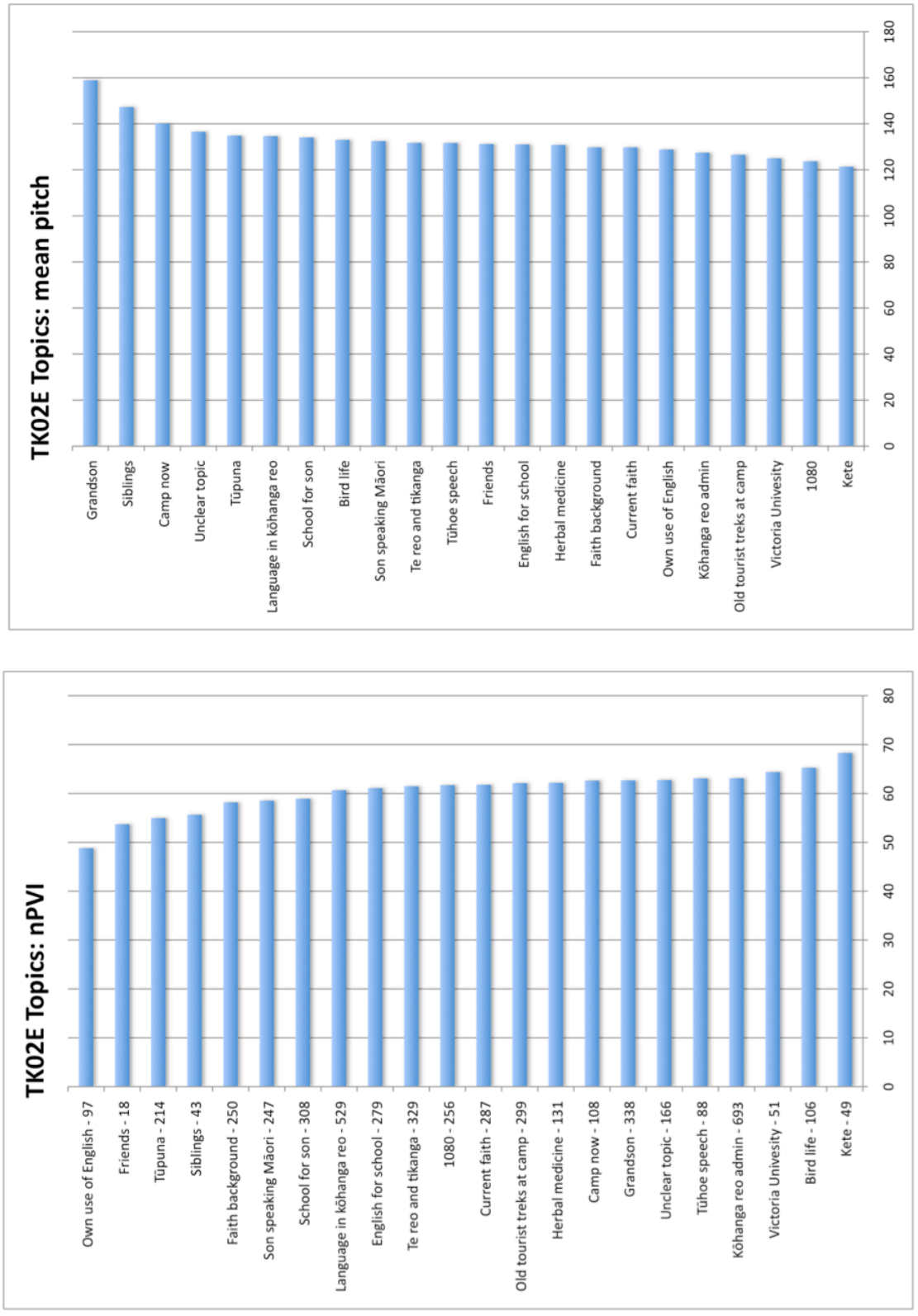

Figure 7.8: Barplots showing nPVI (with number of segments listed alongside the topic title) and mean pitch of TK02E topics.

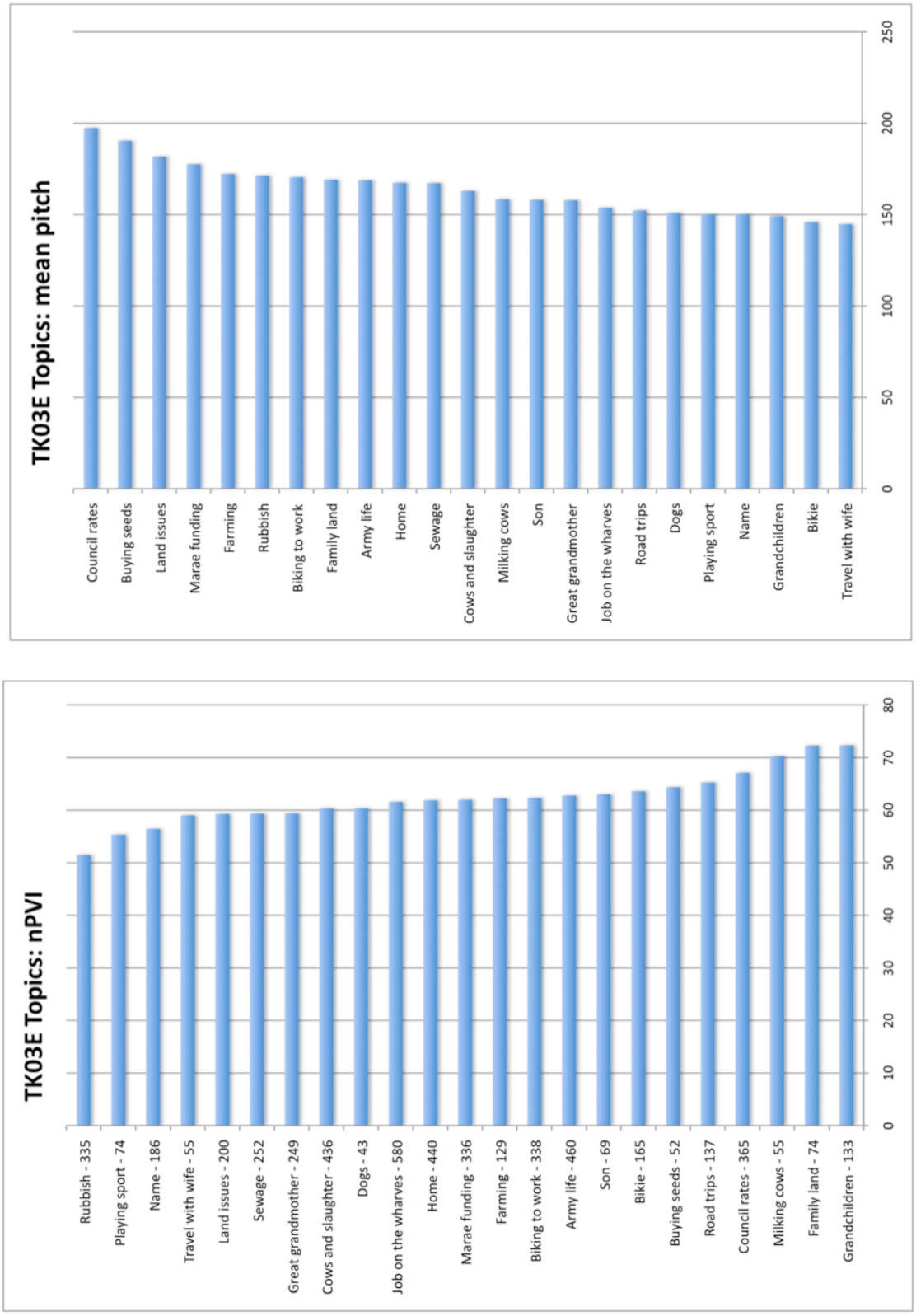

Figure 7.9: Barplots showing nPVI (with number of segments listed alongside the topic title) and mean pitch of TK03E topics.

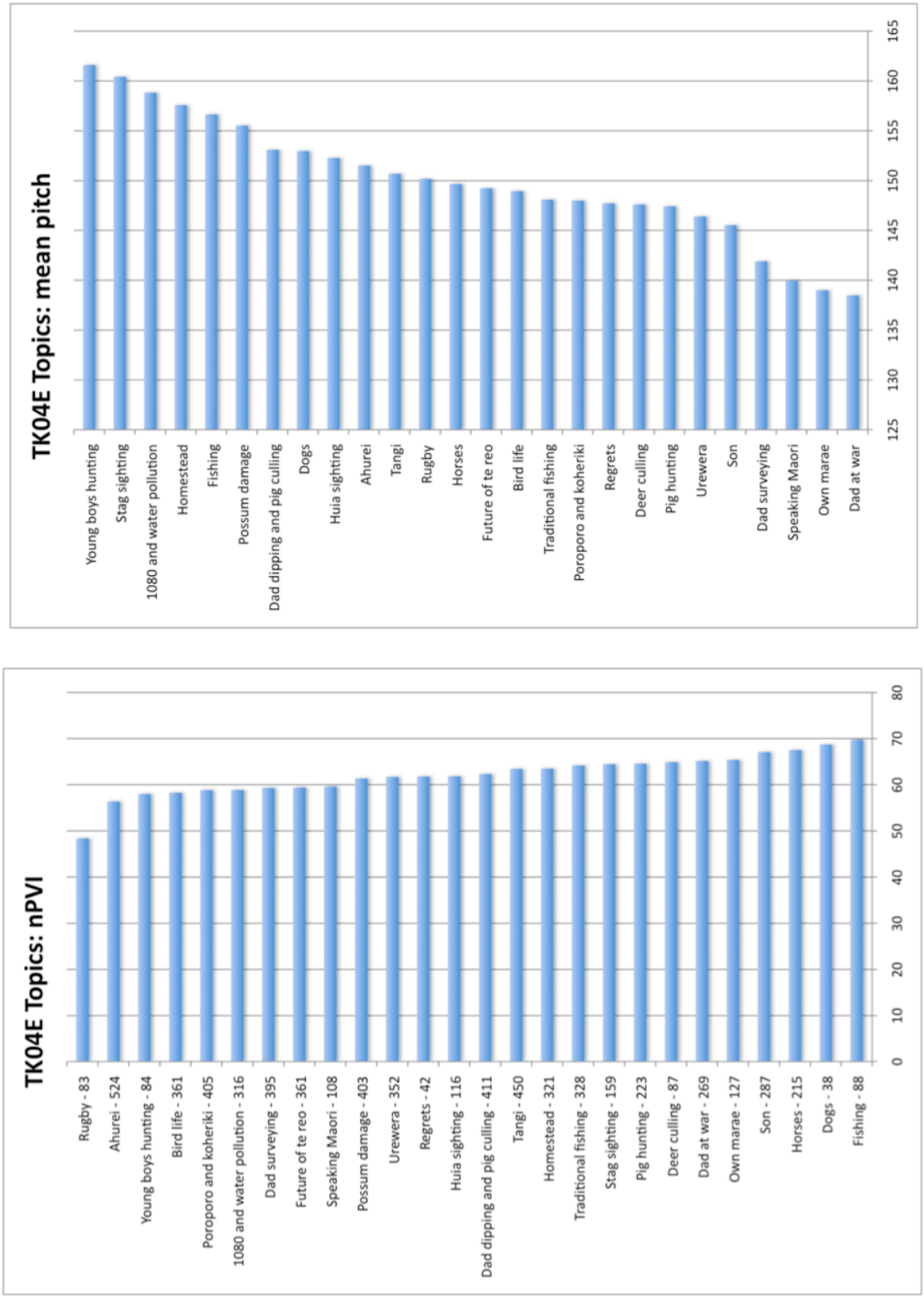

Figure 7.10: Barplots showing nPVI (with number of segments listed alongside the topic title) and mean pitch of TK04E topics.

Given that both high mean pitch and low nPVI are features of ME, it could be expected that if speakers were using ME in association with certain topics, they would demonstrate both of these features in the 'more Māori' topics. The results in Figures 7.7 to 7.10 clearly show that this is not the case and the lack of correlation between nPVI and pitch results is demonstrated in Figure 7.11 (see also Appendix E for individual speaker scatterplots).

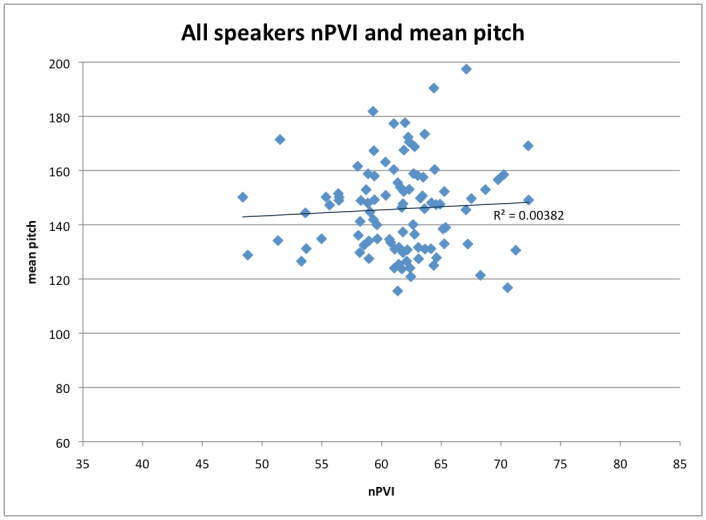

Figure 7.11: Scatterplot showing the nPVI and mean pitch values for each topic for all speakers.

If the speakers were using a Māori-sounding style of speech in some topics, but not others, then we would expect to see low nPVI correlated with high mean pitch. There are several possible explanations for the absence of this relationship. Firstly, it could be that prosodic features, while being salient features of the overall way a person speaks, may not be subject to variation by topic in the same way that phonological, syntactic or semantic features are. As such, a person's overall mean pitch may be 'fixed' and any variations in pitch may be due to emotion (Breitenstein et al., 2001) or intonation and stress patterns within the conversation, rather than being representative of a change in register due to topic. Similarly, rhythm may not vary by topic, but the speaker may indicate their Māori identity through an overall more syllable-timed rhythm. This is less likely to be true for rhythm, as anecdotal observations suggest that variation in rhythm according to addressee does occur, which is related to variation by topic (Bell, 1984).

One example described previously is the comparison of the speech of the young Māori speaker from Part One to the Pākehā interviewer, with his speech to a Māori addressee on the telephone. For this reason, and for the reason that rhythm was shown by Szakay (2008) to be the most salient feature of ME, it was decided to focus on rhythm, rather than pitch, as the indicator of which topics were perceptually 'more Māori'.

Following the model used in Rickford and McNair-Knox (1994), the content of the most and least syllable-timed topics were compared (Table 7.9) with consideration given to:

(i) The number of segments on which the values were based.
(ii) The number of Māori words used in that topic.
(iii) The ethnicity of the referent.
(iv) The number of quotations used in that topic.
(v) The affinity indicated towards the referent.

(i) The number of segments was considered due to the observed effect of short sections of speech on the results from the Set One tags. Figure 7.12 shows the number of segments in the three topics with the lowest nPVI (1, 2, 3) and in the three topics with the highest nPVI (4, 5, 6). There was more variation in the number of segments in the topics with the lower nPVI scores, but overall there was no correlation between lower numbers of segments and either low or high nPVI scores.

The three topics with the largest numbers of segments (>300) were all in the lower nPVI range. It is possible that the speakers may have had more to say about these three topics (Te Whānau ā Apanui, Rubbish and Ahurei) due to the higher degree of saliency they held for the speakers (Giles & Powesland, 1975). In the topic 'Te Whānau ā Apanui', TK01E described the pest eradication programme used by the neighbouring iwi and the potential applications of this for Tūhoe. This was an area of great interest to this speaker as he was doing a considerable amount of work on developing opportunities for his iwi based on the local natural resources. Similarly, when TK03E was discussing 'Rubbish', he was outlining available options for addressing the problem of rubbish being dumped in the area and expressing his feelings towards his family members whom he had caught doing this. Therefore, this was an issue to which he felt personally connected.

Table 7.9: Topics with the highest and lowest nPVI values for each speaker with number of segments, number of Māori words, referent ethnicity and number of quotes.

Speaker	Topic	nPVI	Rank	No. segs	No. Māori words	Ref.	No. quotes
TK01E	Intro to resource issues	71.24	Highest	269	0	U	0
	Settlement	70.56	Second highest	126	0	M	0
	Covenants	67.23	Third highest	190	3	M	0
	Iwi structure	53.63	Third lowest	265	7	M	3
	Te Whānau ā Apanui	53.29	Second lowest	413	11	M	2
	Confederation of Indian Tribes	51.33	Lowest	62	0	NM	0
TK02E	Kete	68.28	Highest	49	3	M	0
	Bird life	65.25	Second highest	106	4	U	0
	Victoria University	64.37	Third highest	51	1	M	0
	Tūpuna	54.98	Third lowest	214	11	M	0
	Friends	53.70	Second lowest	18	3	U	0
	Own use of English	48.80	Lowest	97	0	NM	0
TK03E	Grandchildren	72.32	Highest	133	1	M	1
	Family land	72.29	Second highest	74	0	M	1
	Milking cows	70.24	Third highest	55	0	M	0
	Name	56.45	Third lowest	186	4	M	0
	Playing sport	55.35	Second lowest	74	1	M	0
	Rubbish	51.50	Lowest	335	2	U	5
TK04E	Fishing	69.76	Highest	88	4	NM	0
	Dogs	68.70	Second highest	38	0	U	0
	Horses	67.52	Third highest	215	3	M	0
	Young boys hunting	58.00	Third lowest	84	1	M	5
	Ahurei	56.38	Second lowest	524	40	M	2
	Rugby	48.39	Lowest	83	1	M	1

When TK04E described the ‘Ahurei’, he gave an explanation of the historical background to the Tūhoe festival and it was a topic about which he was eager to share his substantial knowledge.

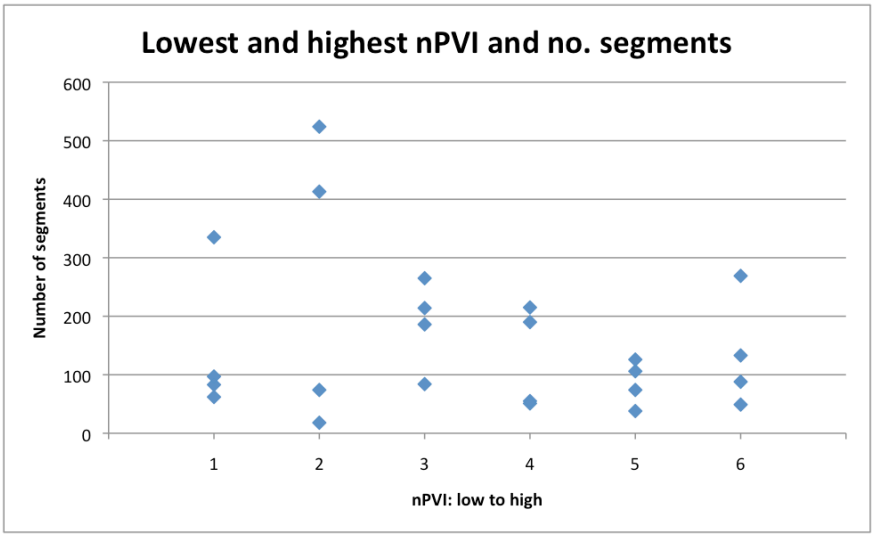

Figure 7.12: Scatterplot showing the three topics with the lowest nPVI values (1, 2 and 3) and the three topics with the highest nPVI values (4, 5 and 6) across the four speakers and the number of segments in each of these topics.

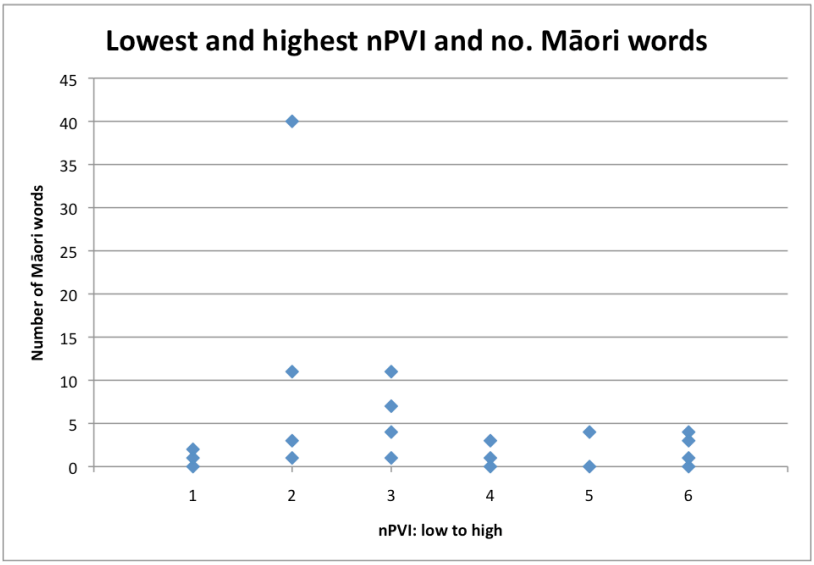

Figure 7.13: Scatterplot showing the three topics with the lowest nPVI values (1, 2 and 3) and the three topics with the highest nPVI values (4, 5 and 6) across the four speakers and the number of Māori words in each of these topics.

(ii) With regard to the second aspect, the number of Māori words used in a topic, it was anticipated that perhaps the syllable-timed rhythm of the Māori words might affect the other words around them, but this was not the case, as shown in Figure 7.13. As expected, the topic with the highest number of Māori words was in the low nPVI range. This pattern was not consistent, however, and the topics with the lowest nPVI for each speaker all had very few Māori words.

(iii) As shown in figures 7.2 to 7.6, there was not an overall association between ethnicity of the referent and nPVI. When only the topics with the lowest and highest nPVI were considered, the same lack of association was seen (see Figure 7.14). This pattern looks quite interesting at first, however the overall results showed that there was not a association between referent ethnicity and nPVI. These results do not show a trend of Māori ethnicity corresponding to low nPVI topics as might have been expected.

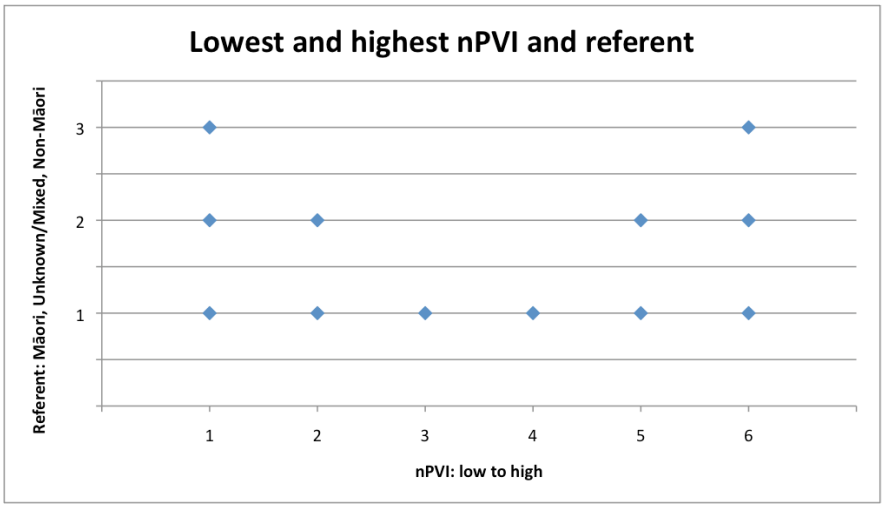

Figure 7.14: Scatterplot showing the three topics with the lowest nPVI values (1, 2 and 3) and the three topics with the highest nPVI values (4, 5 and 6) and the ethnicity of the referent in each of these topics, where 1 indicates Māori, 2 indicates Unknown/mixed and 3 indicates Non-Māori.

(iv) The investigation of the number of quotes used showed a distinct difference between the low nPVI and high nPVI topics (see Figure 7.15).

Of all the factors examined with these data, the influence of quotes stood out as being most noteworthy. While topics from both the lowest and highest nPVI ranges had zero quotes, the topics with the highest number of quotes were all in the low nPVI range. Table 7.10 shows the number of quotes used by each individual speaker in the topics with the highest and lowest nPVI. While the number of quotes used by each speaker were small, a distinct difference is evident.

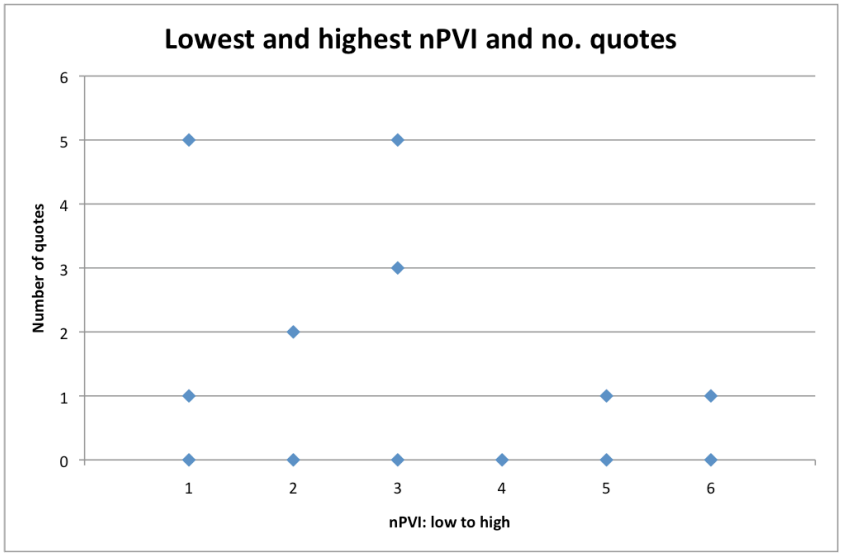

Figure 7.15: Scatterplot showing the three topics with the lowest nPVI values (1, 2 and 3) and the three topics with the highest nPVI values (4, 5 and 6) and the number of quotes used in each topic.

TK01E, TK03E and TK04E all used more quotations in the topics which were more syllable-timed. TK02E did not use quotes in any of the three topics with the highest nPVI or in the three topics with the lowest nPVI.

In order to investigate the relationship between quotes and rhythm further, the nPVI of all the quotes in each recording were compared against the overall nPVI for the recording, as shown in Table 7.11. For this section, the quotes with less than 20 segments were excluded. This minimum number of segments was higher than in other sections due to the occurrence of extreme values (outside 30-80) for topics with 10-19 segments, which is likely to be related to the smaller number of tokens of quoted sections.

Table 7.10: Number of quotes used by each speaker in the three topics with the highest nPVI and the three topics with the lowest nPVI.

Speaker	nPVI	No. quotes
TK01E	High	0
	Low	5
TK02E	High	0
	Low	0
TK03E	High	2
	Low	5
TK04E	High	0
	Low	8

Table 7.11: Overall nPVI, SD of overall nPVI and nPVI of quoted speech for each speaker.

Speaker	Overall nPVI	S.D. overall nPVI	nPVI quotes
TK01E	60.83	2.45	58.82
TK02E	61.86	1.61	69.72
TK03E	62.31	3.00	57.31
TK04E	61.94	1.93	63.77

Again, there is inconsistency across speakers. For two speakers, the nPVI of the quotes were higher than the mean and for the other two speakers, they were lower. For all of the speakers except TK02E, there was a difference of less than, or approximately, 1 standard deviation from the mean. For TK02E, the nPVI of his topics with quotes was more than 2 standard deviations above the mean. His recording contained only two quotes with more than 20 segments, which may account for the unusually high nPVI value. A comparison of the topics containing quotes is made in Table 7.12.

Table 7.12: The number of segments, number of quotes and nPVI of each topic containing quotes.

Speaker	Topic title	Number of segments in quotes	Number of quotes	nPVI of whole topic
TK01E	Consultation	115	2	62.45
	Types of trees to plant	33	1	64.6
	Resource consent	90	2	58.71
	Rights to forest	45	1	61.07
	Ōhinemataroa RMC	56	1	58.21
	Bird life	71	1	61.36
	Iwi or outside contractors	86	1	56.43
	Iwi structure	99	1	53.63
TK02E	Grandson	92	2	62.67
TK03E	Rubbish	20	1	51.5
	Cows and slaughter	24	1	60.33
	Army life	27	1	62.78
	Council rates	33	1	67.11
	Marae funding	103	1	61.97
TK04E	Dad surveying	22	1	59.32
	Poroporo and koheriki	79	2	58.85
	Tangi	101	3	63.43
	1080 and water pollution	94	1	58.87
	Own marae	125	1	65.38

Table 7.12 shows that the number of quotes in a topic, or number of quoted segments in a topic, were not correlated with nPVI, but since there was often only one quote per topic, this finding is perhaps not surprising.

The relationship between quotes and pitch was quite different. The mean pitch of the quotes was notably higher than the speakers' overall mean pitch values, across all speakers, as shown in Table 7.13. This shows that the mean pitch of the quotes was more than 2 standard deviations higher than the overall mean pitch for TK01E, TK02E and TK03E. The mean pitch of quotes used by TK04E was just over 1 standard deviation above the overall mean pitch.

Table 7.13: Overall mean pitch, SD of pitch overall and mean pitch of quoted speech for each speaker.

Speaker	Overall mean pitch	S.D. overall pitch	Mean pitch quotes
TK01E	95.44	1.60	132.14
TK02E	127.50	3.12	171.98
TK03E	164.18	10.35	193.80
TK04E	149.51	4.58	155.97

It was not known whether the higher pitch used in these quotes reflected the higher mean pitch of Māori speakers being quoted, so a comparison was made of the Māori speaker quotes and Non-Māori speaker quotes, as shown in Figures 7.16 to 7.19.

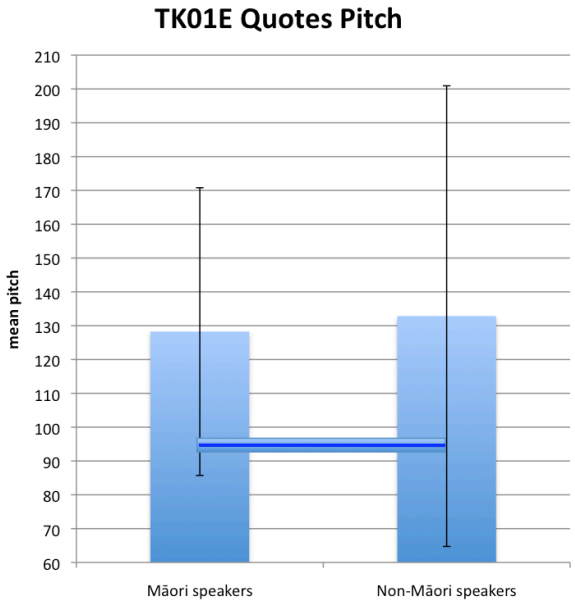

Figure 7.16: TK01E mean pitch of quotes by Māori speakers and Non-Māori speakers. The error bars show 1 standard deviation above and below the means. The middle line shows the overall mean pitch for TK01E and the middle bar shows 1 standard deviation above and below the overall mean pitch.

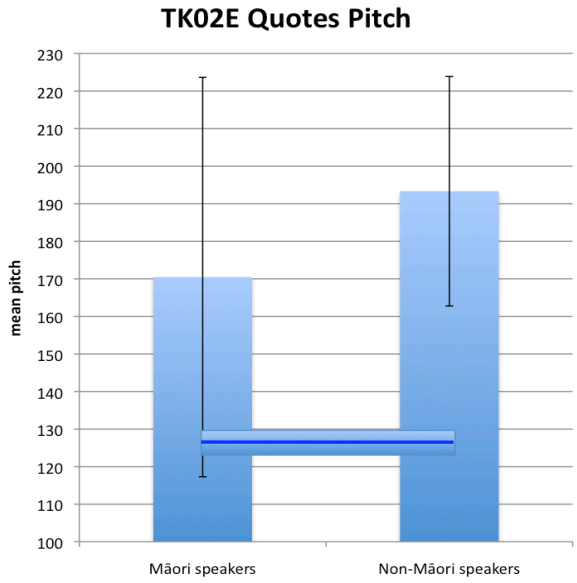

Figure 7.17: TK02E mean pitch of quotes by Māori speakers and Non-Māori speakers. The error bars show 1 standard deviation above and below the means. The middle line shows the overall mean pitch for TK02E and the middle bar shows 1 standard deviation above and below the overall mean pitch.

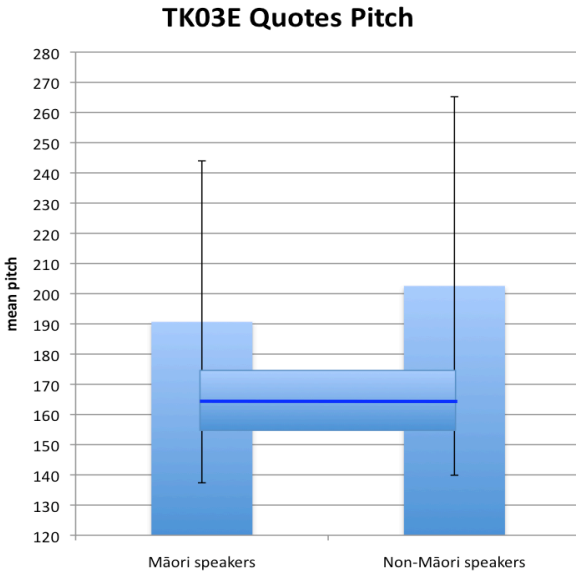

Figure 7.18: TK03E mean pitch of quotes by Māori speakers and Non-Māori speakers. The error bars show 1 standard deviation above and below the means. The middle line shows the overall mean pitch for TK03E and the middle bar shows 1 standard deviation above and below the overall mean pitch.

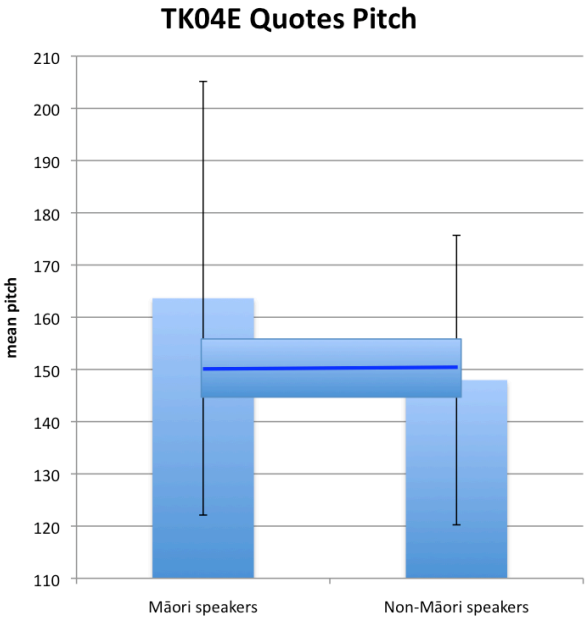

Figure 7.19: TK04E mean pitch of quotes by Māori speakers and Non-Māori speakers. The error bars show 1 standard deviation above and below the means. The middle line shows the overall mean pitch for TK04E and the middle bar shows 1 standard deviation above and below the overall mean pitch.

Figure 7.17 shows that TK02E used a slightly higher mean pitch when quoting non-Māori speakers, however both Māori and non-Māori quotes were more than 1 standard deviation above the overall mean. All of the pitch results of the Māori and non-Māori speakers' quotes in figures 7.16 to 7.18 were more than 1 standard deviation above the mean. Figure 7.19 shows a different pattern for TK04E's recording. Like the other speakers, his pitch was more than 1 standard deviation above the mean when he was quoting Māori speakers. However, he used a slightly lower pitch when quoting non-Māori speakers but the value was within 1 standard deviation of the mean. This reflects the pattern seen in results throughout Part Two of the present study, in which individual speakers show results which differ from the trends of the other speakers.

Overall, the results of the quoted sections of speech show that the topics with the lowest nPVI contained more quotes than the topics with the highest nPVI. However, across all the recordings from all four speakers, there was no correlation between nPVI and either the number of quotes or the number of vowel segments in quotes. The pitch results

showed that the quoted sections had an almost universally higher mean pitch than the overall mean pitch of the speaker. Further examination indicated that this was not related to the ethnicity of the person being quoted, and therefore this elevated mean pitch did not appear to be a reflection of the 'Māoriness' of the topic. It is likely that these higher mean pitch values were related to some other factor, perhaps a generally more animated style while 're-enacting' an interaction.

(v) The final consideration given to these topics related to the degree of affinity indicated by the speaker towards the referent. This posed the most difficulty, as it was not only impossible to know exactly how the speakers felt about the person they were talking about, but also there was no reasonable way to quantify affinity. A qualitative description was assigned to each of these topics, based on the content of that topic. Overt statements of similarity between the referent and the speaker were considered 'high' affinity, while implied similarities were considered 'moderately high' affinity. Similarly, overt or implied differences between the referent and the speaker were considered 'low' and 'moderately low' affinity, respectively. Some topics contained both attitudes and were coded 'mixed' affinity, while some topics contained no such indications and were coded 'not specified'. Table 7.14 lists the topics with the highest and lowest nPVI values alongside a description of the degree of affinity indicated towards the referent.

Table 7.14: The topics with the lowest nPVI values for each speaker with the degree of affinity indicated towards the referent.

Speaker	**Topic**	**Affinity**
TK01E	Iwi structure	High
	Te Whānau ā Apanui	High
	Confederation of Indian Tribes	High
TK02E	Tūpuna	High
	Friends	Moderately high
	Own use of English	Low
TK03E	Name	High
	Playing sport	Moderately high
	Rubbish	Mixed
TK04E	Young boys hunting	Not specified
	Ahurei	Mixed
	Rugby	Mixed

Table 7.14 shows that in most of the topics with the lowest nPVI values, the speaker indicated a high degree of affinity with the referent. A typical example is TK02E emphasizing his connection to his tūpuna (ancestor): "I am third generation from him". Some interesting indications of affinity came from TK01E when talking about Te Whānau ā Apanui and the Confederation of Indian Tribes. While the speaker was not part of either group, he drew parallels between the experiences they had in common. The comments "I think that would be a way forward and that's what the Whānau ā Apanui are doing" and "it just broadens your horizons as to what could be possible" are representative of the two topics, respectively.

The topic which stands out most in this group of results was the low affinity indicated towards the referent in the 'Own use of English' topic. TK02E was describing how he would defend his level of English proficiency if he was confronted, and made the following comment, "I'd give a joker from university a good go… I would be able to retaliate." It may be that the speaker's use of a more syllable-timed rhythm in this topic was a reflection of the 'referee design' described by Bell (1984). TK02E seemed to be diverging away from the referent's style in order to show his lack of affinity with him.

Table 7.15: The topics with the highest nPVI values for each speaker with the degree of affinity indicated towards the referent.

Speaker	**Topic**	**Affinity**
TK01E	Introduction to resource issues	Low
	Settlement	High
	Covenants	Moderately low
TK02E	Kete	Not specified (no referent)
	Bird life	Low
	Victoria University	Not specified
TK03E	Grandchildren	Mixed
	Family land	Moderately low
	Milking cows	Low
TK04E	Fishing	Low
	Dogs	Neutral
	Horses	Neutral

The pattern of affinity indicated in the topics with the highest nPVI (Table 7.15) is markedly different from the affinity indicated in the topics with the lowest nPVI. The referents in these topics were often not human, for example in the 'Milking cows' or 'Dogs' topics. In the 'Kete' topic, TK01E only referred to himself as he related which qualifications he had completed.

In other topics, the speaker made his distance from the referent quite clear, for example when TK02E was talking about 'Bird life' he said, "I think there's a misconception by people, by DoC people and by people." Similarly, in explaining why his extended family did not know about the land titles in the 'Family land' topic he commented, "they been away too long".

The results indicate that speakers tended to use a more syllable-timed rhythm when they felt a high degree of affinity for the referents, either Māori or Non-Māori. Conversely, when the speakers felt more neutral about the referents, or more distanced from them, they tended to use a less syllable-timed rhythm.

CHAPTER 8

PART TWO DISCUSSION

Part Two of the current study addressed the question: Are rhythm and mean pitch influenced by topic? Based on the literature, the following relationships were expected:

- Speakers would use a more syllable-timed rhythm and possibly a higher mean pitch when discussing topics considered more Māori.
- The use of a more syllable-timed rhythm and higher mean pitch would be particularly evident when the referent in the topic was Māori.
- Other aspects of the topics could influence the register used by the speakers, such as the subject matter (and the speakers' perceived formality of this subject), and the time and location referred to in the topic.
- Each speaker's self-identity and affinity with the referents of the topics would likely play a role in the accommodation towards or divergence away from the style used by the referent.

As a result of these expectations, the following questions were posed during the course of the study and will be addressed in this chapter:

1. Is there a correlation between 'Māori' topics and a lower nPVI or higher mean pitch?
2. Are there consistent patterns between any of the topic tags and nPVI or mean pitch?
3. What is the relationship between referent and nPVI?
4. What other factors influence the register used by the speakers?

8.1 Constraining Factors

Before addressing the above questions, however, it is necessary to comment on the constraining factors which potentially, and actually, impacted all of the results in the present study. These were: interviewer ethnicity, interview setting and statistical issues.

Interviewer ethnicity: It was noted in the introduction that the interviewer for all four of these recordings was a Pākehā female academic. The speakers had consented to being recorded and were aware that the recordings would be used for research by other academics. This undoubtedly influenced the style used by the speakers, as accommodation towards the addressee has been shown to be the greatest influence on register selection.

It should be noted, however, that several mitigating factors were present. Firstly, the English language interviews were conducted after the Māori language interviews. Therefore, the speakers knew that the interviewer was more integrated into the Māori community than they might expect had the interviewer been a monolingual English-speaking Pākehā.

Secondly, the interviews were conducted in the speakers' homes and all attempts were made to create an informal atmosphere. As suggested by Brown and Levinson (1978), the perceived formality of a situation is related to the perceived degree of solidarity or distance between the interlocutors. While an atmosphere of solidarity was established for the interviews as far as possible, it can be assumed that this sense of solidarity was enhanced during the topics with which the interviewer was more familiar, while some distance may have been felt when the interviewer was unfamiliar with the subject matter. The interviewer marked her solidarity with the speakers on several occasions, such as noting her history of involvement in the kōhanga reo movement, and her acquaintance with mutual friends.

Therefore, while the effect of a Pākehā interviewer cannot be ignored, it must also be acknowledged that every effort was made to reduce the impact of this. Furthermore, based on the findings of Douglas-Cowie (1978) and Rickford and McNair-Knox (1994), this combination of speakers using a non-standard variety, yet speaking to a standard-

variety user, creates a situation in which maximum variation can be expected, which was ideal for the focus of Part Two of the present study.

Interview setting: While the use of the speakers' homes as the setting for the interviews was intended as a means of creating a familiar and informal atmosphere, there was an associated negative implication. The homes of TK02E and TK03E are located within the Ruātoki Valley, which is an area in which Māori language remains the primary language of communication for the speakers' age-group. The home of TK04E is at the edge of this valley, while the home of TK01E is located within the region, but not directly within the Ruātoki Valley and this may have influenced the register used. It would be expected that TK01E would speak Māori when returning to the Ruātoki Valley, but would be accustomed to speaking English to people in the area around his home. This may have been a factor in the style used by the speakers, although the overall nPVI results did not indicate so.

Statistical issues: Several statistical issues became evident in the present study. While attempts were made to reduce the effects of some of these issues, there was no option but to accept others and interpret the results accordingly.

When the five-category (Set One) tags were used, a new tag was created every time one of the categories changed. This resulted in many short sections of speech, on which the nPVI values were calculated. It is known that nPVI values are less reliable for shorter sections of speech and the present study found that at least 10 segments were necessary to avoid the most extreme outlier values. When values based on fewer than 10 segments were excluded, there was a considerable reduction in the number of tokens available for comparison.

The remaining data consisted of values with large standard deviations and relatively similar means. This was anticipated, as it was known that the degree of style shifting by topic would be relatively small. Statistically, the relatively large variance combined with relatively similar means meant that it was unlikely that any of the comparisons would reach an acceptable level of statistical significance. This was the case with the results in Sections 7.1 (A), (B), (C) and (E).

After the predicted topics failed to show correlations, CART trees and regression analysis were used to investigate whether there were, in fact, any significantly different groups of tags. The results of these were presented in Section 7.1 (D). All possible combinations were investigated and this large number of tests performed on the same data made the 'significant' result less reliable.

An attempt was made to reduce the impact of the short sections of speech, by retagging the recordings with only one tag per topic. Short sections of speech still occurred in topics with multiple 'untagged' sections. It was necessary to eliminate these from the recordings, as they mostly contained overlapping speech, interviewer's speech or sections of Māori speech, all of which would have skewed the values for the speaker's rhythm in English. It should be noted that topics with more sections of Māori speech would likely be considered 'more Māori', and would therefore be of particular interest to the present study. It is possible that the larger number of 'untagged' sections in these topics would have resulted in more sections of speech with fewer than 10 vowel segments, which would have been excluded, and as a result, the results from these topics may be under-represented in the data. This was, however, unavoidable.

With consideration given to these constraints, the following sections address the questions posed in Part Two of the present study.

8.2 Part Two Questions

8.2.1 Is there a correlation between 'Māori' topics and a lower nPVI or higher mean pitch?

The following topics were predicted to be associated with a lower nPVI and possibly a higher mean pitch:

- Talking about Māori language.
- Talking about distinctive aspects of Māori culture, such as spending time on the marae.
- Talking about issues the speaker's iwi has with outside groups.
- Talking about events that took place in the Ruātoki Valley.

- Talking about a time when the speaker was using Māori or ME or was interacting with other Māori.
- Talking about topics where the speaker indicates affinity towards a group of Māori.

These were investigated in Section 7.1 (A) and no reliably significant results were found. This may indicate that there is no correlation between 'Māori' topics and a lower nPVI or higher mean pitch, or the trend may be too small to be significant due to the statistical issues outlined in the previous section.

8.2.2 Are there consistent patterns between any of the topic tags and nPVI or mean pitch?

When the predicted topics in the Set One tags did not show reliably significant results, an attempt was made to identify which of the tags were more associated with high mean pitch or low nPVI. There were no consistent patterns among the tags which showed the greatest difference in the number of tokens in the high or low nPVI ranges. Similarly, only one speaker showed a significant difference when the distribution of tokens in the high or low nPVI ranges was considered for each tag. This confirms the earlier statement that the nPVI values of each tag were very similar for most speakers.

After the results from sections 7.1 (A) to (C) were calculated, it was evident there was no correlation between the mean pitch and nPVI values. It was decided to focus on nPVI for the remainder of the Set One tag comparisons for two reasons. Firstly, rhythm has been identified as the most salient feature of Māori English (Szakay, 2008) and secondly, rhythm was anecdotally observed to vary by addressee for one of the young speakers in Part One of the study. Therefore, rhythm was most likely to show variation by topic. Mean pitch was considered in the Set Two tag comparisons, but again showed no meaningful associations with any of the topics.

In order to establish if there were correlations between any of the tags and a low nPVI, CART trees were created and a regression analysis was completed. These were performed with all tags for all speakers, both individually and combined. Of all the tags

investigated, the only significant result indicated that the speakers were likely to be using a more syllable-timed rhythm when referring to a Māori group (tagged with 'MGp'). This is not statistically robust due to the large number of tests completed with this set of data, however it does support the work of Bell (1984) and Rickford and McNair-Knox (1994). From their studies, it would be expected that variation by topic would mimic the variation made according to addressee, albeit to a lesser degree.

8.2.3 What is the relationship between referent and nPVI?

Further work was completed in order to investigate the relationship between the referent of a topic and the rhythm used, as the CART trees and regression analysis had indicated that this factor had the most potential for influence over variation by topic. When the recordings were divided into sections based on indications of the ethnicity of the referent, there was a consistent pattern of lower nPVI values for sections with Māori referents, however these results only reached statistical significance for two of the speakers. Surprisingly, when the recordings were retagged with the single category Set Two tags, and marked for referent, there was no consistent relationship between referent ethnicity and nPVI.

The methodological difficulties with marking the ethnicity of the referents must be considered. Most notably, it was impossible to know the ethnicity with total accuracy without knowing the referent directly. Furthermore, even if the ethnicity was known, it was impossible to know the variety of speech used in the reported interaction. However, the indication from regression analysis that the referent had the strongest correlation with nPVI should not be dismissed. It would appear that other factors interacted with the referent in influencing the variation by topic.

8.2.4 What other factors influence the register used by the speakers?

In order to address this question, the three topics with the lowest and highest nPVI values for each speaker were compared. The number of segments, ethnicity of the referent, number of Māori words, number of quotes and degree of affinity towards the referent were all considered.

Within these selected topics, there were no consistent patterns in the nPVI values related to the number of segments in each topic, nor with the ethnicity of the referent. Of the twenty-four topics considered in this section, the topic with the highest number of Māori words was in the lower nPVI group as would be expected, however there was no overall pattern of a greater number of Māori words being associated with lower nPVI topics.

There did seem to be an indication of more quotes being used in the topics with lower nPVI values which would support the previous results from Rickford and McNair-Knox (1994, p. 261), however this trend was not seen across all of the topics in all of the recordings. The mean pitch values of the quotes were consistently higher than the overall mean pitch for each speaker, however this was true when most speakers were quoting either Māori or non-Māori speakers. Therefore, the higher mean pitch does not seem to be a reflection of a higher mean pitch used by Māori speakers.

When affinity was considered in association with the referent, a relationship was apparent. Again, this is impossible to accurately gauge without knowing the thoughts of the speakers, however the transcripts of the relevant sections were considered qualitatively, and there was a stronger indication of affinity towards the referents (Māori or otherwise) in the low nPVI topics, and less affinity shown towards the referents in the high nPVI topics.

8.3 Results and Theory

If Bell's hypotheses (1984, summarised in Rickford & McNair-Knox, 1994) are applied to the current study, it would have been expected that:

(i) Variation in rhythm and mean pitch according to topic would only occur if there was variation in these features according to addressee.

(ii) The degree of variation in rhythm and mean pitch according to topic is likely to be small in comparison with variation according to addressee.

(iii) Speakers will use prosodic features when talking on a topic as if they were talking to addressees whom they associate with the topic.

To some extent, these hypotheses are supported by the findings in the current study. Variation in rhythm according to addressee has been anecdotally observed, while mean pitch has not. In the present study, the rhythm results do appear to be more correlated with topic than mean pitch.

Regarding the second hypothesis, it would be expected that the differences in the overall mean nPVI and mean pitch between each topic would be small. This is certainly supported in the present study. Even the most different tags have similar means with large variance, as demonstrated in Figure 7.1 in Section 7.1 (D).

Regarding the third hypothesis, it would be expected that the addressee associated with the topic would have the greatest influence on any observed variation. The CART and regression results support this, as they showed that the Referent category of tags have the greatest degree of correlation between topic and rhythm. Specifically, when the speakers were relating topics in which the addressees were Māori groups, they tended to use a more syllable-timed rhythm. While the results were not statistically robust, this was the strongest trend in the results.

The results can also be related to exemplar theory. According to this theory, the speakers have stored acoustic/phonetic exemplars of linguistic features in association with the social context in which they were heard. The context of the interview and the set of linguistic exemplars used by the interviewer undoubtedly had the biggest impact on the set of exemplars which the speakers were attempting to reproduce. However, it would also be expected that, to some degree, discussing topics from another context, would recall the exemplars used by the interlocutors in that context, especially if a high degree of affinity was felt between the speaker and the referent. This is the pattern shown in the results, albeit subtly. Interestingly, a more syllable-timed rhythm was used to demonstrate affinity not only towards Māori referents, as expected, but also towards the Confederation of Indian Tribes, whose dialect differed from the speaker's (Ball & Bernhardt, 2008).

8.4 Summary of Part Two

In summary, the mean pitch results in the present study show no discernable patterns of variation by topic, while the rhythm results show some trends. When speakers were

referring to Māori groups, their rhythm tended to be more syllable-timed, which reflected the rhythm likely to have been used in interactions with these groups. Additionally, when speakers indicated a sense of affinity with the referents in the topic, whether they were Māori or not, they tended to use a more syllable-timed rhythm. In this way, they were signaling, 'they're like us'.

These results are highly individualised and it is clear that the topics which are associated with a more syllable-timed rhythm for one speaker, are often not associated with a more syllable-timed rhythm for another speaker. For example, TK01E, TK02E and TK04E all discussed 'Bird life' and how this had changed over the years. The results in Figures 7.7 to 7.10 show marked differences between speakers in the ranking of the nPVI values for this topic. It has one of the lowest nPVI rankings for TK04E, one of the highest rankings for TK02E and a middle range ranking for TK01E.

The shifts in style were extremely subtle, due to the competing influences of interview setting, interviewer ethnicity, topic formality, style used by the referent, affinity with the referent and the number of quotes being used.

CHAPTER 9

CONCLUSION

The title of this thesis is, The English of Māori speakers: changes in rhythm over time and prosodic variation by topic. The study was divided into two parts, the first of which addressed the question: Has the distinctive rhythm of modern ME developed from the mora-timed rhythm of the Māori language? The second part addressed the question: Are rhythm and mean pitch influenced by topic?

The results in Part One indicate that the distinctive rhythm of ME has indeed developed from the mora-timed rhythm of the Māori language. Although few ME speakers have native fluency in the Māori language, it is suggested that these speakers signal their Māori identity by attempting to emulate the rhythm of Māori in their English speech. Perhaps it is precisely *because* they are unable to signal their Māori identity through the use of Māori language that they have adopted this Māori-sounding rhythm into their speech.

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 ethnicity, but are likely to be marking their identity with a Māori group. Similarly, the shift towards a more syllable-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.

In Part Two of the present study, the role of identity is demonstrated in relation to variation by topic. The results in this part of the study indicate that mean pitch is not influenced by topic, while rhythm is to a small degree.

Consistent with predictions based on the model described by Bell (1984), the referent of the topic had the greatest influence on variations in rhythm. The speakers tended to use a

more syllable-timed rhythm when referring to Māori speakers although this trend was subtle and in most cases was not statistically significant.

The degree of influence of the referent's ethnicity appears to be influenced by the degree of affinity felt towards that referent. A high degree of affinity, whether the referent was Māori or not, was seen in the topics with the most syllable-timed rhythm. A low degree of affinity was typically associated with a less syllable-timed rhythm. The exception to this trend was the example of the speaker who wanted to emphasise his sense of distance from a Pākehā referent, and expressed this through the use of a more syllable-timed rhythm.

Across the analyses used in Part Two of the present study speakers showed markedly different patterns of variation by topic. This reflects the highly individualised nature of this type of variation, due to multiple simultaneous influences on the speaker's register selection. These include the addressee, the setting of the interaction, the speaker's personal experience of the topic, the referent of the topic and the degree of affinity felt towards that referent.

The lack of reliably significant results in Part Two of the present study confirms that topic alone does not have a significant influence on register selection. The trends in the results indicate that any variation by topic is subtle and highly individualised, based on the speaker's personal recollections of how the referent was speaking and what degree of affinity was felt towards this referent.

The relationship between identity and register selection for ME has been previously addressed. King (1993) showed that the subtle features of ME function as an identity marker for Māori and those who associate closely with Māori. Rickford and McNair-Knox (1994) reported linguistic differences between topics in which the referent was someone the speaker felt 'detached' from and topics in which the referents were members of the speaker's close peer group. The speaker showed accommodation towards the referent in both of these topics.

The results of the present study confirm the findings of these previous studies and provide additional information about the role of identity in linguistic variation. Firstly,

the present study shows that identity accounts for both the shift in PE rhythm towards the syllable-timed rhythm of ME, and the shift in ME towards an even more syllable-timed rhythm in order to maintain a distinction. Secondly, the results show that a speaker may use linguistic features to signify links between personal identity and an outside group, if a sense of affinity is felt towards that group. By using a register typically reserved for in-group interactions when referring to the outside group, the speaker is indicating that this group is 'just like us'.

The role of identity in any speaker's linguistic choices cannot be understated. For the Māori speakers in the present study, identity has influenced both their rhythm over time and their linguistic variation by topic.

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Appendix A: List of comparison topics predicted to show differences in rhythm and mean pitch, for each speaker.

Table A.1: List of topics predicted to show differences in rhythm and mean pitch for TK01E.

Category	**Tags 1**	**Tags 2**
Subject	career	not career
Subject	culture	not culture
Subject	land	not land
Subject	culture or history	career or land
Subject	career or history	land or culture
Referent	NMInd or NMGp	other
Referent	MInd or MGp	NMInd or NMGp
Referent	community, family or self	not community, family or self
Referent	family or self	not family or self
Location	region or village	not region or village
Location	distant or overseas	not distant or overseas
Time	beforeborn or decadeplus	recent, now or future
Time	future	not future
Time	decadeplus	not decadeplus
Attitude	untagged	not untagged
Attitude	disM	not disM
Attitude	approval	not approval
Attitude	disNM	not disNM
Attitude	disM, disNM	approval
Attitude	approval disNM	disM

Table A.2: List of topics predicted to show differences in rhythm and mean pitch for TK02E.

Category	**Tags 1**	**Tags 2**
Subject	culture	not culture
Subject	career or lifestyle	not career or lifestyle
Subject	home or whānau	not home or whānau
Subject	beliefs, culture or history	not beliefs, culture or history
Subject	beliefs, culture, history or land	not beliefs, culture, history or land
Referent	self or family	not self or family
Referent	NMGp or NMInd	not NMGp or NMInd
Referent	MGp or MInd	NMGp or NMInd
Referent	community, self or family	not community, self or family
Referent	family	not family
Location	distant	not distant
Location	village	not village
Location	village or region	not village or region
Time	beforeborn or decadeplus	not beforeborn or decadeplus
Time	future	not future
Time	future or now	not future or now
Attitude	approval	not approval
Attitude	disNM or disM	approval
Attitude	dis M	approval or disNM
Attitude	disM	not disM
Attitude	disNM	not disNM
Attitude	untagged	not untagged

Table A.3: List of topics predicted to show differences in rhythm and mean pitch for TK03E.

Category	**Tags 1**	**Tags 2**
Subject	culture	not culture
Subject	career or lifestyle	not career or lifestyle
Subject	culture or land	not culture or land
Subject	career	not career
Referent	self or family	not self or family
Referent	NMGp or NMInd	not NMGp or NMInd
Referent	community, family or self	not community, self or family
Referent	family	not family
Location	distant or overseas	not distant or overseas
Location	village	not village
Location	village or region	not village or region
Time	beforeborn or decadeplus	not beforeborn or decadeplus
Time	future	not future
Time	future now	not future now
Attitude	approval	not approval
Attitude	disNM or disM	approval
Attitude	dis M	approval or disNM
Attitude	disM	not disM
Attitude	disNM	not disNM
Attitude	untagged	not untagged

Table A.4: List of topics predicted to show differences in rhythm and mean pitch for TK04E.

Category	**Tags 1**	**Tags 2**
Subject	culture	not culture
Subject	culture or history	not culture or history
Subject	career	not career
Subject	career or home	not career or home
Referent	MInd or MGp	NMInd or NMGp
Referent	family or self	not family or self
Referent	community, family or self	not community, family or self
Referent	NM or you	not NM or you
Location	distant or overseas	not distant or overseas
Location	region or village	not region or village
Location	village	not village
Time	beforeborn	not beforeborn
Time	beforeborn or decadeplus	recent, now or future
Time	future or now	not future or now
Time	future	not future
Attitude	approval disNM	disM
Attitude	untagged	not untagged
Attitude	disM	not disM
Attitude	approval	not approval
Attitude	disNM	not disNM
Attitude	disM, disNM	approval

Appendix B: Significant results from comparison of topics predicted to differ in rhythm and mean pitch.

Table B.1: Comparisons of Segmental nPVI, Intervallic nPVI and Mean Pitch values for Set One tags comparisons with $p<0.05$ marked in predicted (*) and reverse (R) direction

Category	Tags 1	Tags 2	TK01E			TK02E			TK03E			TK04E		
			Seg nPVI	Int nPVI	Pitch	Seg nPVI	Int nPVI	Pitch	Seg nPVI	Int nPVI	Pitch	Seg nPVI	Int nPVI	Pitch
Subject	career	not career									*			*
Subject	culture	not culture			*		R	R			*			
Subject	career or lifestyle	not career or lifestyle				R		R			*			
Subject	career or home	not career or home												
Subject	land	not land			R									
Subject	culture or land	not culture or land								*	*			
Subject	culture or history	career or land			*									R
Subject	culture or history	not culture or history												
Subject	career or history	land or culture												
Subject	beliefs, culture, history or land	not beliefs, culture, history or land				R	R	R						
Subject	beliefs, culture or history	not beliefs, culture or history						R						
Subject	home or family	not home or family				*		*						
Referent	MInd or MGp	not MInd or MGp												*
Referent	NMInd or NMGp	not NMGp or NMInd		*	R			*			R			
Referent	MInd or MGp	NMInd or NMGp	*	*	R									

Continued on next page

Referent	NMGp, NMInd or you	not NMGp, NMInd or you												*
Referent	family	not family				*		*			R			
Referent	community, family or self	not community, family or self	R	R							R			R
Referent	family or self	not family or self		R		*	*	*			R			
Referent	community, self or family	not community, self or family												
Location	region or village	not region or village			*						*			*
Location	village	not village						*			*			*
Location	distant or overseas	not distant or overseas									*			*
Location	distant	not distant												
Time	beforeborn	not beforeborn												R
Time	beforeborn or decadeplus	recent, now or future	R	R				R			R			R
Time	future	not future			*			*						*
Time	future now	not future now									R			R
Time	decadeplus	not decadeplus		R	R									
Attitude	untagged	not untagged			*		*	*			*			
Attitude	disM	not disM			*		*							*
Attitude	approval	not approval			R						*			*
Attitude	disNM	not disNM				*	*	*			*	*	*	*
Attitude	disM, disNM	approval				*	*				*			*
Attitude	approval disNM	disM						R			*		*	

Appendix C: Distribution of tokens for each tag, excluding tags with fewer than ten tokens in any range.

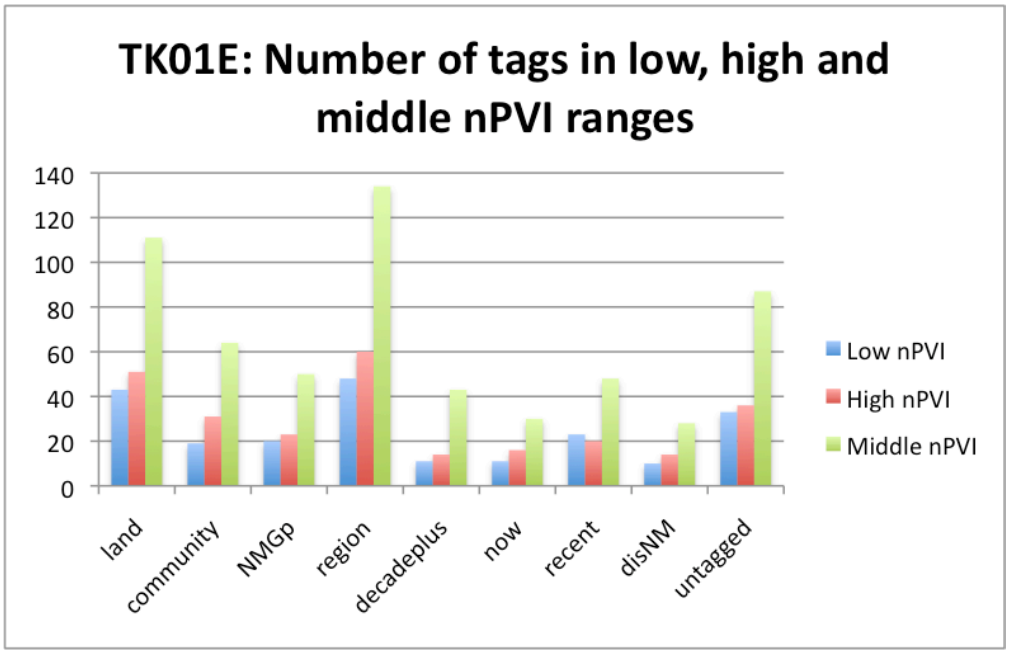

Figure C.1: Distribution of TK01E's tokens in the low, high and middle nPVI ranges for each tag.

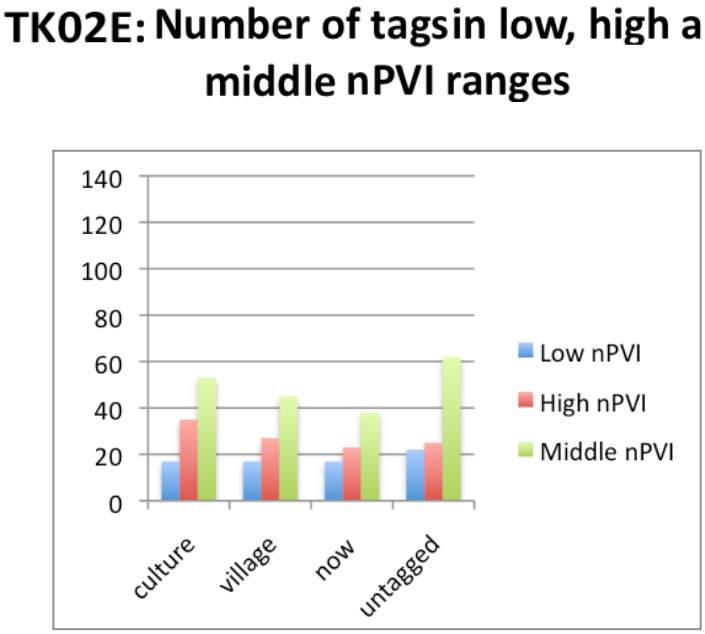

Figure C.2: Distribution of TK02E's tokens in the low, high and middle nPVI ranges for each tag.

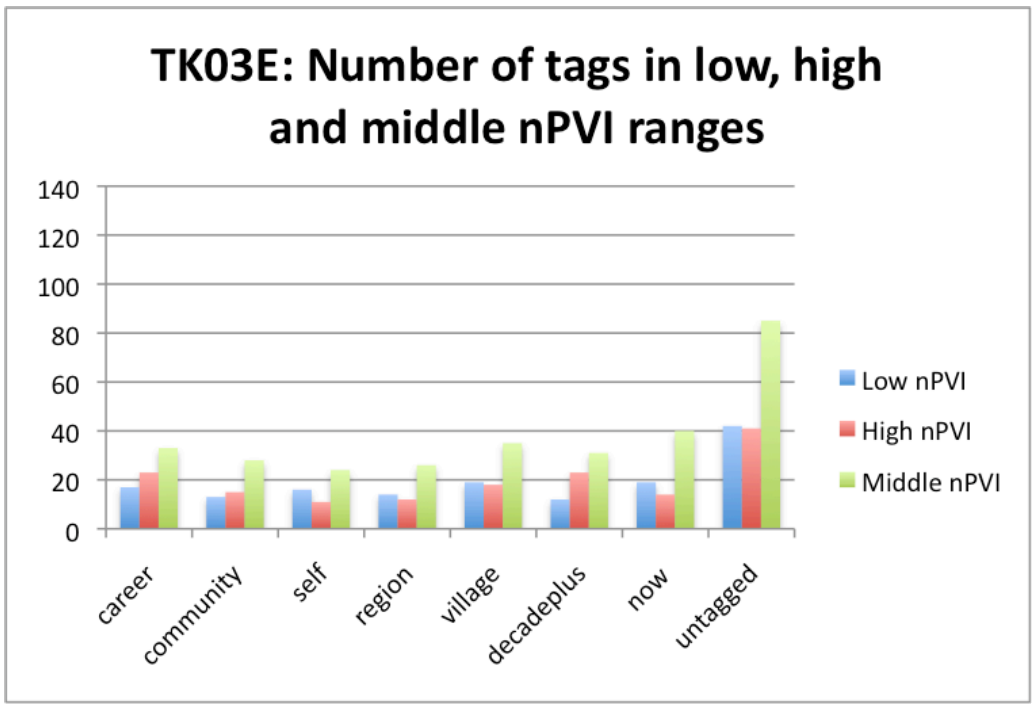

Figure C.3: Distribution of TK03E's tokens in the low, high and middle nPVI ranges for each tag.

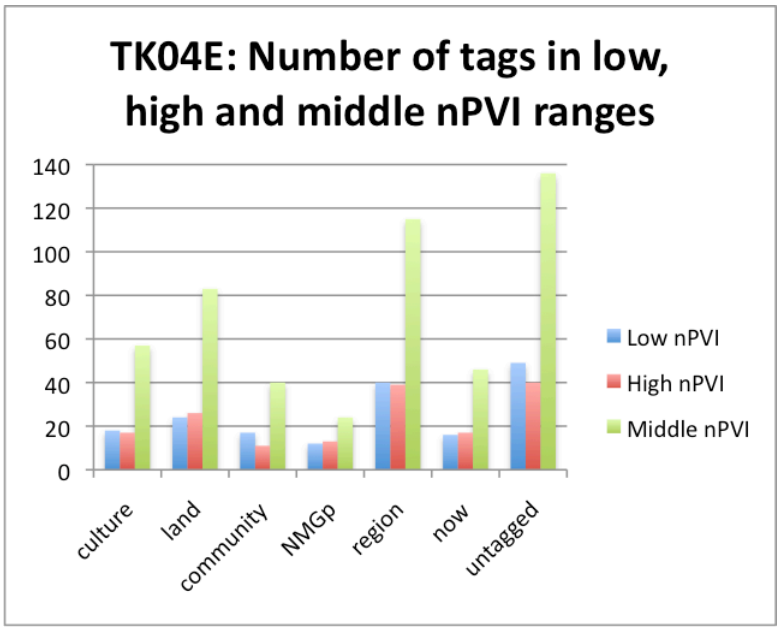

Figure C.4: Distribution of TK04E's tokens in the low, high and middle nPVI ranges for each tag.

Appendix D: CART trees of segmental nPVI for individual speakers.

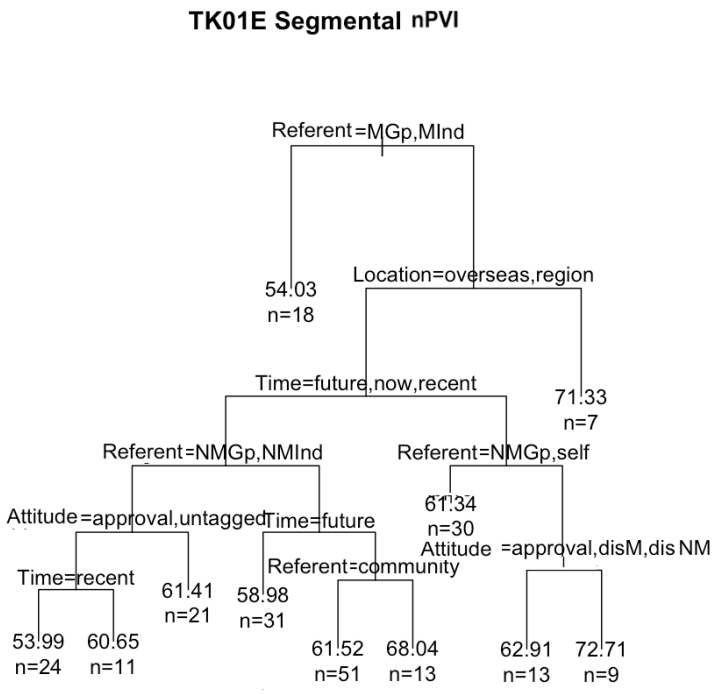

Figure D.1: CART tree with segmental nPVI values for TK01E.

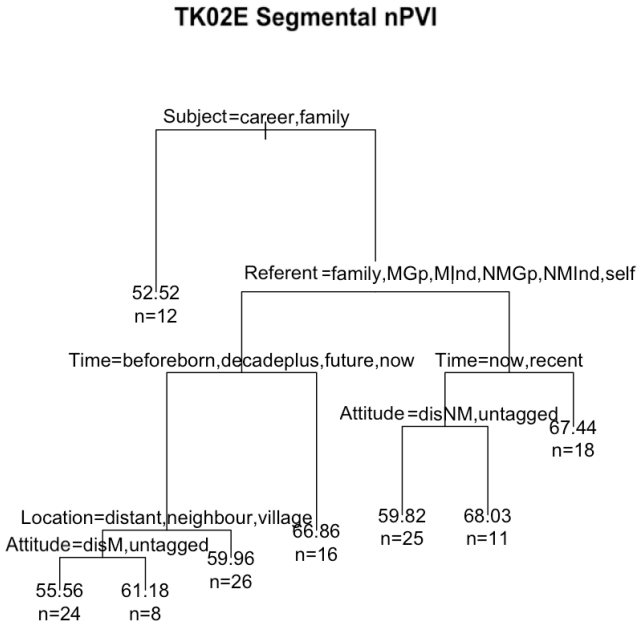

Figure D.2: CART tree with segmental nPVI values for TK02E.

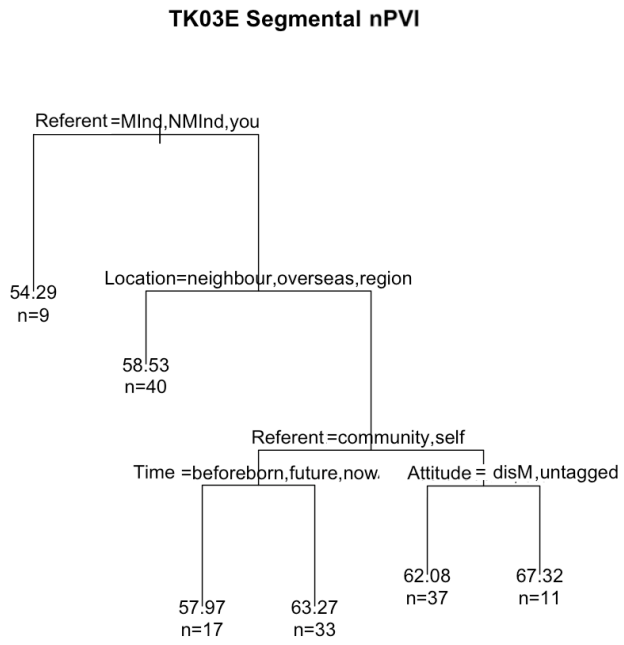

Figure D.3: CART tree with segmental nPVI values for TK03E.

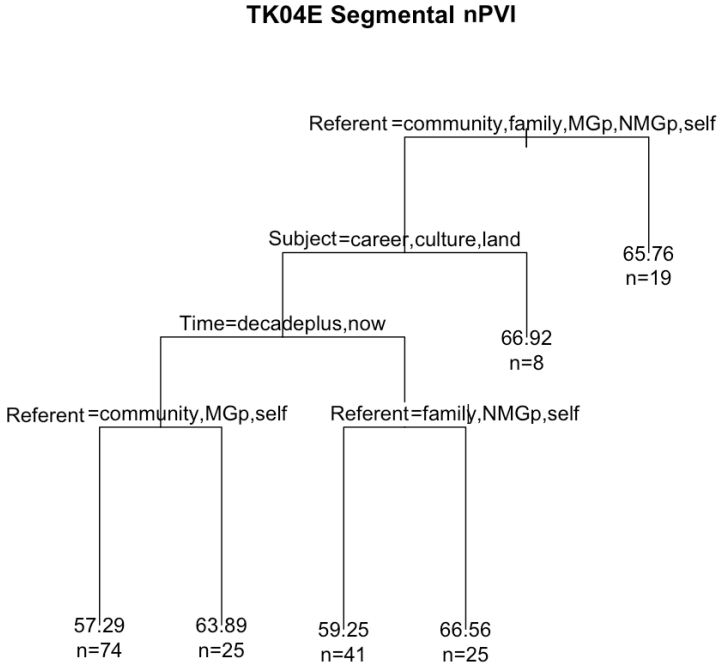

Figure D.4: CART tree with segmental nPVI values for TK04E.

Appendix E: Scatterplots of nPVI and mean pitch of Set Two tags for individual speakers.

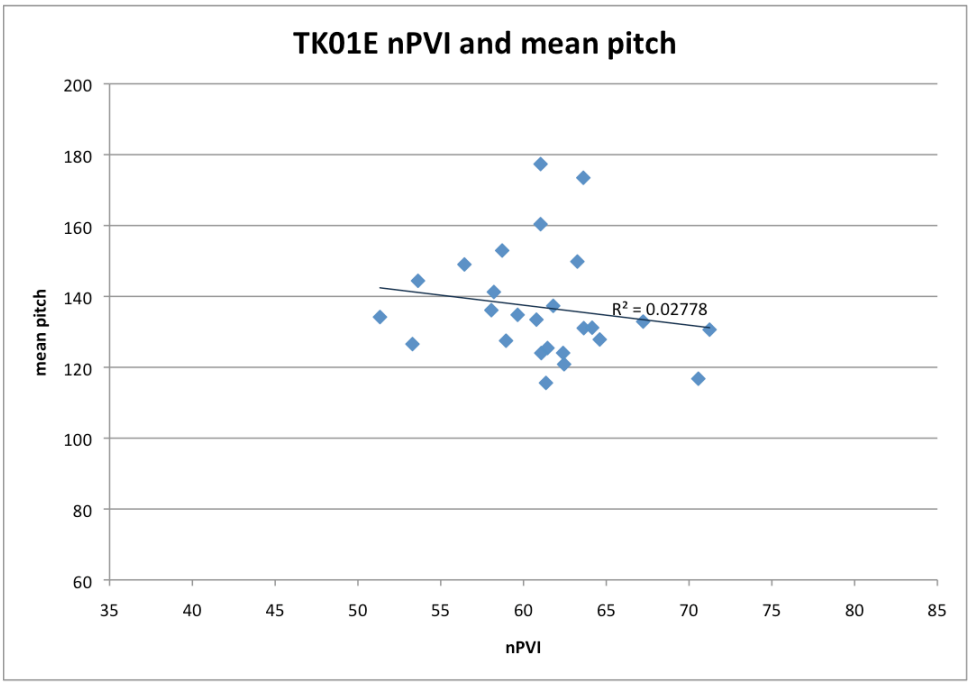

Figure E.1: Scatterplots of nPVI and mean pitch of Set Two tags for TK01E.

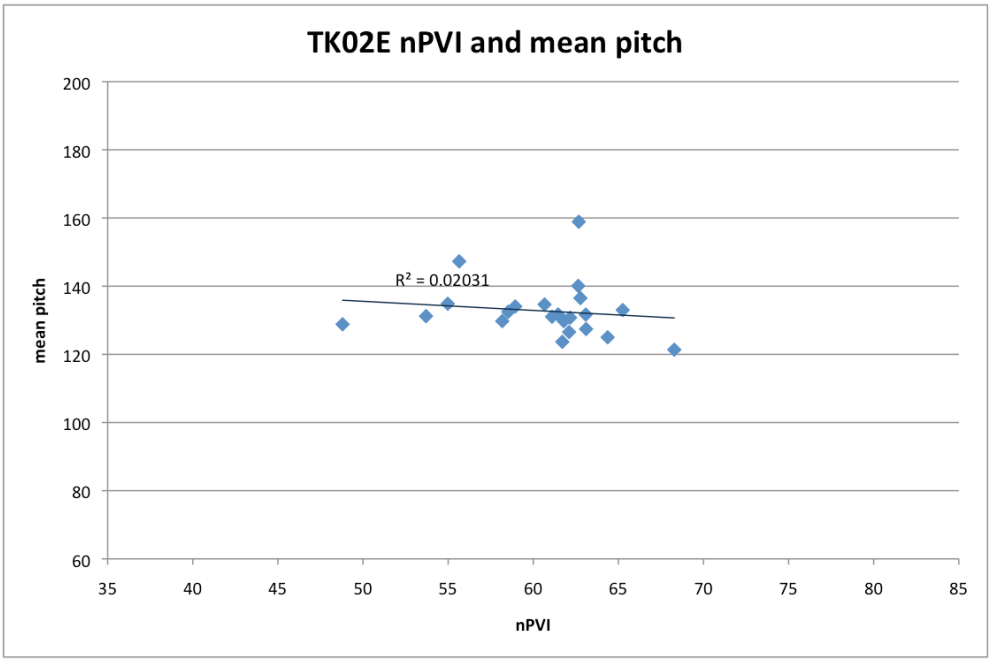

Figure E.2: Scatterplots of nPVI and mean pitch of Set Two tags for TK02E.

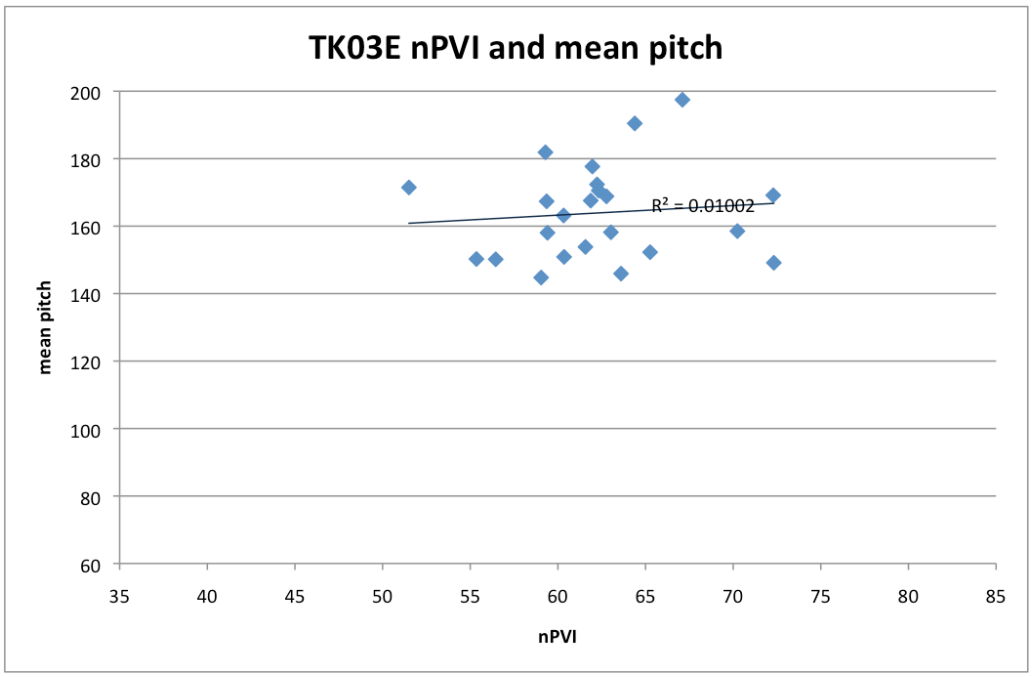

Figure E.3: Scatterplots of nPVI and mean pitch of Set Two tags for TK03E.

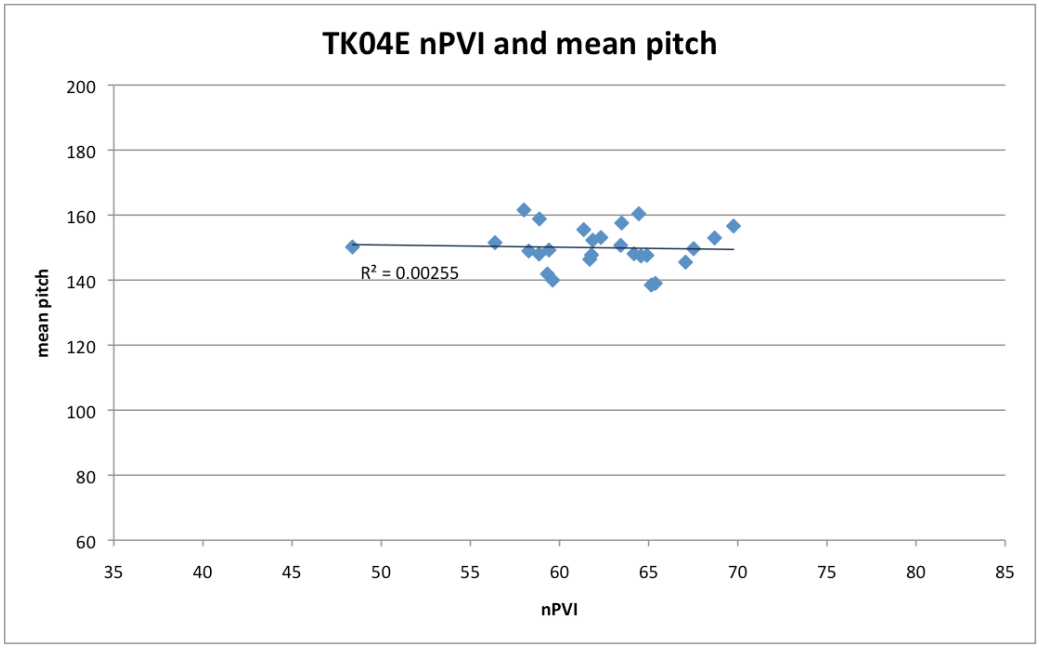

Figure E.4: Scatterplots of nPVI and mean pitch of Set Two tags for TK04E.