Identification of New Zealand English and Australian English based on stereotypical accent markers

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Abstract

Little is known about factors that influence dialect perception and the cues listeners rely on in telling apart two accents. This thesis will shed light on how accurate New Zealanders and Australians are at identifying each other's accents and what vowels they tune in to when doing the task.

The differences between New Zealand and Australian English mainly hail from the differing production of the short front vowels, some of which have reached the status of being stereotyped in the two countries.

With the help of speech synthesis, an experiment was designed to test the perception of vowels produced in a typically New Zealand and a typically Australian fashion. Forty New Zealanders and sixty Australians took part in the study. Participants were asked to rate words on a scale from 1 (definitely NZ) to 6 (definitely Australian). The words contained one of eight different vowels. Frequency and stereotypicality effects as well as nasality were also investigated.

The results demonstrate that dialect identification is a complex process that requires taking into account many different interacting factors of speech perception, social and regional variation of vowels and issues of clear speech versus conversational speech. Although overall performing quite accurately on the task, New Zealanders and Australians seem to perceive each other's speech inherently differently. I argue that this is due to different default configurations of their vowel spaces. Furthermore, a perceptual asymmetry between New Zealanders and Australians concerning the type of vowel has been observed. Reinforcing exemplar models of speech perception, it has also been shown that frequency of a word influences a listener's accuracy in identifying an accent. Moreover, nasality seems to function as an intensifier of stereotypes.

Chapter 1 - Introduction

Language functions as a vessel of social information about its speaker. An accent, in particular, conveys information about the particular geographic area that a speaker is from. And necessarily, other speakers interpret this information to make assumptions about the nationality of a speaker. Little is known about the aspects that influence this process of retrieval of information or which cues listeners tend to rely on in this task. How these cues can be perceived in differing ways depending on if the speaker comes from one's own accent area or a different one is a focus of this thesis.

It becomes especially interesting to pursue this matter in the context of New Zealand English and Australian English, two accents of English that appear highly similar to outsiders but quite different to people from either side of the Tasman Sea. The differences mainly hail from the differing production of the short front vowels, some of which have reached the status of being stereotyped in New Zealand and Australia.

Previous research has attempted to gauge the accuracy of New Zealanders and Australians in telling each other's accents apart but so far no one has investigated the precise cues that listeners rely on in this task. This thesis will shed light on how accurate New Zealanders and Australians are at telling each other's accents apart and will identify what vowels they tune in to when doing the task.

With the help of speech synthesis, an experiment was designed to test the perception of vowels produced in a typically New Zealand and a typically Australian fashion. Forty New Zealanders and sixty Australians took part in the study. Participants were asked to rate words on a scale from 1 (definitely NZ) to 6 (definitely Australian). The words contained one of eight different vowels. Frequency and stereotypicality effects as well as nasality were investigated as well. The results suggest that New Zealanders and

Australians, although overall performing quite accurately on the task, perceive each other's speech inherently differently. I argue that this is due to different default configurations of their vowel spaces. Furthermore, stereotypes are shown to influence them in this perceptual task.

Previous studies on dialect identification on various accents of English and results from studies involving frequency and stereotypicality effects will be reviewed in Chapter 2, as well as the differences in vowel qualities between New Zealand and Australian English. For a detailed outline of the construction of the experiment including the selection, distribution and synthesis of the stimuli as well as a discussion of the participant groups, please refer to Chaper 3. The fourth chapter reports the results from the raw data that were then tested in a statistical model that is presented in Chaper 5. The results from the experiment will be discussed in Chapter 6.

Chapter 2 - Literature Review

2.1 Introduction

Quite a large body of work has been produced investigating the perception of American and British dialects and effects that influence the identification of these dialects, e.g. Bush (1967), Williams, Garrett and Coupland (1999), Clopper and Pisoni (2004). So far, however, no one has extensively researched this issue in Australasian accents. Even more importantly, the use of synthesized stimuli is an entirely novel method in the field of dialect identification allowing for a closer monitoring of the perceptual effects of vowels. Also, including the variable of word frequency and nasality promises to explore dialect identification even further. Hence the present research draws from various previous findings, merges different aspects into one study and applies it to a speech community that no one before has properly researched dialect identification in. This chapter outlines the background literature on which the current study is based.

2.2 Dialect Identification Background

Only recently have sociolinguists focused on perception as a field of significance for their research, perception having been regarded as "a neglected stepsister of production in sociolinguistics" (Thomas 2002:115). Thomas points out several issues that guide socioperceptual studies, two of which are important for the present study. This study seeks to investigate (1) how well listeners can identify an accent and (2) how stereotypical markers of that accent influence its perception. In the following, I will

present and discuss several dialect identification studies that are relevant for this present research and then outline differences in vowel qualities in New Zealand and Australian English.

2.2.1 Previous dialect identification studies

The earliest dialect identification study seems to have been done by Bush (1967), who investigated the influence of certain acoustic characteristics of American English, British English and Indian English on the perceptual identification of these dialects. Four young males of each dialect were recorded reading three different types of stimuli: nonsense items, words and English sentences. Twelve adult native speakers of American English were asked to rate the speaker's dialect on a three-alternative forced choice under four conditions: unaltered, low-passed, high-passed and center-clipped to see if listeners based their identification on prosodic factors. The highest percentages of correct identification were reached for the words and sentences, the nonsense words received lower ratings, yet the accuracy was still over 65%.

More recently, Gooskens (2005) investigated how accurate Norwegians are at identifying Norwegian dialects and tested a cue that is said to be most distinctive of the 15 Norwegian dialects - intonation. Recordings of speakers from the 15 dialect areas were played to 15 groups of young Norwegians from different parts of Norway in two conditions, in the original version and in a monotonized version that excluded intonation. Listeners were asked to mark their judgment on a map of Norway and its counties. I will only go into detail about the results of the identification of the original version here as intonation is not relevant for my research. Her results were as follows: Overall, participants' responses were less accurate than expected given the wide usage of the dialects all over Norway. Gooskens distinguishes endogenous listeners identifying the county of their own dialect and exogenous listeners identifying the county of one of the other 14 dialects. The percentage of correct identifications for endogenous listeners was quite high (67%) as expected, whereas exogenous listeners were only 25% accurate at the

task. Contrary to her expectation that dialects linguistically close to the dialects of the listeners would be better identified than dialects which are less close, Gooskens found that there is no straightforward correlation between linguistic distance between dialects and the percentage of correct identifications.

Stephan (1997) investigated the ability of German students to identify English varieties. Excerpts of recorded speech of twelve varieties, six British and six non-British, were played to 201 German students who were asked to label the varieties. Southern American English was identified most accurately, with 46% correct, followed by Scots (41%) and Southern English English (29%). The students were rather poor at identifying Australian and New Zealand English (15% and 10%), yet they were even worse with Welsh English (6%) and South African English (3%). They most often mistook the Australian English speaker as an American (30%), whereas 2% of the students labeled him as a New Zealander. The New Zealand English speaker was identified as American by 15%, and only correctly identified as a New Zealander by 7%. A major criticism of this study, however, is that the excerpts vary in length, topic, sound quality and sex and age of the speaker and that the actual identity of the speakers was not known. The recordings were characterized – only auditorily - post-hoc as exemplifying a certain variety of English.

In another study, Williams, Garrett and Coupland (1999) tested the ability of Welsh students and teachers to distinguish the 6 different Welsh dialects. Participants were played recordings of speakers from different parts of Wales and also speakers of RP and were asked to identify the dialect of the speaker and to give a judgment about the speaker's "Welshness" and likeability. Williams et al. reported that the teachers were far more successful at the task than the students, who identified the dialects correctly only in 30% of the cases.

Clopper and Pisoni have contributed to a great extent to the field of speech perception and dialect identification. Their studies support some of the earlier results on general accuracy in dialect perception and provide new insights on the effects of talker

gender, early linguistic exposure/residential history and perceptual similarity of dialects that are particularly important for this research.

Clopper and Pisoni (2004) found that American listeners had knowledge of several acoustic-phonetic properties of regional American dialects and were able to use these cues to categorize talkers by dialect. In a first experiment, they took acoustic measurements of recordings from 66 talkers, 11 talkers from each of six dialect regions: New England, North, North Midland, South Midland, South, and West. Several reliable acoustic-phonetic cues were identified for each dialect, e.g. "r-lessness", degree of /ae/ raising, monophthongal /ai/, fronted /u/. In a second experiment, they tested how these acoustic cues influenced a listener's ability to categorize talkers from these dialect regions. Three sentences from each talker were played to 18 Indiana University students who were asked to match each talker to one of the dialect regions that were displayed on a touchscreen as partial maps of the United States. The overall performance was poor - the listeners were only 30% accurate with their judgments - but it was still above chance. Four of the seven acoustic features that were available to the listeners were attended to: New England r-lessness, New England /ae/ backness, Northern /ou/ offglide centralization, and South Midland /u/ fronting. The results suggest further that participants used three broad dialect clusters as the basis of their categorization judgment instead of the six smaller dialect regions that they were given as options. Moreover, Clopper and Pisoni report significant talker-sentence interactions for some of the dialect regions. This effect of the talker is followed up on in their 2005 study and is also relevant for this study.

In their 2005 study, Clopper, Conrey and Pisoni investigated effects of talker gender on dialect categorization. They ran two perception experiments, the procedure of which was identical to the one described above. The first comprised stimuli from female talkers from six dialect regions and listeners had to match the talker to one of the dialect regions represented as partial maps of the United States on a computer. In the second experiment, stimuli from both female and male talkers were used. The results for male talkers alone were taken from the 2004 study. The overall categorization performance in the two conditions was consistent with the previous study on male talkers only, at

roughly 31% accuracy, suggesting that gender does not affect the accurate identification of regional dialect. However, comparing the similarity spaces across the three gender conditions it became obvious that, for some of the sentences, listeners grouped the six dialect regions into different dialect clusters depending on the gender of the talker. For one of the sentences, three major dialect clusters emerged in the female talker condition: New England and North; South and South Midland; and North Midland and West. In the male and mixed gender talker conditions the Northern talkers clustered with the North Midland and Western talkers. Clopper et al. hypothesize that this might be due to women leading change, e.g. the Northern women might have been more advanced in the Northern Cities Chain shift than Northern men, and hence the different pronunciation of certain vowels by female and male talkers could have served as perceptual cues for listeners when they tried to categorize the talkers. Clopper et al. suggest that listeners know that female and male talkers from the same region might produce the same word or phoneme in a reliably different way and that a difference in production does not necessarily indicate a difference in regional variety. In the case of two talkers of the same gender, however, the "same" difference in production can imply a difference in regional variation. Due to only a small number of male listeners participating in the study, the issue of listener gender could not be explored in their study.

Another effect that influences dialect perception is the residential history of the listener (Clopper and Pisoni 2004). Listeners, who had lived in at least three different states in the US ('Army-brats'), turned out to be better at categorizing talkers from six different American dialects than those who had lived only in Indiana ('Homebodies'). Supporting earlier findings by Williams et al. (1999), the analysis also revealed that a history of residence in a given region helped listeners to correctly identify talkers from that region. The results suggest that early exposure to linguistic variation influences a listener's ability to identify the dialect of an unfamiliar talker.

A phenomenon that has not received much attention in the dialect perception literature is nasality of voice. In a previous study (Ludwig 2005) naive New Zealand participants reported a perceived link between nasality of voice and the speaker sounding

Australian. This specific correlation has hardly been mentioned at all in the literature, although Mackiewicz-Krasowska (1976, as cited in Pittam and Gallois 1986) associates nasality with the low-prestige variety of Australian English (Broad Australian). A few studies have sought to link nasality to other social information, such as ethnicity and gender of a speaker.

For example, Bryden (1968) tested if nasality could serve as a perceptual cue in trying to identify the ethnicity of a speaker as European or African American. He had 86 subjects judge the ethnicity and overall speech proficiency of 91 speakers from listening to a recorded reading passage. The overall accuracy was quite high, ranging from 80 to 87 percent. Bryden found a significant connection between number of phonetic distortions in reading the passage and perception of a speaker as African American. He also found that, compared to European Americans, African American speakers had consistently lower relative formant amplitudes on the vowels [i] and [u] – a cue that Thomas (2002:120) interprets as a feature of nasality. However, this difference was not found to be significant in the perceptual task.

Bloom, Zajac and Titus (1999) report an effect of nasality of voice on sex-stereotyped perceptions. Three men and three women were recorded reading a sentence at comparably low, medium, and high levels of nasality. Listeners were asked to rate the speakers with regard to 16 adjectives which represented four positive and four negative stereotypes of men and of women. Each had a 7-point scale from “Not at all” to “Very much”. The results show that, for males and females, increased nasality correlated with less positive female and male stereotyped perceptions and more negative female stereotyped perceptions. Further, the nasality of women’s voices was directly related to negative male stereotyped perceptions. Bloom et al. suggest that increased nasality is associated with weaker positive sex-stereotypes and stronger negative sex-stereotypes.

Pittam and Gallois (1986) also found that nasality of voice has an overall negative connotation in Australia. They had undergraduate students judge recordings from six male and six female speakers in five voice types - breathy, creaky, nasal, tense and whispery – in respect to concepts of solidarity and status. Creaky, nasal and tense voices

were negatively related to solidarity judgments and nasal voice was negatively related to status judgments.

2.2.2 Previous dialect identification studies in Australasia

The widely held belief among New Zealanders and Australians seems to be that the other accent is easily recognizable, yet various studies on accent evaluation show that it might be more difficult than expected to tell the two accents apart. New Zealanders are in fact not particularly accurate at identifying Australian English.

Bayard (1995) and Bayard, Weatherall, Gallois and Pittam (2001) found that the majority of New Zealand participants could not correctly identify a male Australian speaker and mistook him as a fellow New Zealander. Bayard's research focuses on cross-cultural parallels, and differences in the way personality and voice traits are grouped into larger dimensions like power and solidarity. Bayard's stimuli were recordings of speakers reading the same passage. However, he used only one voice each for the categories New Zealand male, New Zealand female, Australian male, Australian female and the reading tone of the male New Zealander was reported to be rather monotonous and received very low personality ratings, possibly due to the reading style. These methodological shortcomings were commented on by Bayard himself (Bayard 1990:76, Wilson and Bayard 1992:28-30).

Weatherall and Gallois (1998) investigate Australasian attitudes towards Australasian accents. They recorded one broad, one general and one cultivated speaker of each accent reading a short extract and played the stimuli to 49 students from New Zealand and 66 Australian students. They found that both New Zealanders and Australians correctly identified five out of six speakers from their own country. The speaker that they failed to identify as one of their own was the female cultivated accent in both cases. Weatherall and Gallois (1998:160) suggest that this shows covert sexism in the way that women with a cultivated accent may be perceived as higher status and hence be ostracized. New Zealand as well as Australian participants also tended to over-identify the general and cultivated male accents in their experiment as being from their own

country. This is consistent with Bayard's finding that New Zealanders demonstrated a tendency to mistake an Australian general male speaker as being from New Zealand. However, contrary to Bayard's conclusion, Weatherall and Gallois conclude that the NZ and Australian participants, overall, were quite accurate at distinguishing Australasian accents. But, as with Bayard's experiment, only one voice was used for each category.

None of the previous studies on accent evaluation has investigated the cues that people may be using in trying to identify New Zealand and Australian English.

A more recent study (Ludwig 2005) sought to extend Bayard's experiment by providing more than one speaker for each of the different categories and using casual speech as stimuli. The tokens were manipulated so as to choose passages that display stereotypical markers of NZ English and Australian English respectively and ones that do not.

The overall rate of accuracy was quite high. New Zealand participants were able to correctly identify Australian and New Zealand speakers with about 70% accuracy, contrary to claims by Williams et al (1999) who suggest that the task of identifying where an unfamiliar speaker is from based on only a short sample of speech is rather difficult. However, in contrast to their studies, this task involved a binary choice for the listeners: The speaker was either from the same dialect region as the listener or he/she was not. Thus, the high overall rate of accuracy is possibly due to the listeners being at a significant advantage over other studies in terms of the nature of the task. The presence of stereotypical accent markers in certain passages did indeed influence the listener's rating of the speaker as Australian or New Zealander. Most interestingly, the presence of an Australian-like KIT vowel led the listeners to give significantly higher ratings on a scale from 1 (definitely New Zealander) to 6 (definitely Australian). Surprisingly, for New Zealand speakers, the presence of a KIT vowel did not seem to have any significant effect. If at all, the reverse pattern seemed to be true: New Zealand-like KIT tended to elicit less New Zealand responses. Furthermore, male Australian speakers, contrary to previous findings, were rated more Australian-like than females. Again, this gender effect did not occur with the New Zealand speakers. The degree of exposure to Australian

English and residence history of the listener were also shown to be crucial factors. The more a participant has been exposed to Australian English, the better the overall performance at the task turned out to be. A drawback of the study was the type of passage used in the experiment. The passages consisted of extracts of natural speech that included many other possible accent markers that could have served as cues for listeners. Further, the accents of the speakers, and their production of the KIT vowel, may have been subject to regional and social variation. Using synthesized, shorter stimuli that display a more varied range of accent markers would provide a great improvement over the original design.

2.3 Frequency and Stereotypicality Effects

Recently, a new, usage-based framework has gained importance within phonetic theory which takes phonetic variability into account as an intrinsic part of the model (Bybee 2001, Johnson 1997, Pierrehumbert 2001). Exemplar theory rejects a strictly modular view and allows for a more direct access to the lexicon based on a more complex memory representation. In detail, this means that a stored representation of a word consists of a large cloud of remembered exemplars of that word, complete with individual phonetic realization and social information of the speaker. Any speech that a person is exposed to gets stored in the mind, forming specific categories, such as for example 'female' or 'Australian' if the speaker is a female Australian. New speech, then, is processed and categorized based on how phonetically similar the perceived word is to the remembered exemplars. These memories decay over time. Each exemplar has an associated strength, a base activation level, that is higher for recent tokens than temporally remote ones (Pierrehumbert 2001). More recently encountered tokens are more vivid in memory, i.e. have higher activation levels, and hence are more easily activated when processing speech.

Exemplar models are not unique to phonetics. Smith and Zárate (1992) developed a similar exemplar-based model for social judgment that suggests that the perception of people and groups is shaped by specific past experiences with the target person and also

by more abstract knowledge like stereotypes. More specifically, this means that just like phonetic realizations of words, representations of people are stored as exemplars complete with perceptual attributes of the person as well as with the perceiver's reactions and inferences. When encountering a new target person, memories similar to the person are activated and used to make a social judgment. This retrieval and use of exemplars is influenced by a range of social and motivational factors that shift the perceiver's individual attention to certain attributes of a person. The group membership of a person for example might become more important for a perceiver when making a judgment than the occupation of the person and hence activate exemplars of people belonging to that specific group rather than exemplars of people who work in the same profession. Group membership is especially important as it influences the social judgment of people in terms of a in-group/out-group division. Smith and Zárate (1992:14) state that

> "more attention is devoted to the individuating (non-category-defining) attributes of the self and fellow in-group members, and more to the category-defining attributes of out-group members."

This out-group homogeneity means that, for example, a man judging a female would pay more attention to gender and judge her as more similar to other women. When perceiving another man, other attributes would form the basis of judgment.

Hay, Warren and Drager (2006b) investigated factors influencing speech perception in the context of the NEAR and SQUARE vowels that are currently merging towards NEAR in New Zealand English. Their results provide strong support for an exemplar-based model of speech perception. Amongst other effects, they found that the lexical frequency of a word affects the participants' ability to categorize NEAR/SQUARE items in a binary forced-choice identification task. Participants were better at identifying NEAR words, which generally tended to have a higher lexical frequency than the SQUARE tokens. Also, given that the merger is towards NEAR, NEAR is by far the more frequently encountered of the two vowels. In an exemplar model, more frequently

encountered tokens have more and more recent exemplars, resulting in stronger categories and higher activation levels which allows for more accurate identification when processing words. Hay et al. also found a link between production and perception: participants who still distinguish between the NEAR and SQUARE vowels were better at the task than participants who merged the two vowels, suggesting that the unmerged participants have more distinct exemplar clouds for the two vowels.

Niedzielski (1999) showed that listeners perceive the diphthong /au/ differently depending on the perceived dialect area. She asked 41 Detroit residents to match resynthesized vowels to vowels in the speech of a Detroiter. Half of the participants were told at the top of their answer sheet that the speaker was from Detroit, the other half were told that the speaker was from Canada. Depending on the apparent nationality of the speaker, participants shifted their response. The 'Canada' condition led Detroiters to respond with a higher, more Canadian-like variant, even though the speaker was a fellow Detroiter.

A follow-up experiment to Niedzielski's study was conducted by Hay, Nolan and Drager (2006a) in a New Zealand/Australian context. New Zealanders were asked to match three different vowels to synthesized continua ranging from a New Zealand-like realization to a typically Australian realization of the vowels. They were played the speech of a New Zealander, but half the participants had 'New Zealander' written on their answer sheet, and half of them had 'Australian'. Interestingly, participants were more likely to report a high variant of the KIT vowel if 'Australian' appeared at the top of their answer sheet and a more central vowel if they had 'New Zealander' written on their answer sheet. These results can be well accounted for by an exemplar model of speech perception. The label on top of the response sheet raises the activation level of exemplars that are indexed with that particular regional label. During the perception task those exemplars get activated that are phonetically similar to the stimuli. The overall centre of the activated distribution is shifted to either more Australian or New Zealand variants depending on which exemplars have previously been primed.

One aspect that was specifically tested for in Hay, Nolan and Drager's study was the influence of stereotypicality of a word. They list the cross-Tasman production of the phrase *fish and chips* as a particularly canonical phrase resulting in mockery in both New Zealand and Australia. It is cited most often when discussing differences between New Zealand and Australian English. The effect of the nationality labels was stronger for sentences containing the word 'fish' than for the other sentences. Hay et al. suggest that this stereotypicality effect is due to the *fish and chips* phrase having more robust categories of New Zealandness and Australianness. Often the performances of the phrase are exaggerated and more extreme than if produced naturally. These productions are stored regardless, with the result that the exemplars of the word *fish* contain more extreme realizations and that the indexing between the phonetic forms and the regional labels are highly salient.

In another study (Ludwig 2005), New Zealanders were asked in what ways they thought the two accents differed. Apart from the *fish and chips* example, other words that were mentioned were *dance*, *six* and *Sydney*. It has yet to be investigated if the stereotypicality and lexical frequency of a word influence listeners in an accent identification task, but the exemplar approach suggests that they might.

2.4 Differences in vowel qualities in Australasia

It has been reported that New Zealand and Australian English are quite similar (Gordon 1991) making it hard for an outsider to distinguish between the two varieties of English. Even New Zealanders themselves sometimes struggle at this task. At the same time, it is also well known that there are distinctive differences in the vowel qualities between New Zealand and Australian English (Watson, Harrington and Evans, 1998) which will be discussed in the following.

The most frequently noted difference concerns the KIT vowel: it has raised to a high front position in Australian English but has centralized in New Zealand English. The

centralization of the KIT vowel in New Zealand English is the consequence of a push chain involving the short front vowels of this variety (Gordon et. al 2004). The already raised TRAP vowel in major input varieties of British English continued to raise in New Zealand, eventually encroaching upon the phonetic space of the DRESS vowel. As a consequence, the DRESS vowel began to raise as well. This then triggered the KIT vowel to move to its central position in New Zealand English, resulting in a centralized KIT vowel, and a raised TRAP and DRESS. The KIT vowel has a higher value for F1 and a lower value for F2 than its equivalent vowel in conservative RP. That is, the KIT vowel is centralized in New Zealand English, i.e. it is displaced further to the centre of the vowel space "to such an extent that it is parodied by Australians using their STRUT vowel" (Bauer and Warren 2004:587).

Gordon and Maclagan (2004:608) report social class variation of the KIT vowel in New Zealand English. It centralized and lowered to the extent that the most advanced New Zealand English speakers now use a vowel more open than schwa. Very few New Zealand speakers now use a vowel that is as high as [ɪ] for KIT, though some older Maori or higher social class Pakeha women, still may (ibid.:611).

Australian English KIT raised over the same period that New Zealand KIT centralized so that the pronunciation of KIT is one of the most striking differences between the two varieties of English (Gordon and Maclagan 2004). New Zealanders accuse Australians of saying *feesh and cheeps* and Australians accuse New Zealanders of saying *fush and chups*. In addition to KIT raising, Australian TRAP and DRESS are lower, relative to New Zealand English.

Bradley (2004:651) reports regional differences of the KIT vowel within Australia. Sydney and Newcastle (New South Wales) have substantial centralization of the KIT vowel, though less extreme than in most sociolects of New Zealand English. Melbourne has this vowel raised nearly to cardinal [i]. This occasionally leads to misunderstandings between Melbournians and other Australians. The New Zealand centralization of KIT, however, is carried much further.

Another prominent difference is the quality of the pre-nasal vowel in words like 'dance' and 'sample' which is articulated with a TRAP vowel by some speakers of Australian English. This DANCE vowel is a subset of the BATH vowel class (Wells 1982), a class which comprises words whose citation form varies between /æ/ and /a:/ across different accents. For some accents, like General American, BATH words are pronounced the same as the TRAP vowel, for others like RP, these words are pronounced like PALM and/or START. In Australian English words like *dance*, *advance*, *chance*, *example*, *demand* tend to be realized as /æ/ whereas other words of the BATH class like *staff*, *path*, *calf* are realized as /a:/. In New Zealand English, all of these words tend to be /a:/ (Bauer and Warren 2004). Although there are New Zealanders (particularly conservative South Island speakers) who use /æ/ in this environment, and although there are Australian speakers who use /a:/ in words like *dance*, the pronunciation of DANCE is perceived "as a shibboleth distinguishing Australian and New Zealand varieties of English" (Bauer and Warren 2004:590).

For most lexical items in Australian English of all regional and social varieties, the distribution of the /æ/ and /a:/ vowels in BATH words generally follows the southeastern British pattern: mainly /a:/ before fricatives, variable before nasal plus obstruent and mainly /æ/ elsewhere (Bradley 2004:645). However, there is a regional and social variation between the distribution of the /æ/ and /a:/ vowels in BATH words in Australia: for about sixty morphemes, especially preceding a nasal plus obstruent, but also a smaller number of prefricative words such as *castle*, *graph* and so on. Apart from the regional pattern there is an overlying social pattern in which the /a:/ vowel is the more formal form.

The NURSE vowel has fronted and become rounded in NZ English compared to its Australian counterpart, yet the two variants of NURSE are still quite similar. For the diphthongs, the most salient difference probably lies in the production of the falling diphthongs in the NEAR and SQUARE vowels. In New Zealand English, these two diphthongs are merging in the direction of NEAR (Maclagan and Gordon 1996). This

merger is not happening in Australian English. In Australia, on the other hand, SQUARE tends to be relatively monophthongal (Watson and Harrington 1999:462).

In some cases, GOOSE may be realized as [y:] in Australian English (Horvath 2004:626). In New Zealand English, the GOOSE vowel before /l/ (called 'SCHOOL' in this study) has a radically different quality than GOOSE elsewhere (Bauer and Warren 2004:590), namely it becomes back and the /l/ disappears.

There are other differences in the vowel qualities between New Zealand and Australian English that have, however, been less commented on. For example, Maclagan (1982) suggests that New Zealand FOOT is centralized relative to Australian English. However, these differences are not relevant for the present study.

2.5 Summary

The first dialect identification studies on English accents were conducted in the late 1960s. Most studies have focused on American and British dialects with various kinds of participant groups, be it American or British people or non-native speakers of English. It was investigated whether certain acoustic features helped the listeners more than others (Clopper and Pisoni 2004) and how early exposure to linguistic variation influences a listener's ability to identify the dialect of an unfamiliar talker (Clopper and Pisoni 2004). The talker gender has been proven to affect the listener's performance as well (Clopper, Conrey and Pisoni 2005). While nasality has been linked to stronger negative sex-stereotypes (Bloom, Zajac and Titus 1999), its effect in a dialect identification task is yet to be explored. Previous dialect identification studies in Australasia suggest that New Zealanders and Australians might not be very accurate at telling apart each other's accents. Yet, these studies were based on rather small speech samples.

Given the fact that Australian English and New Zealand English are laden with stereotypes, e.g. the other accent is unpleasant to listen to and the accents are readily identifiable (Weatherall and Gallois 1998:160), it will be intriguing to investigate more extensively – with the help of speech synthesis - how accurate New Zealanders and Australians are at identifying each other's accent and which cues they may tune in to. The two accents feature various stereotypical vowel differences and it will be interesting to gain some insight into the issue of whether certain vowels carry stereotypes more than others. Findings from within the exemplar framework of speech perception suggest that listeners process an acoustic signal differently depending on the frequency of a word, another variable that might prove to influence a listener's accuracy in identifying an accent.

2.6 The aim of this study

No studies seem to have been conducted using speech synthesis in a dialect identification task and particularly in New Zealand, no one has identified the cues that listeners are using when trying to identify an accent. The present study therefore seeks to extend the line of dialect identification research in the following ways: it will use synthesized vowels to monitor more closely the perceptual effect of different variants of the vowels. Different variables will be tested as well as nasal variants of some vowels. Furthermore, lexical and frequency effects will be investigated, in relation to the predictions of an exemplar model of language.

Chapter 3 - Methodology

3.1 Introduction

The experiment investigates the accuracy of New Zealanders and Australians in trying to identify each other's accents. With the use of synthesized vowels as stimuli it aims to test whether stereotypical accent markers influence the listener's rating of a speaker as Australian or New Zealander.

This chapter outlines the construction of the experiment. First, it discusses the selection of the stimuli, then it addresses the issue of the distribution of the stimuli across the speakers, followed by a description of the synthesis process of the stimuli. Spectrograms of the different synthesized variants illustrate the results of the synthesis. The chapter concludes with an outline of the final design of the experiment and a discussion of the subjects that took part in the study in New Zealand as well as Australia.

3.2 The Stimuli - the words

Seven types of vowels that are realized differently in New Zealand and Australian English were chosen: DRESS, DANCE, KIT, NURSE, SCHOOL, SQUARE and TRAP. For each of these vowel classes, six words that contain the particular vowel were used as stimuli. To investigate lexical effects and frequency, two of each of these groups of words were frequent words, two were of low frequency and two carried a stereotype (e.g. *fish*). Due to a lack of stereotypical words, the NURSE, SQUARE and TRAP vowel paradigm consisted of three pairs of frequent and non-frequent words.

Since the realization of the KIT vowel is often regarded as the most salient difference between New Zealand and Australian English, two sets of words for KIT were selected - one to carry extreme realizations of the vowel (KIT A) and one to carry mild versions (KIT B).

The words in each paradigm were chosen carefully so that the vowel, where possible, is in a similar phonemic environment in each word of the pair, or triplet, e.g. a paradigm for the KIT A vowel consists of the words *fish* (stereotypical), *dish* (frequent), *wish* (non-frequent). This was done in order to keep the phonemic environment that the vowel occurred in as constant as possible and reduce the possibility of effects influencing participants when doing the task.

The frequency values for the words were taken from The CELEX Lexical Database (Baayen et al. 1993). High frequency was usually a value above 3000 (per 17.9 million), whereas a non-frequent word had counts below 1000. These particular figures were chosen based on the occurrence of frequency values in the database. Given the restriction on words regarding their phonology, this particular difference in frequency counts could not always be maintained. However, in these cases (KIT A set 2, NURSE set 2, SCHOOL set 1, SCHOOL set 2) the frequency counts were still reasonably distinct.

The words that are assumed to carry a stereotype commonly appear in the context of comparison of New Zealand and Australian English, for example *fish* and *chips* are 'stereotypical' words. Wells (1982:606) points out that "Australians can identify New Zealanders at the quayside by the fact that they speak of *chups*, unlike Australians who call them *cheeps*". In a previous study (Ludwig 2005), participants often quoted words like *pen*, *ten* and *six* as exemplifying the difference between New Zealand and Australian English since these words often lead to misunderstandings in the two different accents. Furthermore, the word *dance* was listed frequently. The stereotypicality of the words *school* and *pool* is illustrated by a colleague's daughter, who routinely uses these words when imitating Australians.

Table 3.1 shows the full list of words for each vowel class with their frequency values, where available. The word *Sydney* was not listed in the corpus, hence it does not have a frequency value. The DRESS, DANCE, KIT A, KIT B and SCHOOL vowel paradigms each consists of two sets of triplets, namely DRESS 1 and DRESS 2, DANCE 1 and DANCE 2, etc. whereas NURSE, SQUARE and TRAP are represented in three sets of pairs each (NURSE 1, NURSE 2, NURSE 3, etc.).

Table 3.1: List of words for each vowel class with their frequency values

Vowel	Paradigm	Word	Frequency
DRESS	DRESS 1		
	stereotypical	pen	461
	frequent	set	5630
	non-frequent	fret	89
	DRESS2		
	stereotypical	ten	4054
	frequent	then	33749
	non-frequent	den	179
DANCE	DANCE 1		
	stereotypical	dance	1177
	frequent	chance	3089
	non-frequent	lance	32
	DANCE 2		
	stereotypical	example	4994
	frequent	answer	3048
	non-frequent	sample	311
KIT A	KIT A 1		
	stereotypical	six	3794
	frequent	big	7059
	non-frequent	dig	716
	KIT A 2		
	stereotypical	chips	274
	frequent	ships	1295
	non-frequent	sips	294
KIT B	KIT B 1		

	stereotypical	fish	2927
	frequent	wish	3373
	non-frequent	dish	504
	KIT B 2		
	stereotypical	Sydney	
	frequent	business	4409
	non-frequent	kidney	158
SCHOOL	SCHOOL 1		
	stereotypical	school	9198
	frequent	rule	2224
	non-frequent	ghoul	16
	SCHOOL 2		
	stereotypical	pool	733
	frequent	tool	800
	non-frequent	drool	34
NURSE	NURSE 1		
	frequent	work	12514
	non-frequent	jerk	276
	NURSE 2		
	frequent	turn	1037
	non-frequent	stern	181
	NURSE 3		
	frequent	girl	7856
	non-frequent	whirl	183
SQUARE	SQUARE 1		
	frequent	air	4502
	non-frequent	fare	268
	SQUARE 2		
	frequent	hair	3576
	non-frequent	heir	174
	SQUARE 3		
	frequent	where	11857
	non-frequent	ware	28
TRAP	TRAP 1		

	frequent	that	82603
	non-frequent	mat	144
	TRAP 2		
	frequent	man	29231
	non-frequent	pan	489
	TRAP 3		
	frequent	back	17657
	non-frequent	pack	688

Since the results from a previous study (Ludwig 2005) have suggested that New Zealand participants often associate nasality with Australian English, nasalized versions of one frequent and one non-frequent word of each vowel class were included in the experiment. The nasalized vowels were constructed by eliciting separate words that had the vowel in a pre-nasal position. Table 3.2 lists the target words and the words that elicited the nasalized vowels that were then spliced back into the target words to produce nasalized versions of the stimuli. That is, participants won't actually listen, for example, to the word *send* at all, but to the word *set*, once with a nasalized vowel and once with a non-nasalized vowel. Obviously, there was no nasal variant in the DANCE set as the vowels are already nasal.

Table 3.2: List of target words for nasalized variants with the word that elicited the nasalized vowel

paradigm	type of word	word	word to elicit the nasalized vowel
DRESS 1	frequent	set	send
	non-frequent	fret	friend
KIT A 1	frequent	big	bing
	non-frequent	dig	ding
KIT B 1	frequent	wish	win
	non-frequent	dish	din
NURSE 1	frequent	work	worm
	non-frequent	jerk	journey

TRAP 1	frequent	that	than
	non-frequent	mat	man

3.3 The stimuli - the speakers

The stimuli were produced by six speakers of New Zealand English, three males and three females, aged from 23 to 28 years. Each speaker produced approximately one third of the words in order to keep the experiment at reasonable length and, more importantly, in order to prevent participants from recognizing the same voices turning up repeatedly in the experiment. The words were divided among the speakers so that each paradigm was assigned to two speakers (one male and one female), e.g. speaker F1 and M1 read the first paradigm, speaker M2 and F2 read the next paradigm and so on. Every speaker read six paradigms, except speakers F1 and M1 who read seven. The words that were used to elicit the nasalized vowels were read by the speaker assigned to the specific paradigm that included the nasal variants, namely DRESS 1, KIT A 1, KIT B 1, NURSE 1 and TRAP 1. Thus, each paradigm is produced in a single voice and speaker variability can be ruled out when looking at any given paradigm in particular. This was especially important for the paradigms that included nasal variants. Table 3.3 shows the distribution of paradigms across the six speakers.

Table 3.3: Distribution of paradigms across the six speakers

	paradigm	speaker	
DANCE	DANCE 1	F1/M1	
	DANCE 2	F2/M2	
DRESS	DRESS 1	F3/M3	plus separate words that elicit the nasal vowel
	DRESS 2	F1/M1	
KIT A	KIT A 1	F2/M2	plus separate words that elicit the nasal vowel
	KIT A 2	F3/M3	

KIT B	KIT B 1	F1/M1	plus separate words that elicit the nasal vowel
	KIT B 2	F2/M2	
NURSE	NURSE 1	F3/M3	plus separate words that elicit the nasal vowel
	NURSE 2	F1/M1	
	NURSE 3	F2/M2	
SCHOOL	SCHOOL 1	F3/M3	
	SCHOOL 2	F1/M1	
SQUARE	SQUARE 1	F2/M2	
	SQUARE 2	F3/M3	
	SQUARE 3	F1/M1	
TRAP	TRAP 1	F2/M2	plus separate words that elicit the nasal vowel
	TRAP 2	F3/M3	
	TRAP 3	F1/M1	

Each speaker was asked to read out each word three times, with falling intonation. The words were presented in two columns on a single page. In cases of word-final /l/, the speakers were explicitly asked to produce the /l/ since in New Zealand English word-final /l/ is often dropped. Since this study did not focus on consonantal differences between New Zealand and Australian English, this was done in order to keep the consonants surrounding the vowels that are the focus of this study as constant as possible. In particular, we were interested in the quality of the GOOSE vowel before /l/ and a vocalized /l/ is likely to have a significant effect on the vowel's realization. The speakers were recorded in a quiet room directly onto a laptop, using a headmounted microphone and a USB preamp, at a sampling rate of 44,100 Hz. In nearly all cases, the second of the three productions of a word of all the speakers were used as stimuli since these were produced with the most consistent intonation patterns.

3.4 The stimuli – the synthesis

The manipulation and synthesis of the words used PRAAT (Boersma 2005). To create the nasal versions, the nasal vowel was extracted from the word that elicited it and spliced into the target word. In most cases, a few waveforms were also removed to match the vowel length of the non-nasal variant.

The synthesis was conducted using PRAAT 4.3.27 and a modified version of a PRAAT script written by Paul Warren. To manipulate the formant values the script uses Linear Predictive Coding. The synthesis is conducted on a downsampled version of the sound file at 11,000Hz. In the course of the synthesis, the user specifies the target formant values, and the vowel is resynthesized to have a steady state at the the first two formants during the target region, while the three formants above retain their original values throughout. Further, a logistic function is used to ensure a smooth transition from the formants before and after the manipulation area, to the target formants. This transition occurs over a user-specified region, called 'in' and 'out' transition. Portions of the word preceding the 'in' transition and following the 'out' transition remain non-modified.

The formant values for the synthesis of the Australian variants were taken from Cox (1996) and are reproduced in Table 3.4 for females and Table 3.5 for males. The values were normalized by Cox using Nearey's technique.

Table 3.4: Formant values for vowels produced by Australian females (taken from Cox 1996)

word	F1	F2	lexical-class
heed	391	2729	FLEECE
hid	402	2697	KIT
head	537	2400	DRESS
had	886	2014	TRAP
hard	955	1525	START
hud	941	1563	STRUT
hod	708	1182	LOT
horde	494	954	THOUGHT
who'd	399	2138	GOOSE
hood	436	1054	FOOT
heard	527	1926	NURSE

haired	529	2389	SQUARE

Table 3.5: Formant values for vowels produced by Australian males (taken from Cox 1996)

word	F1	F2	lexical-class
heed	320	2339	FLEECE
hid	332	2336	KIT
head	467	2085	DRESS
had	695	1763	TRAP
hard	757	1349	START
hud	743	1386	STRUT
hod	584	1040	LOT
horde	439	846	THOUGHT
who'd	341	1796	GOOSE
hood	378	948	FOOT
heard	468	1637	NURSE
haired	452	2092	SQUARE

It was important to synthesize the New Zealand variants as well as the Australian variants for several reasons. The scope of this study did not allow for the recording of Australian speakers as well as having Australian participants. The synthesis, therefore, was a good option to produce Australian variants and more closely monitor the perceptual effects of specific vowels. However, it was important to create the same conditions for the New Zealand variants of the words. Natural speech may have created too great of a difference compared to the synthesized Australian variants. The synthesis of both Australian and New Zealand variants ensured that any effects in the results that could be ascribed to the quality of the synthesis of the variants will be present in both variants of a word. Ideally, the only difference in the words are the formant values of the vowels. Another reason to employ synthesis for the New Zealand variants as well was the possibility to include different degrees of the KIT vowel, e.g. an extreme version versus a mild version, that would not have been possible to the same degree if natural speech had been used.

The formant values for the synthesis of the New Zealand variants were taken from the dataset described in Maclagan and Hay (2006) and are reproduced in Table 3.6 for

females and Table 3.7 for males. These values are non-normalized however, taken from a study involving 80 participants.

Table 3.6: Formant values for vowels produced by New Zealand females (taken from Maclagan and Hay 2006)

F1	F2	lexical-class
401	2757	FLEECE
645	1875	KIT
428	2700	DRESS
597	2356	TRAP
876	1557	START
853	1573	STRUT
673	962	LOT
435	755	THOUGHT
446	1875	GOOSE
559	1161	FOOT
462	2026	NURSE

Table 3.7: Formant values for vowels produced by New Zealand males (taken from Maclagan and Hay 2006)

F1	F2	lexical-class
322	2234	FLEECE
524	1599	KIT
381	2171	DRESS
537	1943	TRAP
716	1375	START
696	1344	STRUT
602	897	LOT
420	869	THOUGHT
367	1634	GOOSE
501	1128	FOOT
433	1664	NURSE

Figure 3.1 and 3.2 show the corresponding vowel spaces of the Australian and New Zealand vowels for females and males. The New Zealand variants are circled.

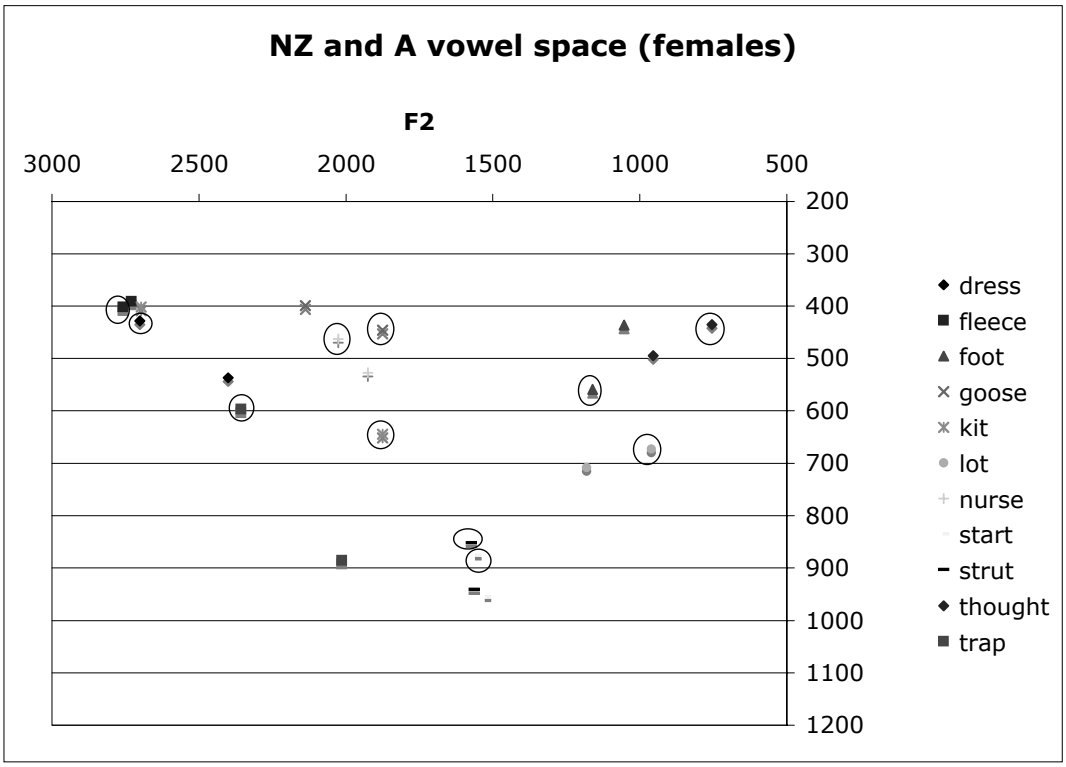

Figure 3.1: Vowel space for the Australian and New Zealand variants (females)

As the figures show, the vowel spaces with the datasets from Cox (1996) and Maclagan and Hay (2006) are comparable. The New Zealand and Australian variants of the vowels that are investigated in this study are all reasonably apart from each other, whereas the variants of the remaining vowels, such as for example START, STRUT and FLEECE, take up similar positions in the vowel space.

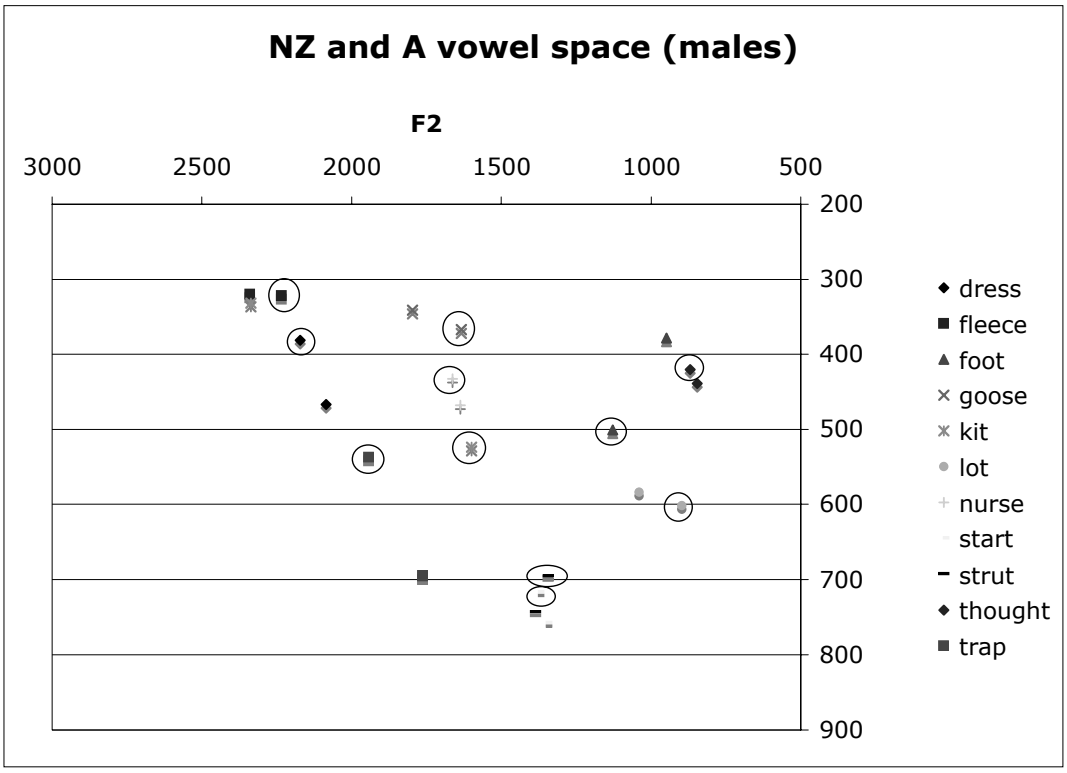

Figure 3.2: Vowel space for the Australian and New Zealand variants (males)

For the KIT vowel, which is considered one of the most prominent markers between New Zealand and Australian English (Bauer and Warren 2004:587), two versions were synthesized: KIT A is the actual variant of the KIT vowel for either New Zealand or Australian English using the formant values given above. KIT B denotes a less extreme version of the KIT vowel for each accent. The formant values were calculated as steps 1/3 and 2/3 along the way from New Zealand-like KIT and Australian-like KIT, for both males and females.

Table 3.8 shows the formant values for the four step continuum of the KIT vowel for females and Table 3.9 for the males. In each case, the values for KIT A correspond to the values for the KIT vowels in the vowel spaces.

Table 3.8: KIT continuum for females

	F1	F2
KIT-A-Australian	402	2697

KIT-B-Australian	483	2423
KIT-B-New Zealand	564	2149
KIT-A-New Zealand	645	1875

Table 3.9: KIT continuum for males

	F1	F2
KIT-A-Australian	332	2336
KIT-B-Australian	396	2090
KIT-B-New Zealand	460	1845
KIT-A-New Zealand	524	1599

Australian and New Zealand variants of each word were synthesized using these formant values as a guideline.

Because GOOSE before /l/ ('SCHOOL') has a radically different quality than GOOSE elsewhere in New Zealand English (Bauer and Warren 2004, 590) ("the /l/ vanishes and the quality of the vowel becomes genuinely back"), the GOOSE values produced by Maclagan and Hay (2006) are not suitable for the synthesis of the New Zealand SCHOOL vowel. The formant values for the vowels in the SCHOOL words were as follows: GOOSE for the Australian variant and an average of the formant values of the vowels in the recorded SCHOOL words for the New Zealand variant. These are shown in Table 3.10.

Table 3.10: Formant values for the SCHOOL vowel for Australian and New Zealand variants

SCHOOL	F1	F2
Australian		
females	399	2138
males	341	1796
New Zealand		
females	348	758
males	337.5	733

The synthesis of the SQUARE words was the only occasion where the synthesis transition was conducted differently for the New Zealand and Australian variants. In New Zealand English, the SQUARE vowel is more similar to the NEAR vowel (Maclagan and Gordon 1996) with an onset and a schwa offglide. In Australian English, the SQUARE vowel is realized with a more open onset and is generally more monophthongal (Watson and Harrington 1999:462). To model the more diphthongal nature of the SQUARE vowel in New Zealand English, only the first part of the vowel was synthesized using the New Zealand FLEECE values listed earlier. The second part remained the original schwa offglide. For the Australian variants of the SQUARE words, a two-part synthesis was conducted, using the SQAURE values from the dataset of Cox (1996) in Table 3.11.

Table 3.11: Formant values for the Australian SQUARE vowel (taken from Cox 1996)

SQUARE				
Australian	onset		offset	
	F1	F2	F1	F2
females	543	2390	473	2183
males	452	2080	400	1960

The first part of the vowel was synthesized with the onset values of Australian SQUARE with the endpoint of the synthesis reaching into the second part of the diphthong. This synthesized vowel was then taken as an input for another synthesis that modified the second part of the vowel with the offset values for Australian SQUARE.

Transition lengths were matched for both the Australian and the New Zealand variants of each word. The beginning and end points of the IN- and OUT-transition of the synthesis were guided by the original. The transitions of the synthesis were applied wherever any original movement in the vowel formants occurred due to the influence of preceding or following consonants. When the vowel reached its steady value in the original, that is where the transition stopped and the synthesis produced steady formant values. The transition points were always chosen at the zero-crossing on the way up.

The following spectrograms show examples of words where the transitions of the synthesis were quite long due to the length of the original transition from the vowel into

the nasal, or approximant respectively. Figure 3.3 shows the spectrogram of the word *example* produced by speaker M2. The first two arrows mark the IN-transition where the formants move from the consonant to the values that constitute the vowel: the first formant rises, the second formant drops. The last two arrows mark the OUT-transition of the synthesis. The formants move to the values that form the word-final lateral.

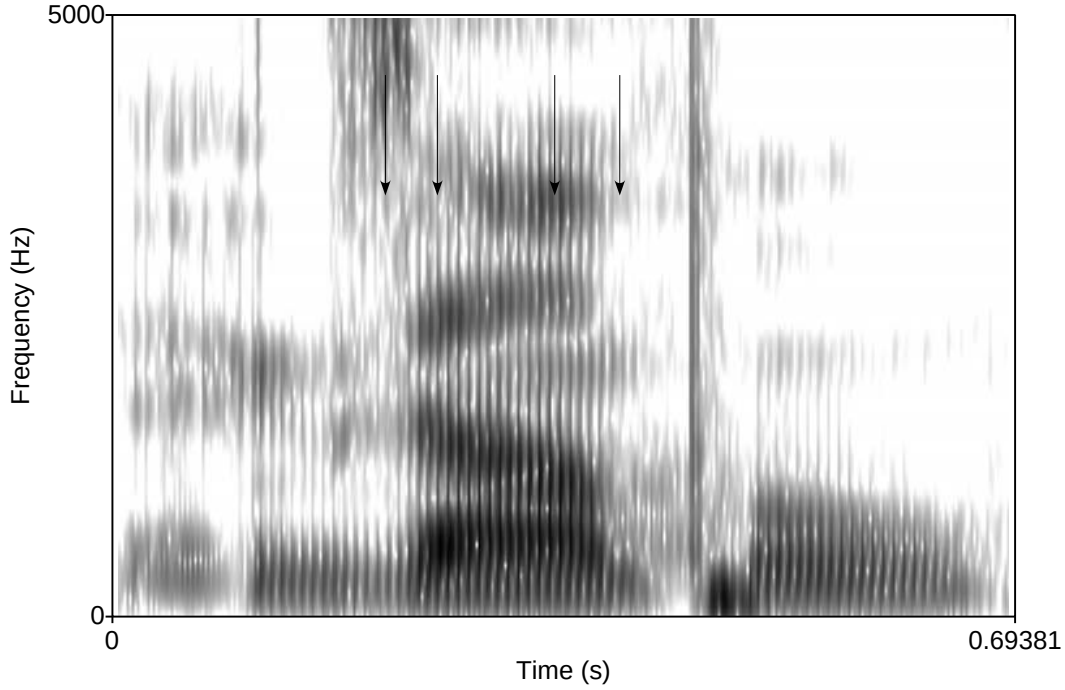

Figure 3.3: Spectrogram of *example* produced by speaker M2

The results of the synthesis are shown in the following two spectrograms. Figure 3.4 shows the word *example* produced by speaker M2 after it has been synthesized with the Australian formant values. The spectrogram of the New Zealand variant is displayed in Figure 3.5.

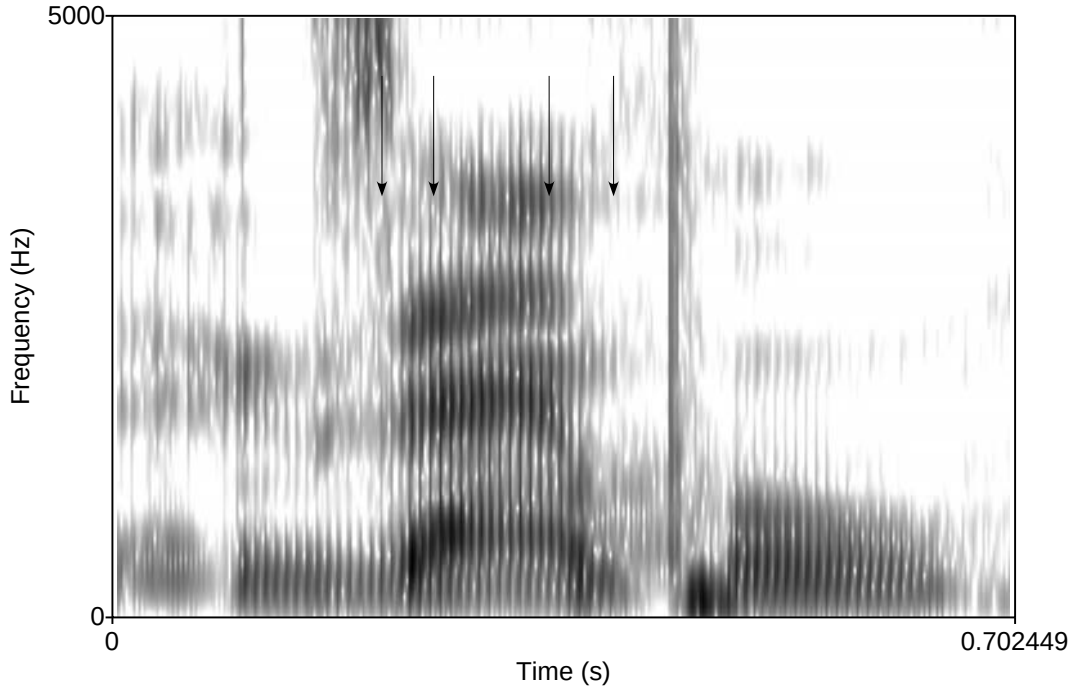

Figure 3.4: Spectrogram of *example* synthesized with Australian values (speaker M2)

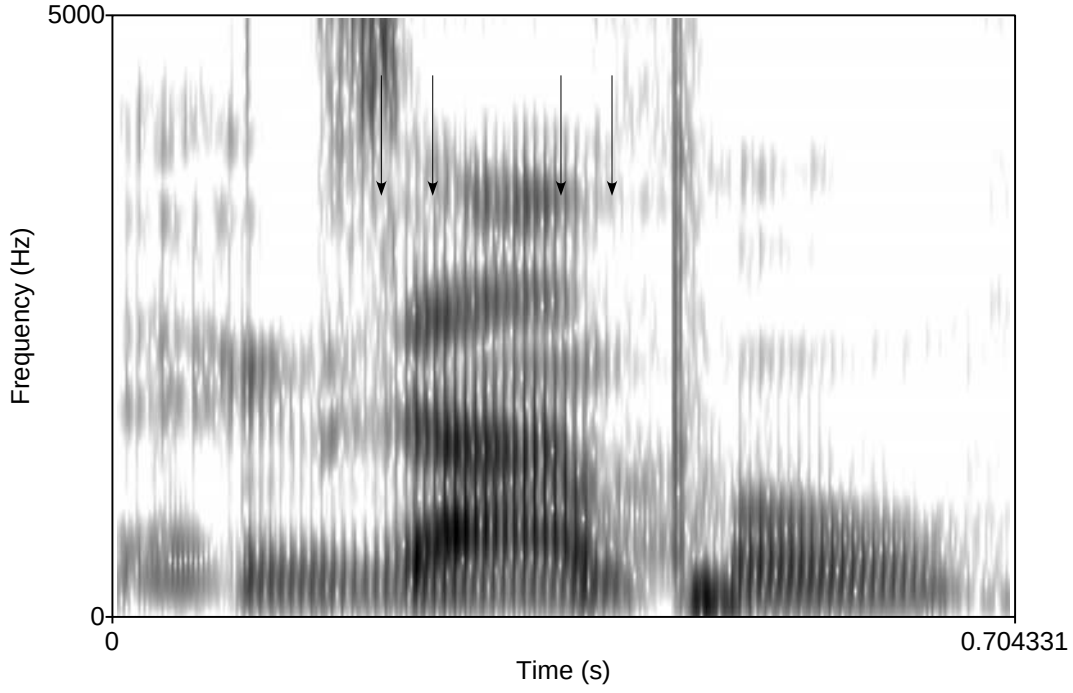

Figure 3.5: Spectrogram of *example* synthesized with New Zealand values (speaker M2)

As shown, the synthesis was guided by the original in the way that both words had long transitions from the vowel to the surrounding consonants.

Figure 3.6 shows the spectrogram of the nasal version of the word *that* produced by speaker F2. In this case, the transitions were kept minimal as the TRAP vowel in *that* showed minimal influence from the surrounding consonants.

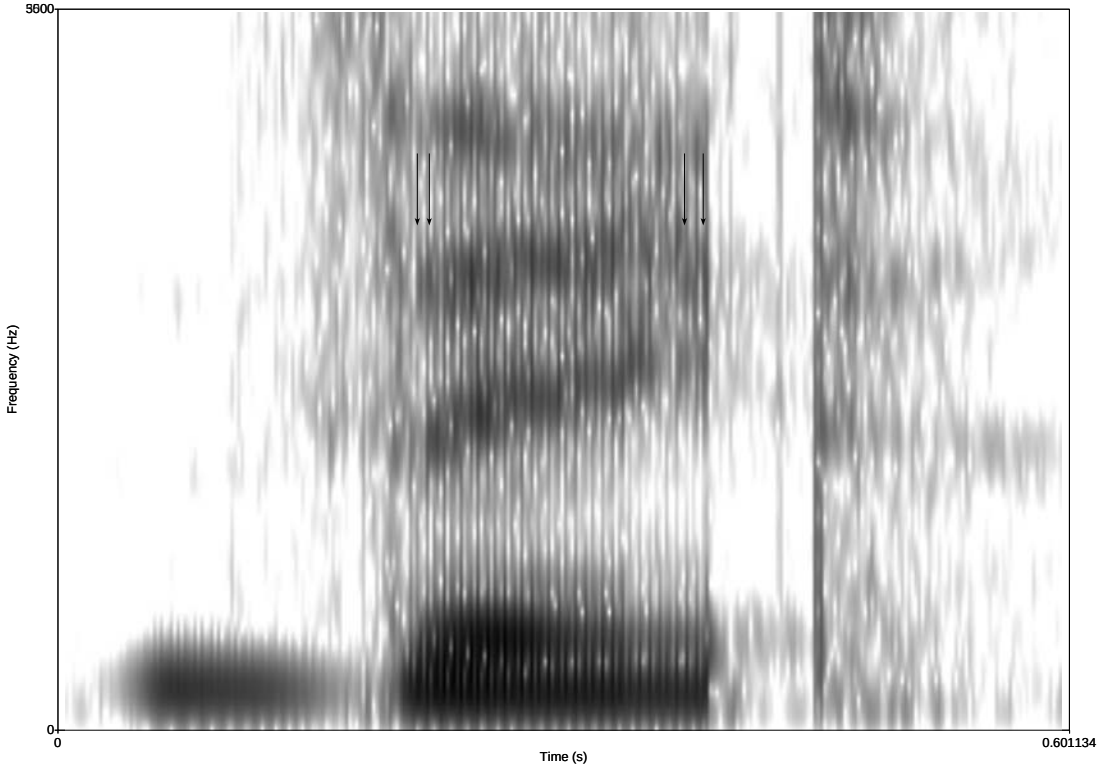

Figure 3.6: Spectrogram of *that-nasal* produced by speaker F2

The resulting Australian and New Zealand variants of the word are shown in the spectrograms in Figure 3.7 and 3.8.

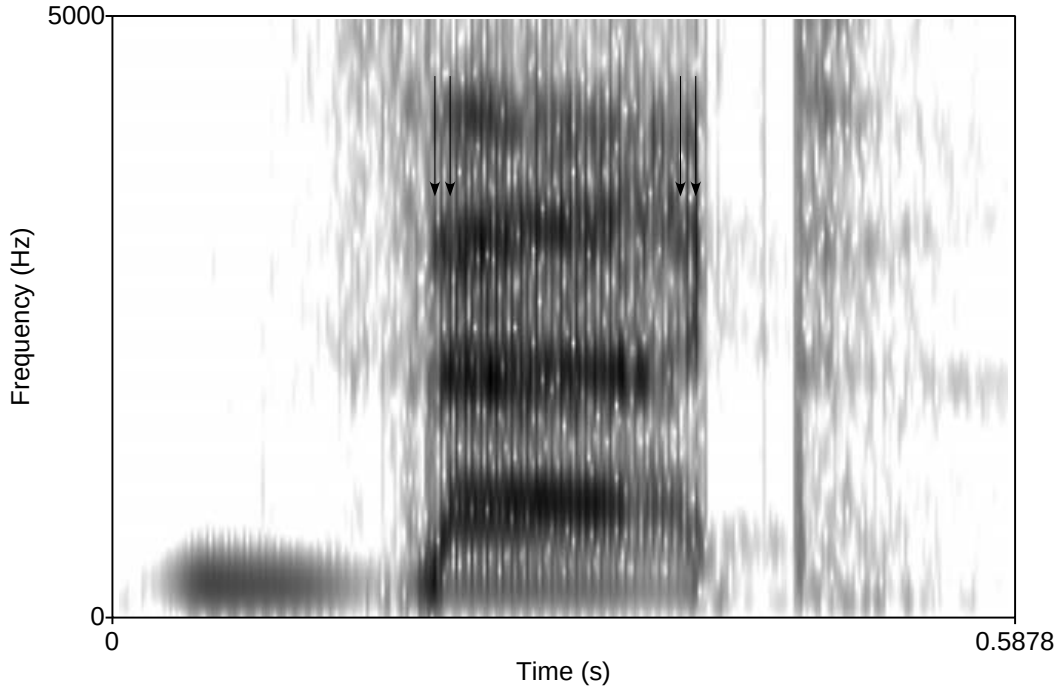

Figure 3.7: Spectrogram of *that-nasal* synthesized with Australian values (speaker F2)

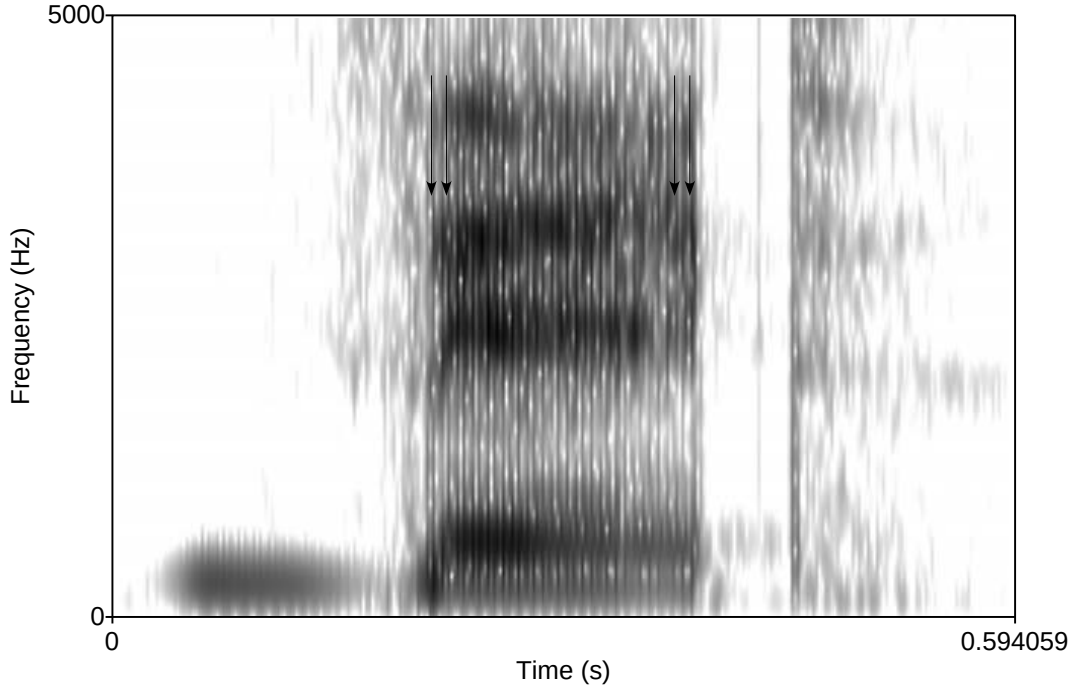

Figure 3.8: Spectrogram of *that-nasal* synthesized with New Zealand values (speaker F2)

A few hand corrections had to be made to remove any irregularities in the soundfiles. In some words, clicks or pops that the synthesis created were removed. Most often these clicks only occurred in one of the variants of a word, Australian or New Zealand, and therefore could distract the listeners. The synthesis also sometimes had a detrimental effect on a preceding or following consonant, e.g. clicks or other distortions were inserted. In these cases the consonant was extracted from the original soundfile and spliced on to the synthesized word, e.g. for the word *wish* produced by speaker F1. In other cases, such as the word *example* produced by speaker F2, the synthesis did not work for the original vowel because it was too glottalised for the formant tracker. The second part of the word *–ample* was replaced by its counterpart from the word *sample* produced by the same speaker. The word was then resynthesized. For a few words only, the amplitude of the synthesized vowel had to be magnified to match the amplitude of the original vowel. In all cases, identical modifications were made to all variants of a word, e.g. if one problematic waveform was removed from a New Zealand variant of a word, it was also removed from the Australian variant.

In piloting the experiment, it was established that for most words people could not detect that they had been interfered with. In just a couple of words there is residual noise which people tend to attribute to poor recording quality.

In sum, the 48 words, 6 words per vowel class, were produced by a female and a male speaker each, and each speaker had Australian and New Zealand variants for a total of 192 stimuli. The 10 nasal variants each had New Zealand and Australian variants as well, but were either produced by a male or a female speaker, resulting in an additional 20 stimuli for a grand total of 212 stimuli.

3.5 Experiment Design

The 212 stimuli were divided amongst two groups of participants to avoid any individual being exposed to an Australian and a New Zealand variant of the same word from the same speaker. The division into two participant groups, A and B, also shortened

the length of the experiment to just 12 minutes running time. The words were distributed across the two groups based on the following guidelines:

- the Australian and New Zealand variants of the same word produced by the same speaker were in complementary distribution across the two groups. If group A listened to speaker M1 saying *feesh*, group B listened to M1 saying *fush*.
- the Australian variant of a word produced by a female speaker is always paired in the same group with the New Zealand variant of the same word produced by a male speaker
- where possible, the nasal and non-nasal variant of the same word produced by the same speaker were in the same group.

As an example, Table 3.12 shows the distribution for the word *set* produced by speakers F3 and M3.

Table 3.12: Distribution of the word set produced by speakers F3 and M3 across the two groups A and B

paradigm	word	variant	nasality	speaker	group-hearing
DRESS 1	set	NZ	non	F3	B
DRESS 1	set	A	non	F3	A
DRESS 1	set	NZ	non	M3	A
DRESS 1	set	A	non	M3	B
DRESS 1	set	NZ	nasal	F3	A
DRESS 1	set	A	nasal	M3	B

The word *set*, as produced by speaker F3, appears in both groups: Group A is assigned the Australian variant, Group B the New Zealand one. Further, participants of Group A listen to Australian-like *set* produced by a female speaker and New Zealand-like *set* produced by a male speaker. Also, Group B listens to both the non-nasal and the nasal variant of Australian-like *set* produced by the same speaker (M3). Due to the experiment design, this pairing of nasal/non-nasal variants is not always possible. By definition, to have an equal number of nasal variants of each word in the two groups, the other nasal variant of this paradigm needs to be assigned to Group A, although the corresponding non-nasal New Zealand-like variant of speaker F3 is in Group B.

The other paradigms were divided up across the two groups in the same way. To keep the distribution of type of word (frequent, non-frequent, stereotypical) paired with gender of speaker and variant (Australian, New Zealand) equal across the groups, the allocation of the words to Group A or B was varied for each paradigm. Thus, for the example shown above, the order of allocation was B – A – A – B, for a different paradigm it might have been A – B – B – A. Table 3.13 shows the full distribution of the words across the two groups with regard to type of word, gender of speaker and variant. Due to the experiment design, a fully equal distribution was not always possible.

The words were randomized so that the same word did not appear twice in a row and so that the same speaker did not appear more than twice in a row. The same order was maintained in both groups. For example, if Group A listened to the New Zealand variant of a word, Group B listened to the Australian variant of the same word produced by the same speaker.

		females						females Total	males						males Total	Grand Total
		Australian		Australian Total	NZ		NZ Total		Australian		Australian Total	NZ		NZ Total		
variable	type	a	b		a	b			a	b		a	b			
DANCE	freq	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
	non	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
	stereo	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
DANCE Total		3	3	6	3	3	6	12	3	3	6	3	3	6	12	24
DRESS	freq	1	1	2	2	1	3	5	1	2	3	1	1	2	5	10
	non	2	1	3	1	1	2	5	1	1	2	1	2	3	5	10
	stereo	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
DRESS Total		4	3	7	4	3	7	14	3	4	7	3	4	7	14	28
KIT A	freq	2	1	3	1	1	2	5	1	1	2	1	2	3	5	10
	non	1	1	2	2	1	3	5	1	2	3	1	1	2	5	10
	stereo	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
KIT A Total		4	3	7	4	3	7	14	3	4	7	3	4	7	14	28
KIT B	freq	1	1	2	2	1	3	5	1	2	3	1	1	2	5	10
	non	1	2	3	1	1	2	5	1	1	2	2	1	3	5	10
	stereo	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
KIT B Total		3	4	7	4	3	7	14	3	4	7	4	3	7	14	28
NURSE	freq	1	2	3	2	2	4	7	3	1	4	1	2	3	7	14
	non	3	1	4	1	2	3	7	1	2	3	2	2	4	7	14
NURSE Total		4	3	7	3	4	7	14	4	3	7	3	4	7	14	28
SCHOOL	freq	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
	non	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
	stereo	1	1	2	1	1	2	4	1	1	2	1	1	2	4	8
SCHOOL Total		3	3	6	3	3	6	12	3	3	6	3	3	6	12	24
SQUARE	freq	1	2	3	2	1	3	6	2	1	3	1	2	3	6	12
	non	2	1	3	1	2	3	6	1	2	3	2	1	3	6	12
SQUARE Total		3	3	6	3	3	6	12	3	3	6	3	3	6	12	24
TRAP	freq	2	2	4	1	2	3	7	1	2	3	3	1	4	7	14
	non	1	2	3	3	1	4	7	2	2	4	1	2	3	7	14
TRAP Total		3	4	7	4	3	7	14	3	4	7	4	3	7	14	28
Grand Total		27	26	53	28	25	53	106	25	28	53	26	27	53	106	212

Table 3.13: Full distribution of the words across the two groups with regard to type of word, gender of speaker and variant

The total length of the experiment was approximately 12 minutes, in which the 106 words were played, plus numbers spoken by a New Zealand male. Between each stimuli passage there was a pause of about 2.5 seconds, followed by the next number, a pause of about 1 second, the word, another pause of about 1 second and the repetition of the same word. Whenever participants had to turn the page, the pause between the words was doubled to 5 seconds to allow for more time.

3.6 The Participants – New Zealanders

40 native speakers of New Zealand English, 17 females and 23 males, aged between 18 and 60 years, took part in the study, with the majority of them being undergraduate students at the University of Canterbury in Christchurch. Three New Zealanders were recruited in Sydney. The distribution across the two conditions is shown in Table 3.14. The table shows the total number of New Zealand participants. When the cell includes New Zealanders recruited from Sydney, the number of Sydney participants is shown in parentheses. The label 'younger' refers to participants under the age of 40, 'older' denotes subjects over the age of 40.

Table 3.14: Distribution of New Zealand participants across the two conditions

total	younger females	older females	younger males	older males
condition A	7	1	11 (1)	1
condition B	8 (1)	1	8 (1)	3

3.7 The participants - Australians

The Australian data was collated from a total of 60 participants, 45 females and 15 males, aged between 17 and 56, with the majority being undergraduate students from several universities in Melbourne and Sydney. Eight Australians were recruited in Christchurch. The distribution across the two conditions is shown in Table 3.15 (total number of Australian participants), Table 3.16 (A participants in

Sydney), Table 3.17 (A participants in Melbourne), Table 3.18 (A participants in Melbourne from an Advanced Phonetics class) and Table 3.19 (A participants in Christchurch). The following abbreviations will be used for the participant groups: younger females (yf), older females (of), younger males (ym) and older males (om).

Table 3.15: Distribution of A participants across the two conditions

total	yf	of	ym	om
condition A	20	3	7	-
condition B	20	2	8	-

Table 3.16: Distribution of A participants in Sydney across the two conditions

SYD	yf	of	ym	om
condition A	12	2	3	-
condition B	11	-	3	-

Table 3.17: Distribution of A participants in Melbourne across the two conditions

MELB	yf	of	ym	om
condition A	4	-	1	-
condition B	6	-	2	-

Table 3.18: Distribution of A participants from Advanced Phonetics class in Melbourne

LING MELB	yf	of	ym	om
condition A	2	-	2	-
condition B	3	-	1	-

Table 3.19: Distribution of A participants in Christchurch across the two conditions

CHCH	yf	of	ym	om
condition A	2	1	1	-
condition B	-	2	2	-

3.8 Experiment procedure

The instructions for the participants were as follows. Each participants was given a set of instructions that informed them about the experiment, inviting them to participate in a research project that would investigate how accurate New Zealanders/Australians were at identifying New Zealand and Australian English. They were told that they would be asked to listen to words spoken by a variety of speakers and that they were required to rate their accent on a scale from 1 (definitely New Zealander) to 6 (definitely Australian). Then, they were asked to fill out a background information sheet that recorded age, gender, occupation, highest qualification and the place of their upbringing. Furthermore, they were asked about specific visits to New Zealand, or Australia respectively, the lengths of these stays, and how often they watched New Zealand/Australian TV shows, out of the three options 'never', 'sometimes' and 'often'. Participants also had to rate how well they thought they could hear the difference between New Zealand and Australian English on a scale from 1 (not at all) to 6 (very accurately). The last part of the questionnaire was concerned with the participants' knowledge of New Zealand and Australian English. Participants were asked to note down what they thought were typical features of Australian English and of New Zealand English. After signing the consent form, participants were given more detailed information about the experiment, namely that they will be played 106 words, spoken by a variety of speakers, and that they will hear each word twice and then be required to provide a rating for the word on the above-mentioned scale. It was further pointed out to the participants that it was their first intuition about the word that counted and that it was important to give a rating for every word, even if they were not sure about their answer. The following seven pages were filled with the 106 stimuli words that were each listed with a scale from 1 to 6. The stimuli were played to the participants over headphones from a portable CD player or computer. After the experiment, participants were asked to state on a scale from 1 (very difficult) to 6 (very easy) how difficult they thought the task was and if they had changed their opinion about what might be typical features of Australian English, or New Zealand English respectively. Participants were given a Crunchie bar in appreciation of their time.

3.9 Predictions

The following predictions can be made about the outcome of the experiment based on the literature that was reviewed in Chapter two.

- Overall, Australians and New Zealanders are expected to be able to identify each other's and their own accents with a certain degree of accuracy.
- Certain types of vowels will elicit stronger ratings by participants than others, i.e. vowels that are more distinguished in the two accents will be more readily identified than vowels that are more similarly realized in the two accents.
- Stereotypical and frequent words are expected to be identified more easily than non-frequent words.
- Nasality is expected to reinforce the rating of a word as Australian, at least by the New Zealand participants. It is unclear how nasality will influence Australian participants.
- Australians and New Zealanders may use different cues from one another to complete the task.
- The gender of the voice might have an effect.
- Participants who have been exposed to the other dialect more will be more accurate at the task.

Chapter 4 - Results – The raw data

4.1 Introduction

This chapter will outline the main trends in the data and identify what seem to be the main results emerging from the study. In Chapter 5, the data will be subjected to statistical analysis.

4.2 Overall Performance

The overall performance of the participants in categorising the two accents was 65% which is relatively high compared to other dialect identification studies. Though, given the differing nature of the tasks involved in the studies, a direct comparison cannot be made. New Zealand participants were slightly better at the task with an accuracy of 69% compared to the Australian participants who were 63% accurate. Participants were considered 'accurate' if they responded with the variant that was intended, regardless of nasality. The 6-point scale gave them the option to rate the passages as either New Zealand (1-3) or Australian (4-6) with 1 being definitely New Zealand and 6 being definitely Australian. Although the participants were not specifically told to use 1 to 3 for shades of New Zealand English and 4 to 6 for shades of Australian English, it is reasonable to assume that the participants have placed their threshold halfway along the continuum between 1 and 6.

In the following, both accuracy percentages and average responses will be presented. Both Australians and New Zealanders were better at identifying the New Zealand variants than the Australian ones as can be seen from the percentages of accuracy in Table 4.1.

Table 4.1: Percentages of accuracy for A/NZ participants

	A variants	NZ variants	total
Australian participants	59%	67%	63%
New Zealand participants	67%	77%	69%

Table 4.2 and Figure 4.1 present the average responses that Australian and New Zealand participants gave on a scale from 1 to 6, with 1 to 3 being New Zealand and 4 to 6 Australian. The line at the 3.5 point in Figure 4.1 indicates the threshold between the New Zealand and the Australian label range and will be plotted in all of the following graphs.

Table 4.2: Average responses for A/NZ participants

	A variants	NZ variants
Australian participants	3.84	2.75
NZ participants	3.96	2.38
total	3.89	2.6

The figures show that the confidence of the participants generally is not particularly high, with averages ranging from 2.6 to 3.89 on a given scale from 1 to 6.

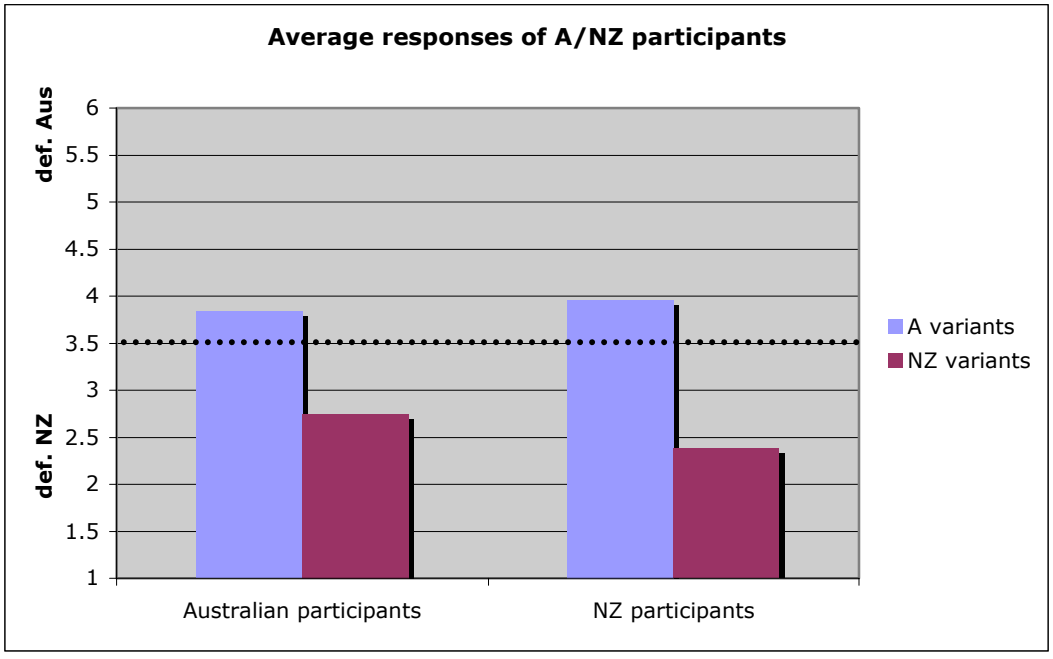

Figure 4.1: Average responses of A/NZ participants

The Australian variants of the words were rated more New Zealand-like than expected with an average response of only 3.89 which falls just inside the Australian label range. The New Zealand variants of the words received an average rating of 2.6 which is in the middle of the New Zealand label range.

As expected, the overall performance in the two groups A and B did not differ much. The variable of the group-hearing can therefore be disregarded. The average responses are presented in Table 4.3.

Table 4.3: Average responses for Group A and B

	A variants	NZ variants
Group A	3.89	2.66
Group B	3.88	2.55

In the following, the reporting of the results will be restricted to the data of the non-nasal variants. The results concerning the nasal variants will be reported in section 4.4.

4.3 The non-nasal variants

4.3.1 Gender of the speaker

While it was easier for the Australian participants to identify male speakers of their own accent than female ones, they were better at identifying the female speakers of the other accent as can be seen in Table 4.4. In other words, to the Australian participants females sound more like New Zealanders and males more like Australians.

Table 4.4: Average responses to non-nasal variants in relation to gender of the speaker

	A variants		NZ variants	
	f	m	f	m
A participants	3.69	3.95	2.6	3.04
NZ participants	4.27	3.6	2.48	2.17

Table 4.4 and Figure 4.2 also show that the New Zealanders were better at categorising the female Australians than the male ones. They were also better identifying male speakers of their own accent than female ones. In sum, to the New Zealand participants females seem to sound more Australian, males sound more New Zealand-like.

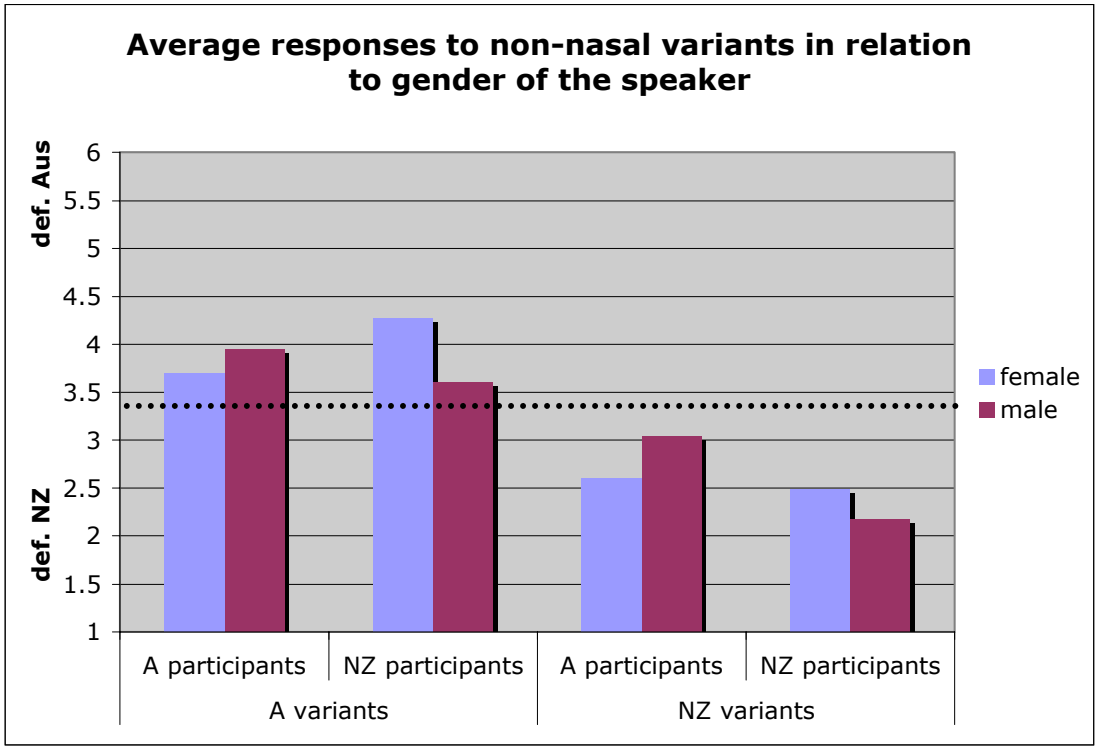

Figure 4.2: Average responses to non-nasal variants in relation to gender of the speaker

The same pattern emerges when looking at the specific accuracy values. Table 4.6 shows that Australian participants were most accurate at identifying female New Zealand speakers, followed by male Australian and male New Zealand speakers.

Female Australian speakers were identified just above chance by Australian participants.

Table 4.5: Accuracy of A participants for non-nasal variants in relation to gender of the speaker

	f	m
A variants	56%	61%
NZ variants	70%	61%

New Zealand participants were most accurate with male New Zealand speakers and least accurate with male Australian speakers as Table 4.6 shows.

Table 4.6: Accuracy of NZ participants for non-nasal variants in relation to gender of the speaker

	f	m
A variants	67%	51%
NZ variants	75%	83%

The gender of the participant did not seem to have an effect, that is female and male participants did not give very different responses. As can be seen from Table 4.7, the values concerning female and male tokens of each of the two accents nearly overlap in most cells and completely overlap in one of them.

Table 4.7: Average responses to non-nasal variants in relation to gender of the participants

		A variants	NZ variants
A participants	f	3.85	2.82
	m	3.72	2.81
NZ participants	f	3.86	2.36
	m	3.98	2.36

4.3.2 Lexical effects

The hypothesized lexical effects concerning the type of word - non-frequent, frequent and stereotypical - were present for the New Zealand participants who gave the strongest ratings on stereotypical words, followed by frequent and non-frequent ones, for both Australian and New Zealand variants. This effect, however, was not present for the Australian participants.

Table 4.8: Average responses to non-nasal variants in relation to type of word

		A participants	NZ participants
A variants	non	3.9	3.67
	freq	3.8	3.83
	stereo	3.69	4.63
NZ variants	non	2.9	2.48
	freq	2.68	2.31
	stereo	2.92	2.07

Table 4.8 shows that for New Zealand participants, the ratings of Australian variants move successfully towards 6, 'Australian' end of the scale, as the words become more frequent and stereotypical. Accordingly, the ratings of New Zealand variants move towards the 'New Zealand' end of the scale. The values concerning the word type are close to overlapping for the Australian participants. Figure 4.3 illustrates this.

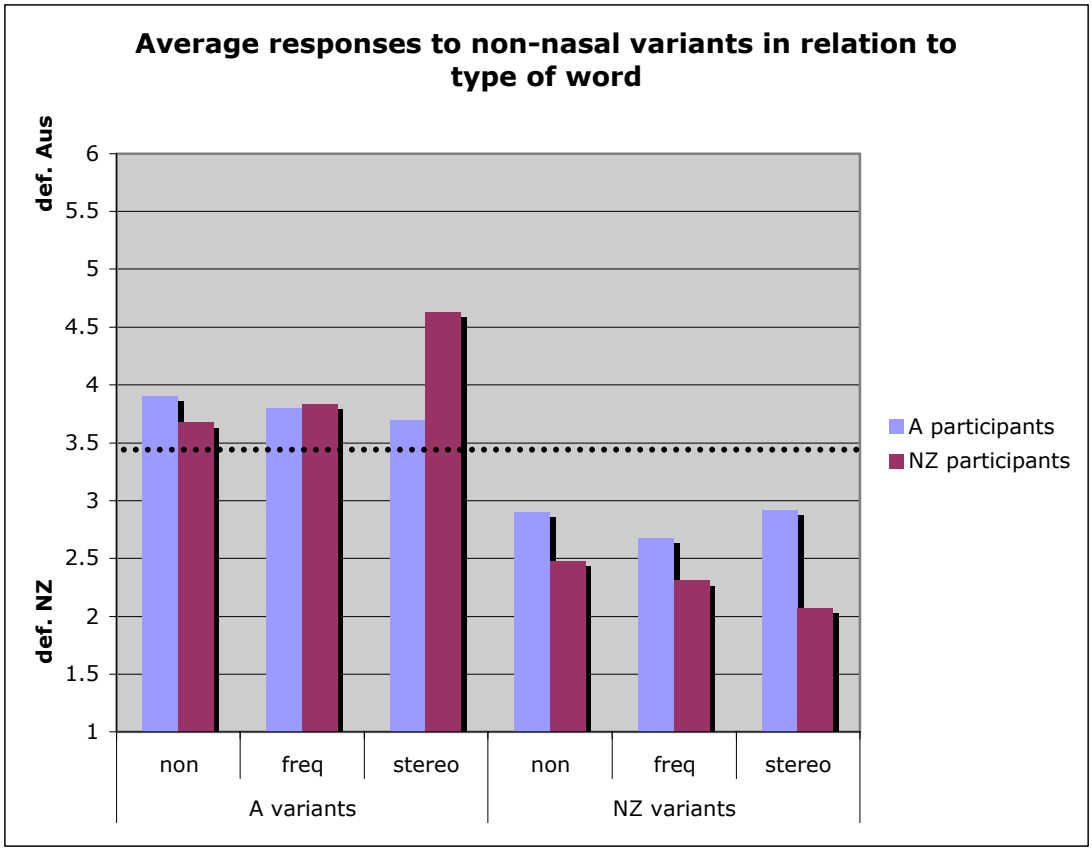

Figure 4.3: Average responses to non-nasal variants in relation to type of word

4.3.3 Lexical effects in relation to vowel type

This trend is replicated when looking at the lexical effects vowel by vowel. Table 4.9 presents the average responses for the Australian participants in relation to type of word and vowel. The Australian participants only responded to the Australian KIT B variants with the hypothesized pattern of strongest ratings for stereotypical words, followed by frequent ones and then non-frequent ones. They were also more confident with the frequent Australian TRAP and frequent New Zealand TRAP variants than the respective non-frequent counterparts.

Table 4.9: Average responses of A participants in relation to type of word and vowel (non-nasal variants only)

		A variants	NZ variants
DANCE	non	4.98	3.4

	freq	3.74	2.93
	stereo	4.78	3.33
DRESS	non	4.43	3.24
	freq	4.48	2.73
	stereo	4.09	3.23
KIT A	non	3.54	1.38
	freq	3.71	1.21
	stereo	3.4	1.51
KIT B	non	2.38	1.86
	freq	3.04	2.1
	stereo	3.75	2.06
NURSE	non	4.04	3.76
	freq	3.92	3.4
SCHOOL	non	2.66	4.51
	freq	2.28	4.28
	stereo	2.45	4.51
SQUARE	non	4.38	2.13
	freq	4.16	2.22
TRAP	non	4.33	2.89
	freq	4.49	2.54

As seen before the lexical effect is somewhat stronger among the New Zealand participants and this tendency is reflected by the vowel by vowel analysis as well. As with the Australian participants, the New Zealand participants also responded to the Australian KIT B variants with the strongest ratings for the stereotypical words, followed by frequent ones and non-frequent ones. This effect is even stronger among the New Zealanders whose responses range from 2.33 (non-frequent) to 4.26 (stereotypical) compared to the Australians' responses (2.38 – 3.75). Furthermore, the same response pattern is present for the Australian SCHOOL variant and the Australian and New Zealand TRAP variants.

Table 4.10: Average responses of NZ participants in relation to type of word and vowel (non-nasal variants only)

		A	NZ
DANCE	non	4.95	1.99
	freq	4.04	1.73
	stereo	4.96	2.08
DRESS	non	3.1	2.49
	freq	2.88	2.64
	stereo	3.56	2.65
KIT A	non	5.1	1.94
	freq	5.16	1.68
	stereo	4.93	1.48
KIT B	non	2.33	1.85
	freq	3.9	2.28
	stereo	4.26	1.7
NURSE	non	2.6	2.94
	freq	2.92	2.53
SCHOOL	non	4.98	2.44
	freq	5.46	2.29
	stereo	5.41	2.44
SQUARE	non	3.52	3.04
	freq	3.52	2.52
TRAP	non	3.48	2.57
	freq	3.53	2.53

4.3.4 Vowel Type

In this section, the average responses to non-nasal variants in relation to the type of vowel will be presented. Table 4.11 shows the average responses of the Australian participants when trying to identify speakers of their own accent, in descending order. The DANCE and the TRAP vowel were the crucial factors in vowel type for the Australian participants to identify other Australians. The Australian KIT

and SCHOOL vowels elicited more New Zealand-like ratings among the Australian participants, with overall average responses at or below the threshold of 3.5.

Table 4.11: Average responses to non-nasal variants in relation to vowel type (A participants on A variants)

variant	variable	A participants
A	DANCE	4.5
	TRAP	4.41
	DRESS	4.33
	SQUARE	4.27
	NURSE	4
	KIT A	3.55
	KIT B	3.06
	SCHOOL	2.46

A different 'vowel hierarchy' emerges when looking at how Australians perceive the New Zealand variants. The New Zealand KIT vowel facilitated the most New Zealand-like ratings, followed by SQUARE and TRAP. The New Zealand NURSE and SCHOOL vowels received the least New Zealand-like ratings as can be seen in Table 4.12, with overall average responses above the threshold. The asymmetry of the two vowel hierarchies is intriguing. Obviously just because one vowel makes it easy to identify a New Zealander does not mean that the same vowel in a very different realization helps a listener to identify an Australian.

Table 4.12: Average responses to non-nasal variants in relation to vowel type (A participants on NZ variants)

variant	variable	A participants
NZ	KIT A	1.36
	KIT B	2
	SQUARE	2.18
	TRAP	2.72
	DRESS	3.06
	DANCE	3.22

	NURSE	3.6
	SCHOOL	4.43

Figure 4.4 sums these results up. The x-axis shows the type of vowel class in the order of importance for the Australian participants when trying to identify other Australians, the higher the bar is the more helpful that vowel turns out to be in the task. The dark bars indicate the average responses of Australian participants on New Zealand variants of that vowel, the lower the bar is the more important that vowel turns out to be in the task of identifying speakers of New Zealand English.

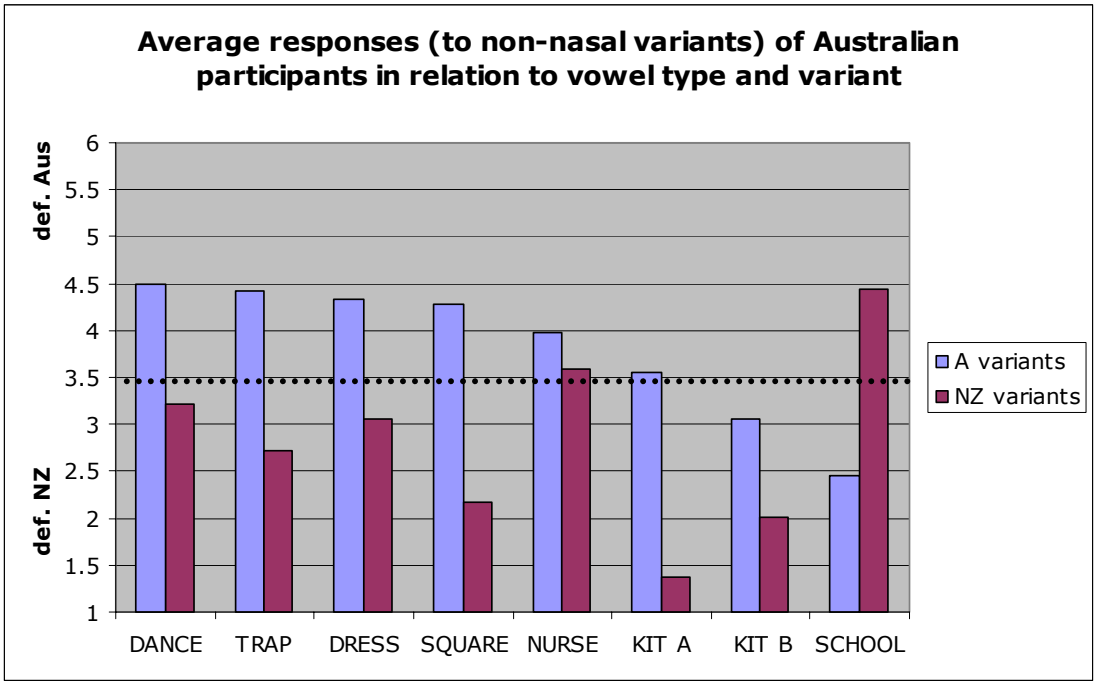

Figure 4.4: Average responses (to non-nasal variants) of Australian participants in relation to vowel type and variant

This same pattern is replicated by the accuracy values shown in Table 4.13.

Table 4.13: Accuracy of A participants in relation to vowel type (non-nasal variants)

	A variants	NZ variants
DANCE	74%	59%
TRAP	73%	68%
SQUARE	73%	81%
DRESS	73%	62%

NURSE	61%	49%
KIT A	54%	94%
KIT B	38%	85%
SCHOOL	22%	24%

Table 4.14 and 4.15 present the average responses of New Zealand participants in relation to vowel type. When identifying speakers of their own accent, the KIT and the DANCE vowel seem to be most helpful for New Zealanders, whereas NURSE and SQUARE serve least as a cue on this task.

Table 4.14: Average responses to non-nasal variants in relation to vowel type (NZ participants on NZ variants)

variant	variable	NZ
NZ	KIT A	1.7
	DANCE	1.93
	KIT B	1.94
	SCHOOL	2.39
	TRAP	2.54
	DRESS	2.6
	NURSE	2.73
	SQUARE	2.78

The Australian SCHOOL vowel facilitates the most Australian-like ratings among the New Zealand participants, followed by KIT A and DANCE. The DRESS and NURSE vowels help the New Zealand participants least in trying to identify a speaker from Australia.

Table 4.15: Average responses to non-nasal variants in relation to vowel type (NZ participants on A variants)

variant	variable	NZ
A	SCHOOL	5.28
	KIT A	5.06

	DANCE	4.65
	SQUARE	3.52
	TRAP	3.51
	KIT B	3.5
	DRESS	3.18
	NURSE	2.76

Again, a graph will illustrate these results. Figure 4.5 shows the average responses of New Zealand participants in relation to vowel type and variant. The vowel types on the x-axis are listed in the order of importance for New Zealanders when trying to identify speakers of their own accent. The lower the dark bars are, the more helpful that specific vowel turned out to be in the task. The lighter bars indicate the average responses of New Zealand participants on Australian variants of the vowels. The higher it is, the more helpful it was in the task.

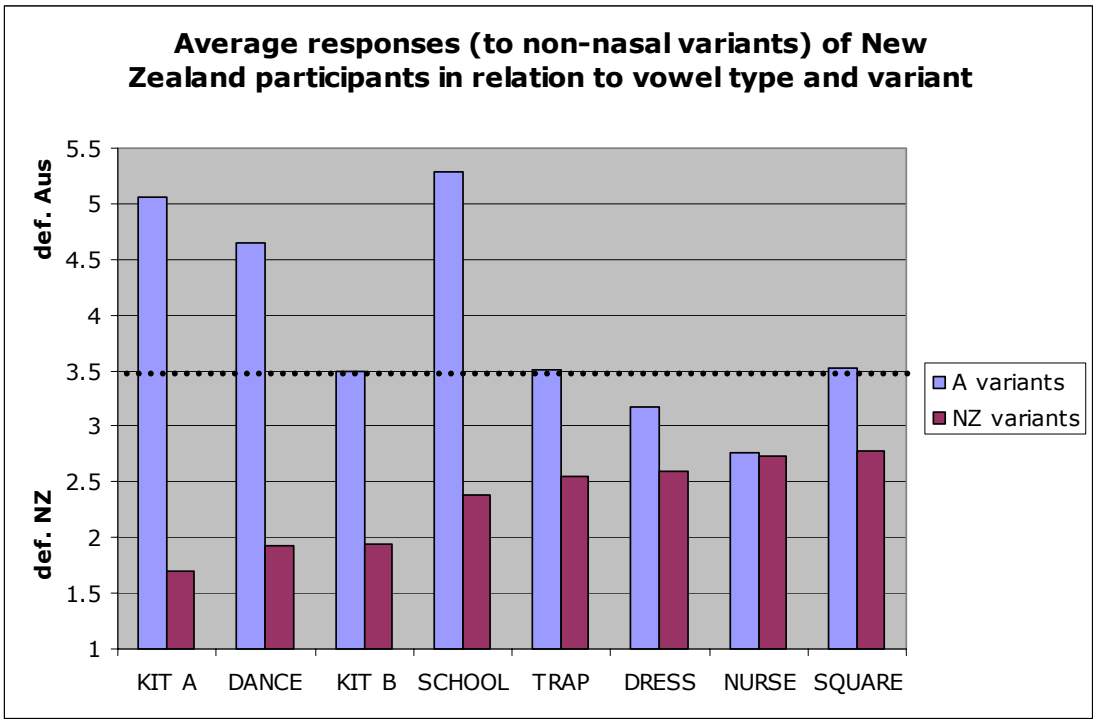

Figure 4.5: Average responses (to non-nasal variants) of New Zealand participants in relation to vowel type and variant

This same pattern is replicated by the accuracy values shown in Table 4.16.

Table 4.16: Accuracy of NZ participants with vowel type (non-nasal variants)

	A variants	NZ variants
SCHOOL	87%	77%
KIT A	83%	91%
DANCE	75%	85%
SQUARE	53%	70%
TRAP	51%	78%
KIT B	50%	89%
DRESS	44%	70%
NURSE	29%	71%

4.3.5 City

The variable of the city only really makes sense for the Australian participants who were recruited from Christchurch, Sydney and Melbourne. Only 3 New Zealand participants were recruited in Australia.

There seems to be an effect among the Australian participants regarding the city in which they currently reside. Australians in Christchurch were better at identifying Australians correctly than Australians were in Sydney and Melbourne. Yet, they were worse at identifying New Zealanders than other Australians from Sydney and Melbourne. Australians living in Australia also distinguished more between Australian and New Zealand variants than Australians from Christchurch whose responses ranged only from 3.94 (Australian variants) to 3.29 (New Zealand variants).

Table 4.17: Average responses to non-nasal variants in relation to city

		A variants	NZ variants
A participant	chch	3.94	3.29
	syd	3.82	2.74
	melb	3.77	2.75
NZ participant	chch	3.94	2.31
	syd	3.86	2.51

Looking at the variable of the city in more detail, that is, looking at how different on average participants from different cities rated the different types of vowels, the following results occur. For Australians living in Christchurch, the DRESS and the TRAP vowels elicited the strongest ratings for the Australian variants whereas Australians living in Melbourne and Sydney responded strongest to the Australian DANCE, SQUARE and TRAP variants. Irrespective of the city, all Australian participants were most confident with the New Zealand KIT A variants, followed by New Zealand KIT B (Australians from Christchurch and Sydney) and New Zealand SQUARE (Australians from Melbourne). Interestingly, the DRESS and TRAP vowels were generally given more Australian-like ratings by the Australians living in Christchurch, whether the vowels were realized in a typically Australian or a typically New Zealand fashion. This is not the case with the Australians living in Sydney or Melbourne who responded with more New Zealand-like ratings when the DRESS and TRAP vowels occurred in a New Zealand variant and more Australian-like ratings when they were realized in a typically Australian fashion.

Table 4.18: Average responses to non-nasal variants in relation to city and vowel type (A participants)

	A variants			NZ variants		
	chch	melb	syd	chch	melb	syd
DANCE	4.21	4.33	4.69	2.98	3.17	3.32
DRESS	4.67	4.23	4.32	4.06	2.9	2.92
KIT A	3.65	3.55	3.53	1.75	1.48	1.19
KIT B	3.6	2.92	3.01	2.58	2.07	1.81
NURSE	3.75	3.98	4.03	4.19	3.63	3.39
SCHOOL	2.98	2.67	2.19	4.42	4.21	4.59
SQUARE	3.94	4.34	4.31	2.65	2.13	2.08
TRAP	4.77	4.13	4.51	3.69	2.44	2.66

New Zealanders living in Christchurch did not give very different responses to New Zealanders living Sydney. It is important to note though that only three New Zealanders were recruited in Australia. For the New Zealand variants, both groups

responded strongest to KIT A, KIT B and DANCE. New Zealanders from Christchurch on average considered the SCHOOL vowel most helpful when categorizing the Australian variants, followed by KIT A and DANCE while for the expatriats in Sydney DANCE, KIT A and KIT B were the key vowels.

Table 4.19: Average responses to non-nasal variants in relation to city and vowel type (NZ participants)

	A variants		NZ variants	
	chch	syd	chch	syd
DANCE	4.62	5	1.95	1.61
DRESS	3.14	3.61	2.57	2.89
KIT A	5.15	4	1.73	1.22
KIT B	3.46	3.94	1.91	2.38
NURSE	2.7	3.5	2.7	3.11
SCHOOL	5.42	3.56	2.32	3.28
SQUARE	3.5	3.72	2.74	3.22
TRAP	3.5	3.56	2.56	2.33

Taking nasality into account as well, the following differences in average responses occur. Australian participants living in Christchurch, Melbourne or Sydney rated nasal New Zealand variants as more New Zealand-like than the non-nasal counterparts. For the Australian variants, Australians from Melbourne and Sydney took nasality as a reinforcement of the accent and gave slightly more Australian-like ratings. Only the expatriats, Australians living in Christchurch, rated the nasal Australian variants as more New Zealand-like, but the difference is minimal.

Table 4.20: Average responses of A participants in relation to city, nasality and variant

city	nasality	A variants	NZ variants
chch	nasal	3.85	2.075
	non-nasal	3.95	3.29
melb	nasal	3.89	2.44
	non-nasal	3.77	2.75
syd	nasal	4.21	1.98

	non-nasal	3.82	2.74

New Zealand participants living in either Christchurch or Sydney, on average, rated nasal Australian variants as more Australian-like than the non-nasal counterparts. For the Australian variants, nasal versions on average received more Australian-like ratings from the New Zealand participants in Christchurch, but more New Zealand-like ratings from the one New Zealand participant recruited in Sydney.

Table 4.21: Average responses of NZ participants in relation to city, nasality and variant

city	nasality	A variants	NZ variants
chch	nasal	4.24	2.91
	non-nasal	3.94	2.31
syd	nasal	4	2.29
	non-nasal	3.86	2.51

4.3.6 Exposure to the accent

Another variable that has proven to be significant in previous studies is the degree of exposure to the accent of the other kind. In this study, length of stay in the other country and the influence of the media are investigated in this regard.

Participants were asked to indicate if they had ever been to Australia/New Zealand before and, if yes, indicate how much time they have spent in the other country. According to their response, participants were divided into three groups: “no” (they haven’t been to the other country), “holiday” (they have been to the other country, but not for longer than 3 months), “live” (they have lived in the other country for more than 3 months). The Australian participants become slightly better at identifying the Australian variants the more time they have spent in New Zealand, but at the same time become worse at the New Zealand variants as can be seen in Table 4.22. There is no clear pattern among the New Zealand participants.

Table 4.22: Average responses to non-nasal variants in relation to visits to the other country

		A variants	NZ variants
A participants	no	3.78	2.69
	holiday	3.89	2.85
	live	3.93	3.36
NZ participants	no	3.91	2.23
	holiday	4	2.37
	live	3.84	2.28

Participants were also asked how often they watched Australian/New Zealand TV shows. There is an effect among the Australian participants who specified that they "often" watched New Zealand TV shows: They responded with more Australian-like ratings to both the Australian and the New Zealand variants. There is no such media exposure effect with the New Zealand participants as can be seen in Table 4.23.

Table 4.23: Average responses to non-nasal variants in relation to media exposure

		A variants	NZ variants
A participants	never	3.81	2.79
	sometimes	3.81	2.75
	often	4.03	3.53
NZ participants	never	3.98	2.48
	sometimes	3.95	2.21
	often	3.95	2.58

4.3.7 Social class

The social class was assigned to the participants on the basis of their education and job. Participants holding a tertiary degree and working in their profession were labeled "professional". "Non-professionals" had usually gained a secondary school certificate and are employed in the manual trade. The majority of the participants were students. If they studied lingustics, they were only first-year students, with the

exception of an Advanced Phonetics class of 8 students who are labelled as “s-ling” in Table 4.24.

Table 4.24: Average responses to non-nasal variants in relation to social class

		A variants	NZ variants
A participants	non-prof	3.33	2.14
	prof	3.94	3.37
	student	3.77	2.67
	s-ling	3.91	2.63
NZ participants	non-prof	3.95	2.16
	prof	3.85	2.44
	student	3.96	2.35

Within the group of the Australian participants, the non-professionals were better at identifying the New Zealand variants than the professionals who on the other hand were better at categorising the Australian variants. It is interesting, but perhaps not surprising to see that the Advanced Phonetics students on average rated the Australian variants as more Australian-like and the New Zealand variants as more New Zealand-like than the group of general students.

Among the New Zealand participants, the students were best at identifying the Australian variants followed by the non-professionals and the professionals. Just like the Australian non-professionals, the New Zealand non-professtionals were better at categorising the New Zealand variants than the two other social class groups. The professionals on average gave the New Zealand variants less New Zealand-like ratings than the students.

4.3.8 Effects of speaker

In this section, any effects of a specific speaker voice will be reported. Table 4.25 and 4.26 present the average responses of Australian participants in relation to the individual speakers.

Table 4.25: Average responses to non-nasal variants in relation to speakers (A participants on A variants)

speakerID	A variants
m3	4.11
m2	4.08
f2	3.96
m1	3.71
f3	3.61
f1	3.54

The Australian variants of speaker M3 and speaker M2 received the strongest Australian-like ratings by the Australian participants, followed by the Australian variants of speaker F2 and speaker M1. The Australian variants of speakers F3 and F1 were rated least Australian-like.

Looking at the New Zealand variants, speaker F2 and M2 were the ones that Australian participants on average responded to most accurately, followed by speakers F1 and F3. The New Zealand variants of speakers M1 and M3 were least accurately identified by the Australian participants.

Table 4.26: Average responses to non-nasal variants in relation to speakers (A participants on NZ variants)

speakerID	NZ variants
f2	2.21
m2	2.37
f1	2.67
f3	2.9
m1	3.27
m3	3.44

The average responses of New Zealand participants in relation to the individual speakers are reported in Table 4.27 for the Australian variants and in Table 4.28 for the New Zealand variants.

Looking at the Australian variants, the New Zealanders were most accurate with the speakers F2 and F3, unlike the Australian participants who tended to be more accurate with the Australian variants of male speakers. The New Zealand participants rated the speakers M2 and M1 as least Australian-like sounding.

Table 4.27: Average responses to non-nasal variants in relation speakers (NZ participants on A variants)

speakerID	A variants
f2	4.59
f3	4.46
m3	3.9
f1	3.85
m2	3.81
m1	3.17

For the New Zealand variants, New Zealand participants were most accurate with the speakers M2 and M1, followed by speakers F1 and M3. The speakers F2 and F3 were rated least New Zealand-like.

Table 4.28: Average responses to non-nasal variants in relation to speakers (NZ participants on NZ variants)

speakerID	NZ variants
m2	2.03
m1	2.08
f1	2.15
m3	2.42
f2	2.66
f3	2.69

4.4 The nasal variants

The preceding sections all dealt with results concerning the non-nasal data with the exception of a brief discussion of nasal variants in comparison of the cities in section 4.3.5. The following three sections look at how participants responded to the nasal variants of Australian and New Zealand vowels.

4.4.1 Nasality in general

The nasal variants of Australian vowels elicited more Australian-like ratings, from New Zealand as well as Australian participants. The nasal variants of New Zealand vowels, however, caused Australians to rate the speaker as more New Zealand-like, whereas New Zealand participants tended to give these variants a more Australian-like rating as can be seen in Table 4.29 and Figure 4.6. It seems that with the New Zealand vowels nasality enforces stronger ratings of the other accent.

Table 4.29: Average responses in relation to nasality

		A participants	NZ participants
A variants	nasal	4.05	4.22
	non-nasal	3.82	3.93
NZ variants	nasal	2.15	2.87
	non-nasal	2.82	2.33

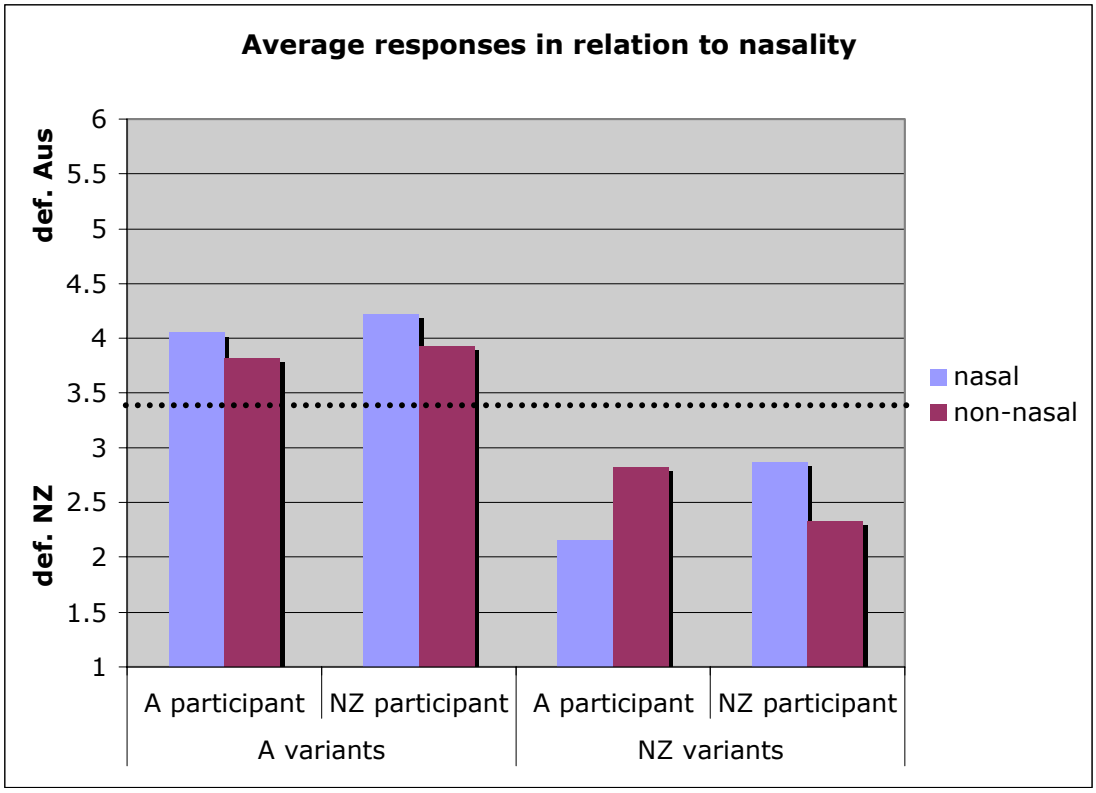

Figure 4.6: Average responses in relation to nasality

The accuracy percentages replicate this pattern. Australian participants were more accurate at identifying the nasal variants of New Zealand vowels as well as Australian vowels than the non-nasal ones of each accent. New Zealanders were more accurate at identifying the nasal variants of Australian vowels than the non-nasal ones. New Zealanders on average responded with more Australian-like ratings to the nasal New Zealand variants than the non-nasal ones and they were also more accurate at identifying the non-nasal variants of New Zealand vowels.

Table 4.30: Accuracy of participants in relation to nasality

	A variants		NZ variants	
	nasal	non-nasal	nasal	non-nasal
A participants	66%	58%	82%	65%
NZ participants	68%	59%	65%	79%

The next two sections look at the effect of nasality in more detail and report how the gender of the speaker (3.2) and the type of vowel (3.3) influences the participants' responses to nasal variants.

4.4.2 Nasality and Gender of the Speaker

Table 4.31 and Figure 4.7 present the average responses of Australian participants in relation to nasality and gender of the speaker.

Table 4.31: Average responses in relation to nasality and gender of the speaker (A participants)

		nasal	non-nasal
A variants	f	4.26	3.69
	m	3.83	3.95
NZ variants	f	1.79	2.6
	m	2.51	3.04

The nasal Australian variants produced by females elicited the most Australian-like ratings. The same pattern holds for the New Zealand variants. New Zealand females received the highest New Zealand-like ratings when producing nasal variants. Males received less extreme ratings than the females, yet were rated more New Zealand-like when the vowel was nasalized.

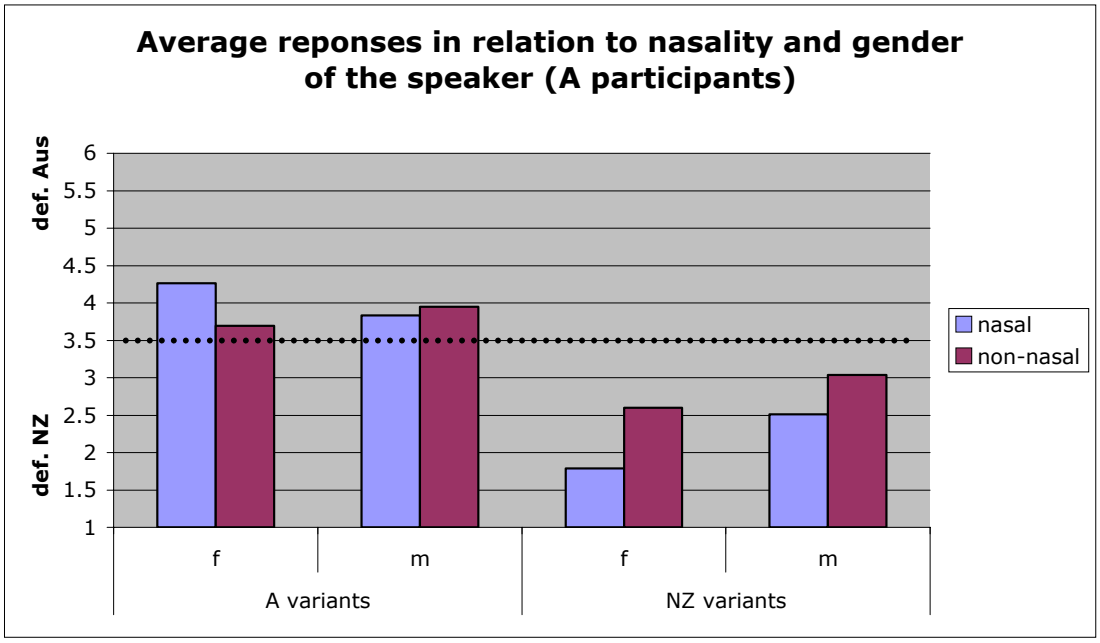

Figure 4.7: Average responses in relation to nasality and gender of the speaker (A participants)

Table 4.32 present the average responses of New Zealand participants in relation to nasality and gender of the speaker. Just like the Australian participants, New Zealanders identified the nasal Australian variants produced by a female as more Australian-like sounding than the male counterparts. But New Zealanders also rated the female nasal New Zealand variant on average as more Australian-like sounding than the male ones.

Table 4.32: Average responses in relation to nasality and gender of the speaker (NZ participants)

		nasal	non-nasal
A variants	f	4.79	4.27
	m	3.65	3.6
NZ variants	f	3.04	2.48
	m	2.69	2.17

Figure 4.8 nicely shows that nasality generally elicited more Australian-like ratings among the New Zealand participants and this effect is stronger for the variants that were produced by female speakers than male speakers.

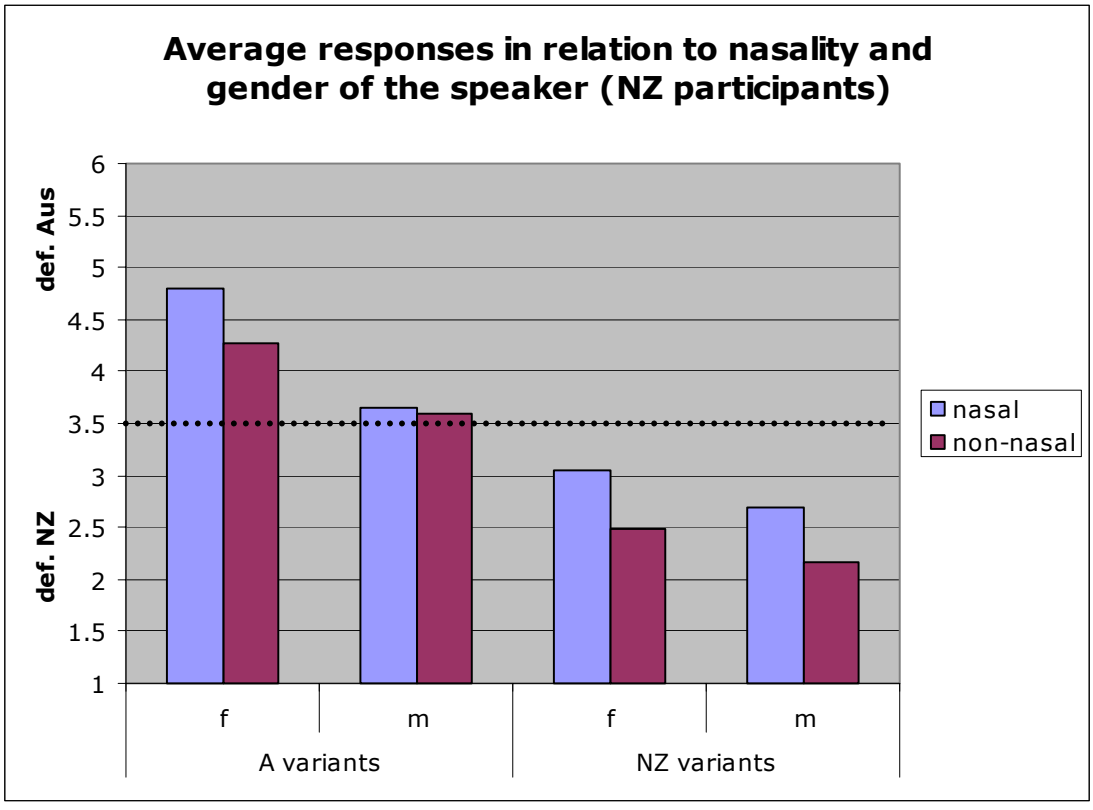

Figure 4.8: Average responses in relation to nasality and gender of the speaker (NZ participants)

4.4.3 Nasality and Vowel Type

This section shows how different types of vowels received different ratings depending on nasality. Table 4.33 present the average responses of Australian participants in relation to nasality and vowel type. Except for the DRESS vowel, all the vowels that had nasal variants were rated more Australian-like when they appeared in the nasal Australian form. Except for the NURSE vowel, all the vowels were rated more New Zealand-like when they appeared in the nasal New Zealand form.

Table 4.33: Average responses in relation to nasality and vowel type (A participants)

		nasal	non-nasal
A variants	DRESS	3.8	4.33
	KIT A	3.9	3.55
	KIT B	3.48	3.06
	NURSE	4.1	3.98
	TRAP	4.95	4.41
NZ variants	DRESS	1.77	3.06
	KIT A	1.25	1.36
	KIT B	1.93	2.01
	NURSE	3.72	3.58
	TRAP	2.08	2.72

As can be seen in Figure 4.8, the effect on the New Zealand variant of NURSE is rather minimal, yet the nasal variants were both rated more Australian-like than the non-nasal ones. The average responses on the Australian and New Zealand variant of the DRESS vowel are even more intriguing. The nasal variant of DRESS was rated more New Zealand-like than the non-nasal variant, irrespective of whether it was realized in a typically New Zealand or Australian fashion. The results of the DRESS vowel will be taken up again below and explored in more detail.

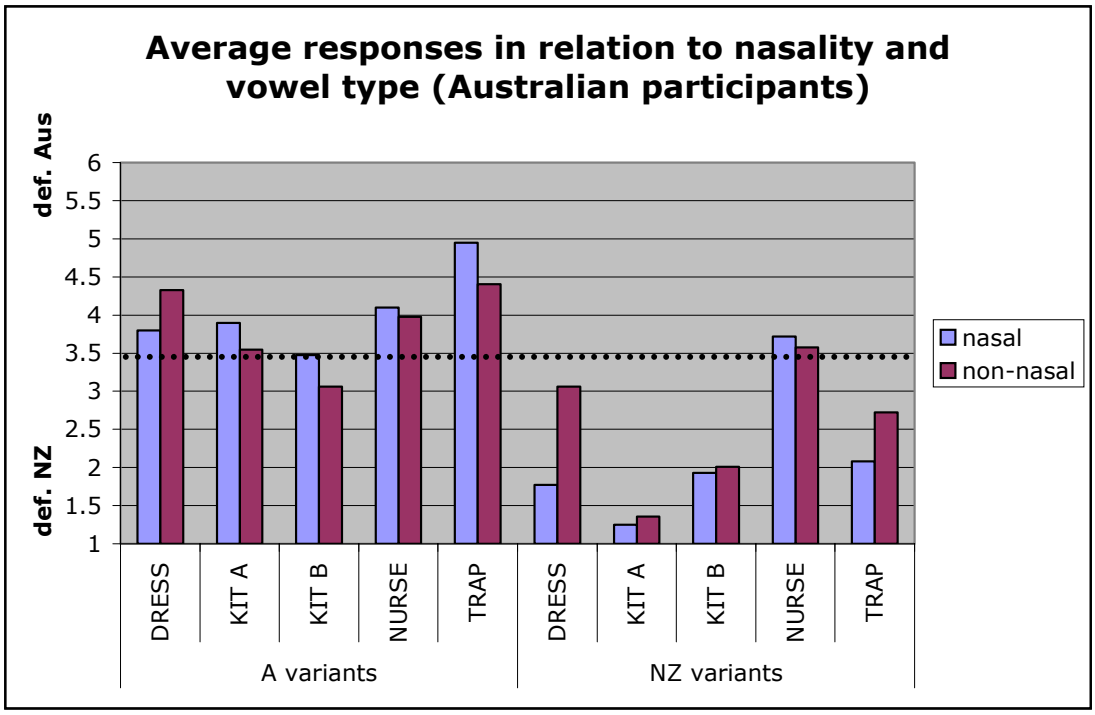

Figure 4.8: Average responses in relation to nasality and vowel type (A participants)

Table 4.34 presents the average responses of the New Zealand participants in relation to nasality and vowel type. All the Australian vowels received more Australian-like ratings when they appeared in their nasal form, although this effect was stronger for the DRESS and NURSE vowels. Except for KIT B, this effect is also present for the New Zealand variants of the vowels which were all rated more Australian-like in their nasal form.

Table 4.34: Average responses in relation to nasality and vowel type (NZ participants)

		nasal	non-nasal
A variants	DRESS	4.23	3.18
	KIT A	5.08	5.06
	KIT B	4.08	3.5
	NURSE	3.88	2.76
	TRAP	3.85	3.5
NZ variants	DRESS	4.03	2.59
	KIT A	2.23	1.7
	KIT B	1.68	1.94

	NURSE	3.33	2.73
	TRAP	3.08	2.55

Figure 4.9 illustrates these tendencies. Contrary to the Australian participants, the New Zealanders rated the nasal variants of the DRESS vowel as more Australian-like sounding than the non-nasal variants of DRESS irrespective of whether it was realized in a typically Australian or New Zealand fashion. The same is true for the NURSE and the TRAP vowels the nasal variants of which were generally perceived as more Australian-like than the non-nasal counterparts.

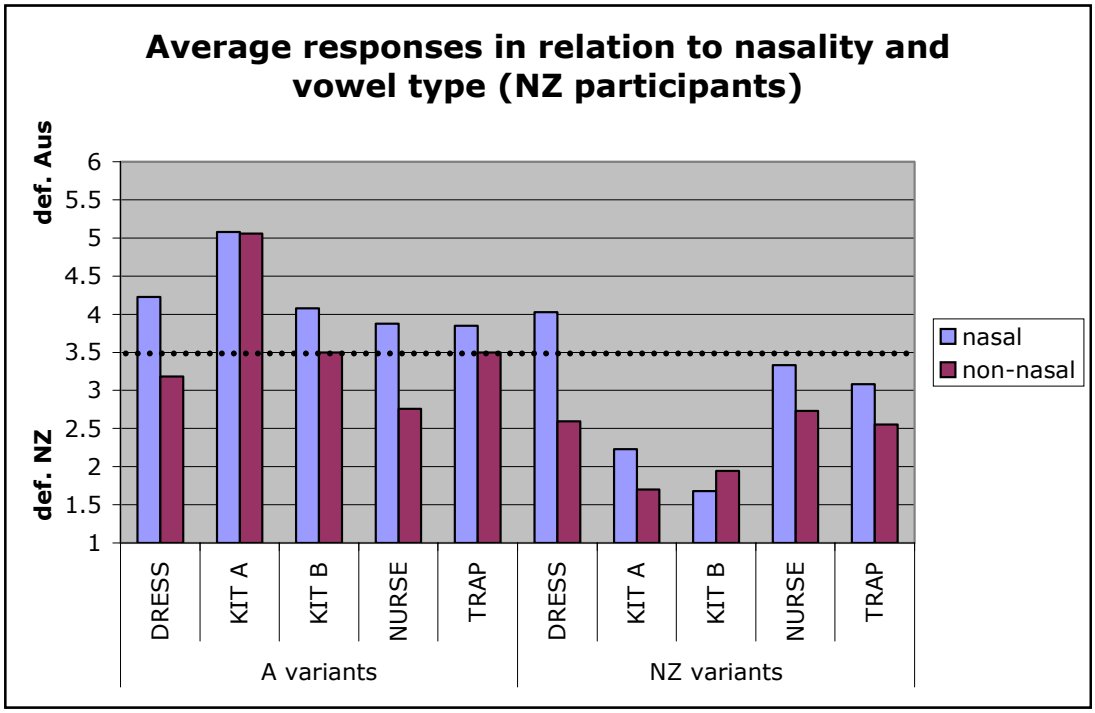

Figure 4.9: Average responses in relation to nasality and vowel type (NZ participants)

Since there were quite strong effects with the DRESS vowel, the results will be presented in more detail in the following. Table 4.35 lists the average responses to the DRESS vowel in relation to nasality and variant.

Table 4.35: Average responses to the DRESS vowel in relation to nasality and variant

		A participants	NZ participants
nasal	A variants	3.8	4.23
	NZ variants	1.77	4.03
non-nasal	A variants	4.33	3.18
	NZ variants	3.06	2.59

Figure 4.10 illustrates the difference in response between the New Zealand and Australian participant groups. For the New Zealand participants nasality was a decisive factor: Both New Zealand and Australian variants of the DRESS vowel on average elicited more Australian-like ratings when nasalized while the non-nasal versions were rated more New Zealand-like.

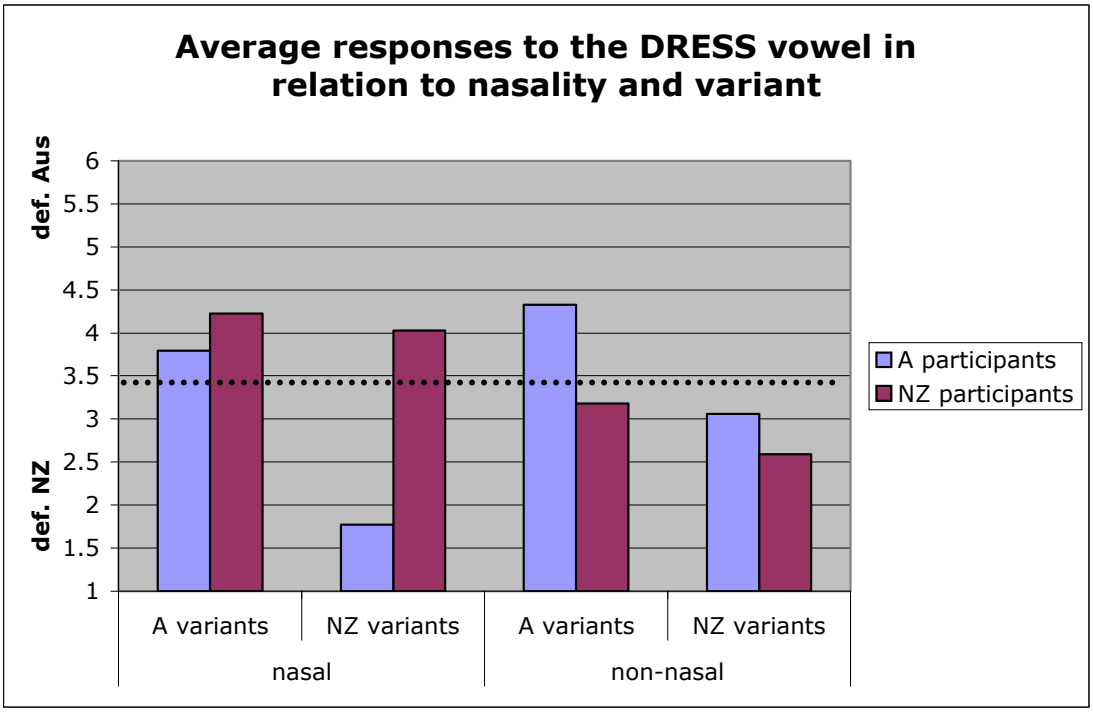

Figure 4.10: Average responses to the DRESS vowel in relation to nasality and variant

For the Australian participants nasality did not play as much a role as the type of variant did. The Australian versions of the DRESS vowel, whether nasal or non-nasal, elicited more Australian-like ratings while the New Zealand ones were rated more New Zealand-like.

4.5 Comments of participants

In the questionnaire prior to the experiment participants were asked to state what they thought were typical features of Australian English and New Zealand English. The answers were quite diverse, ranging from comments on differences in the lexical part of the accents, e.g. slang words to the way the other accent was perceived socially ("annoying woman voices" as a feature of Australian English). However, most of the responses focussed on differences in pronunciation. The responses were coded on the basis of the following characteristics: their mention of differences in vowel pronunciation in general, of differences in specific vowel sounds and of stereotypical words like the fish and chips shibboleth. Furthermore, I investigated how often nasality was mentioned as a feature of Australian or New Zealand English. The resulting percentages are presented in Table 4.36.

Table 4.36: Responses of A and NZ participants on features of A/NZ English

Mention of	vowels in general	KIT vowel	TRAP vowel	DRESS vowel	SCHOOL vowel	"fish and chips"
A participants	82%	40%	10%	8%	0%	15%
NZ participants	60%	25%	10%	5%	10%	5%

Participants in general had a good understanding of the broad differences between the two accents. 81.6% of the Australian and 60% of the New Zealand participants mentioned vowel differences. Forty percent of the Australians and 25% of the New Zealanders put it down more specifically to the KIT vowel, followed by TRAP, DRESS and SCHOOL (only for the New Zealanders). Out of all the words that participants noted down to exemplify the difference between the two accents, "fish and chips" was the phrase that was most often quoted, 15% of the Australian participants mentioned it as well as 5% of the New Zealand participants. Two other vowel sounds were mentioned: one New Zealand participant noted down " 'o' in do" as a feature of Australian English as well as one Australian participants who mentioned "broad, rounder vowels ('o' in particular)". Furthermore, one Australian

participant put down “here/hair” as a feature of New Zealand English, probably referring to the NEAR SQUARE merger.

Nasality was more often mentioned by New Zealand participants as can be seen in Table 4.37. The 5% of New Zealand participants that assigned nasality to New Zealand English, at the same time put down nasality as a characteristic of Australian English, hence mentioned nasality for both New Zealand and Australian English.

Table 4.37: Mention of nasality as a feature of A/NZ English

Mention of nasality as a feature of..	A English	NZ English
A participants	10%	5%
NZ participants	18%	5%

After having done the experiment, participants were asked to state if they had changed their opinion about the features of the other respective accent. Table 4.38 presents the responses of both participant groups. The majority of the participants indicated that they had not changed their opinion.

Table 4.38: Responses of A/NZ participants after the experiment

changed opinion?	yes	no	-
A participants	47%	43%	10%
NZ participants	35%	60%	5%

Most of the participants that stated that they had changed their opinion noted down that the task was harder than they realized, especially if they had to base their judgments on just one word and that the two accents are indeed quite similar. Participants also thought that they had more of an idea what the other accent was like after having done the experiment, usually they were aware of more vowel differences. One New Zealand participant wrote that he realized that Australians can sound more nasal, another one remarked that vowels in Australian English ‘seem stretched’ compared to New Zealand English. Some Australian participants also commented on Australian English having more ‘elongated vowels’. One Australian participant also claimed to find it easier to detect the identity of the female voices than the male ones.

4.6 General informal comments of participants

In an informal manner after the experiment participants were asked about impressions they had of the task. Two participants, one New Zealander who had lived in Australia for a couple of years and one Australian living in New Zealand, remarked that some of the speakers were New Zealanders imitating Australians, or people putting on nasal Australian accents respectively. They mostly marked them as New Zealanders. A few subjects picked up on the fact that there were only a couple of speakers and they recognized the same speaker at times.

A majority of participants pointed out that they would usually base their judgment of the speakers on the principle of excludability. If a stimuli sounded 'strange' or 'munted', they would usually mark the speaker as coming from the other country. Also, some participants said that having the words written down helped them in so far as they would imagine how a New Zealander/Australian (from their circle of friends for example) would pronounce it and then compare their expectation to the actual production that they listened to. One participant thought to have recognized Asian, Scots, or Indian speakers, another noticed different Australian accents.

People also made comments about the gender of the speakers. A few participants stated that the gender of the speaker would influence their ratings, with one male New Zealander claiming that the female speakers sounded more Australian. One Australian subject also commented on a difference in vowel length between New Zealand and Australian English: He would have expected the Australian variants to be longer (Australians drag the words out), and felt they were clipped out/cut short in the experiment.

4.7 Summary

The main trends in the raw data are as follows. While New Zealand participants were slightly more accurate at the task, both participant groups performed better at identifying the New Zealand variants. The participants' confidence was not

particularly high. The average responses ranged from 2.6 to 3.89 on a given scale from 1 to 6.

Interestingly, the participants' responses depended on the gender of the speaker. Australians rated female speakers more New Zealand-like and male speakers more Australian-like. New Zealanders, on the other hand, perceived female speakers as more Australian sounding and male speakers as more New Zealand sounding.

In terms of lexical effects, a trend among the New Zealanders was observed. They responded with the strongest ratings to stereotypical words, followed by frequent and non-frequent words. The Australian participants did not make this distinction.

Furthermore, the type of vowel influenced the listeners' responses. Most interestingly, there was an asymmetry concerning the vowels that helped listeners to identify the New Zealand variants compared to the Australian variants. The DANCE and the TRAP vowel were the crucial factors in vowel type for the Australian participants to identify other Australians while the KIT and the SQUARE vowel helped them most to identify New Zealanders. The KIT and SCHOOL vowels were least helpful to identify other Australians and the New Zealand NURSE and SCHOOL vowels received the least New Zealand-like ratings by the Australians.

The KIT and the DANCE vowel seem to be most helpful for New Zealanders to identify other New Zealanders, whereas NURSE and SQUARE serve least as a cue. The Australian SCHOOL vowel facilitated the most Australian-like ratings, while the DRESS and NURSE vowels help the New Zealand participants least in trying to identify a speaker from Australia.

An effect was found among the Australian participants concerning the city that they live in. Australians in Christchurch were better at identifying Australians correctly than Australians were in Sydney and Melbourne. Yet, they were worse at identifying New Zealanders than other Australians from Sydney and Melbourne.

The degree of exposure to an accent by visits to the other country and through the media affected listeners in the perception of the two accents. The Australian participants become slightly better at identifying the Australian variants the more time they have spent in New Zealand, but at the same time become worse at identifying the New Zealand variants. In addition, Australians who "often" watch New Zealand TV shows responded with more Australian-like ratings to both the Australian and the

New Zealand variants. No such effects were observed among the New Zealand participants.

As for social class, the main trends in the raw data were the following. The non-professional Australians were better at identifying the New Zealand variants than the professionals who on the other hand were better at categorising the Australian variants. As expected, the Australian students with the advanced phonetics background performed better than the group of general students. Among the New Zealanders, the students performed best on the Australian variants while the non-professionals on average were best at identifying New Zealand speakers.

Lastly, nasality proved to affect participants in this perceptual task. Nasalized variants of Australian vowels lead both participant groups to rate a speaker as more Australian-like. With the New Zealand variants, however, nasality seemed to enforce stronger ratings of the other accent. That is, New Zealanders rated a New Zealand speaker as sound more Australian if the variants were nasalized while nasal New Zealand vowels facilitated more New Zealand-like responses from the Australian participants.

Chapter 5 - Results - Statistics

5.1 Introduction

This chapter subjects the data to a statistical analysis, in order to assess the degree to which the observed trends are significant.

5.2 Overall results

For the statistical analysis, a linear regression model was fitted to the entire data set by hand. This was done using the R statistical programming language with the Design and Hmisc libraries. The following factors were taken into account as potential predictors:

(1) Information about the stimuli: what kind of variant it is (Australian or New Zealand), what vowel type the stimuli included (variable), whether the variant is nasal or non-nasal, whether it was produced by a female or a male, the lexical characteristics of the word (non-frequent, frequent, stereotypical).

(2) Information about the participants: where the participant is from (Australia or New Zealand, labeled 'participantID'), the city the participant lives in (Christchurch, Sydney, Melbourne) whether the participant is female or male, the age and social class of the participant, the degree to which the participant has been exposed to the other accent (by media and visits to the other country).

(3) Information about the experiment conditions: whether the stimuli occurred in group A or B, how far through the experiment the stimuli is presented.

Table 5.1: Overall model: Wald statistics for predicting response

	d.f.	*F*	*P*
variable (Factor+Higher Order Factors)	28	82.55	<.0001
All Interactions	21	85.97	<.0001
participantID (Factor+Higher Order Factors)	23	61.48	<.0001
All Interactions	22	63.7	<.0001
variant (Factor+Higher Order Factors)	22	160.04	<.0001
All Interactions	21	81.33	<.0001
gender (Factor+Higher Order Factors)	2	14.84	<.0001
All Interactions	1	29.62	<.0001
nasality (Factor+Higher Order Factors)	3	23.67	<.0001
All Interactions	2	28.01	<.0001
type (Factor+Higher Order Factors)	8	8.19	<.0001
All Interactions	6	6.44	<.0001
participant gender (Factor+Higher Order Factors)	2	4.73	0.0089
All Interactions	1	8.17	0.0043
age (Factor+Higher Order Factors)	2	29.87	<.0001
All Interactions	1	52.39	<.0001
social class	2	6.17	0.0021
tv exposure	1	4.33	0.0375
variable * participantID (Factor+Higher Order Factors)	14	79.85	<.0001
variable * variant (Factor+Higher Order Factors)	14	104.2	<.0001
participantID * variant (Factor+Higher Order Factors)	10	94.16	<.0001
variant * gender (Factor+Higher Order Factors)	1	29.62	<.0001
variant * nasality (Factor+Higher Order Factors)	1	15.19	0.0001
variant * type (Factor+Higher Order Factors)	4	8.76	<.0001
participantID * type (Factor+Higher Order Factors)	4	4.31	0.0017
participantID * participant gender (Factor+Higher Order Factors)	1	8.17	0.0043
participantID * nasality (Factor+Higher Order Factors)	1	40.83	<.0001
participantID * age (Factor+Higher Order Factors)	1	52.39	<.0001
variable * participantID * variant (Factor+Higher Order Factors)	7	110.2	<.0001
participantID * variant * type (Factor+Higher Order Factors)	2	6.83	0.0011
Total interaction	33	65.66	<.0001
Regression	51	90.02	<.0001

In fitting the model, non-significant factors were removed. A large number of potential two-way and three-way interactions between the above named factors were tested for. As can be seen from the ANOVA table (Table 5.1), nearly all of the factors

turned out to be highly significant. At 51, the degree of freedom of the overall model is reasonably high, but still acceptable for the amount of data considered. Every participant provided a total of 106 responses which amounts to a total of 10600 responses included in the model. The model coefficients of the overall fitted model are presented in Table 5.2.

Table 5.2: Model coefficients for the overall fitted model

		P
Intercept	4.465069	<.0001
variable=dress	-0.251552	0.0201
variable=kit a	-0.908695	<.0001
variable=kit b	-1.388585	<.0001
variable=nurse	-0.468142	<.0001
variable=school	-2.034439	<.0001
variable=square	-0.168116	0.1566
variable=trap	0.033983	0.7673
participantID=NZ p	1.495874	<.0001
variant=NZ v	-1.944029	<.0001
gender=m	-0.171285	<.0001
nasality=non	-0.137191	0.1181
type=non	0.067334	0.2713
type=stereo	0.20432	0.0136
participant gender=m	-0.049987	0.274
age	0.01098	0.0005
social.class=prof	0.156057	0.013
social.class=student	-0.004321	0.9445
tv exposure=sometimes	-0.133183	0.0375
variable=dress * participantID=NZ p	-1.168059	<.0001
variable=kit a * participantID=NZ p	1.224798	<.0001
variable=kit b * participantID=NZ p	0.222604	0.2092
variable=nurse * participantID=NZ p	-1.236286	<.0001
variable=school * participantID=NZ p	2.667773	<.0001
variable=square * participantID=NZ p	-0.811844	<.0001
variable=trap * participantID=NZ p	-1.091864	<.0001
variable=dress * variant=NZ v	-0.043076	0.786
variable=kit a * variant=NZ v	-0.916885	<.0001
variable=kit b * variant=NZ v	0.20718	0.1916
variable=nurse * variant=NZ v	0.950983	<.0001
variable=school * variant=NZ v	3.246005	<.0001

variable=square * variant=NZ v	-0.817743	<.0001
variable=trap * variant=NZ v	-0.531838	0.0011
participantID=NZ p * variant=NZ v	-1.392062	<.0001
variant=NZ v * gender=m	0.328786	<.0001
variant=NZ v * nasality=non	0.418989	<.0001
variant=NZ v * type=non	0.162336	0.0608
variant=NZ v * type=stereo	0.094605	0.4181
participantID=NZ p * type=non	-0.256832	0.008
participantID=NZ p* type=stereo	0.154278	0.2369
participantID=NZ p* participant gender=m	0.192949	0.0043
participantID=NZ p* nasality=non	-0.701201	<.0001
participantID=NZ p* age	-0.027128	<.0001
variable=dress * participantID=NZ p* variant=NZ v	2.266374	<.0001
variable=kit a * participantID=NZ p* variant=NZ v	0.379469	0.1287
variable=kit b * participantID=NZ p* variant=NZ v	0.865999	0.0005
variable=nurse * participantID=NZ p* variant=NZ v	1.560227	<.0001
variable=school * participantID=NZ p* variant=NZ v	-3.421005	<.0001
variable=square * participantID=NZ p* variant=NZ v	2.622079	<.0001
variable=trap * participantID=NZ p* variant=NZ v	2.192812	<.0001
participantID=NZ p * variant=NZ v* type=non	0.254894	0.0626
participantID=NZ p* variant=NZ v* type=stereo	-0.416209	0.0233

Various interactions occurred between factors concerning the participants and factors regarding the stimuli. Effects regarding the experiment conditions, such as where in the experiment and in which group the stimuli appeared, proved not to be significant.

In the following, the significant effects will be discussed in greater detail, beginning with the discussion of individual factors followed by the discussion of interactions between factors.

5.3 Individual Factors

The social class of the participant and the degree to which a participant has been exposed to the other accent through television proved to be individual significant

factors in predicting whether a participant rated a word as more Australian-like or more New Zealand-like.

In Figure 5.1 social class is divided into "n" (non-professionals), "p" (professionals) and "s" (students). The students from an Advanced Phonetics class (previously labeled "s-ling") did not give significantly different responses from the general students so their data was collapsed together with 'students' to simplify the model. Professionals were more likely to give more Australian ratings than participants from the other two groups. The dashed lines represent 95% confidence intervals.

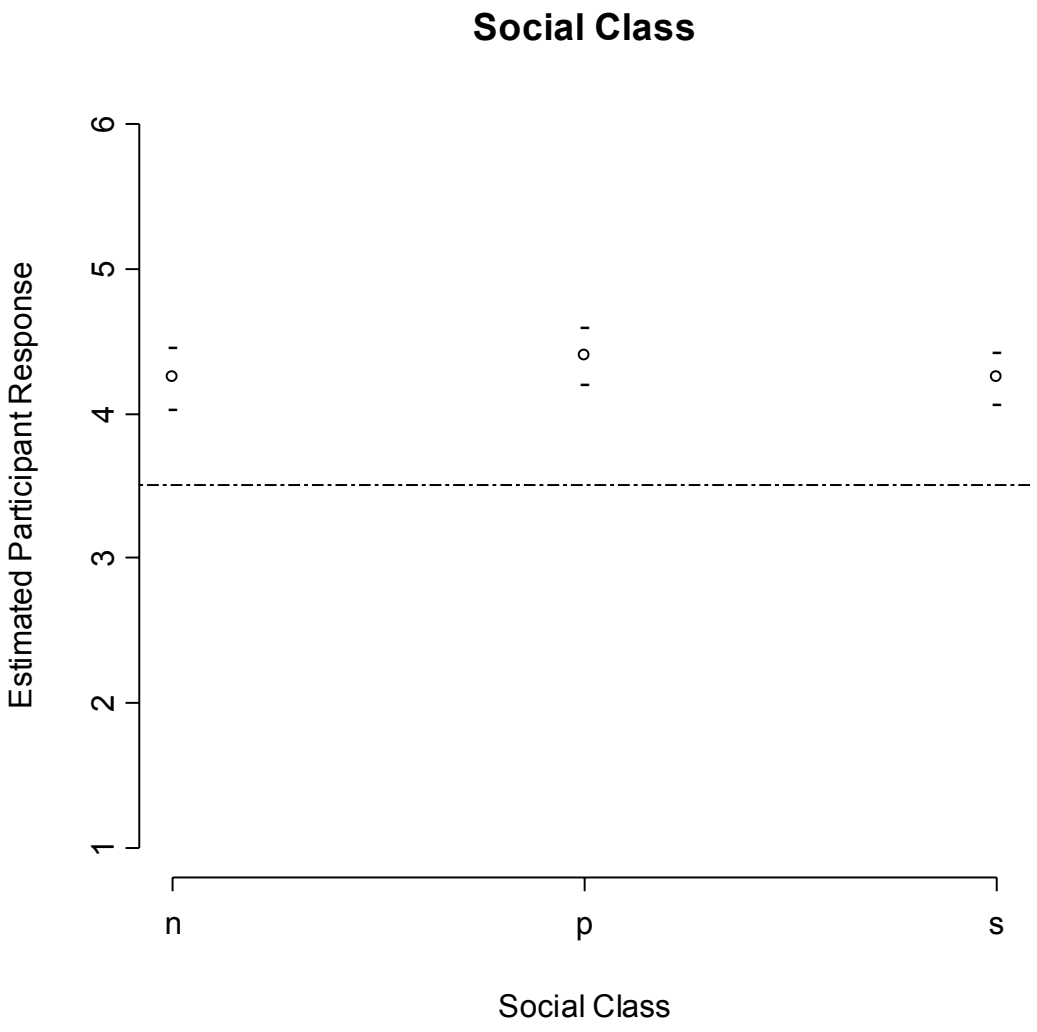

Figure 5.1: Response predicted by the model, as a function of social class (Lines showing confidence intervals)

The line at the 3.5 point indicates the threshold between the New Zealand and the Australian label range and will be plotted in all of the following graphs. However, it is important to note that these graphs do not actually represent the absolute values since all other coefficients are held constant at their most frequent, mean or alphabetically first factors, e.g. this graph sets the coefficients to variant = Australian, so the fact that the three factors appear above the 3.5 line reflects this fact, not a general bias towards responding at the more Australian end of the scale. What is important is that the professional responses are *more* Australian.

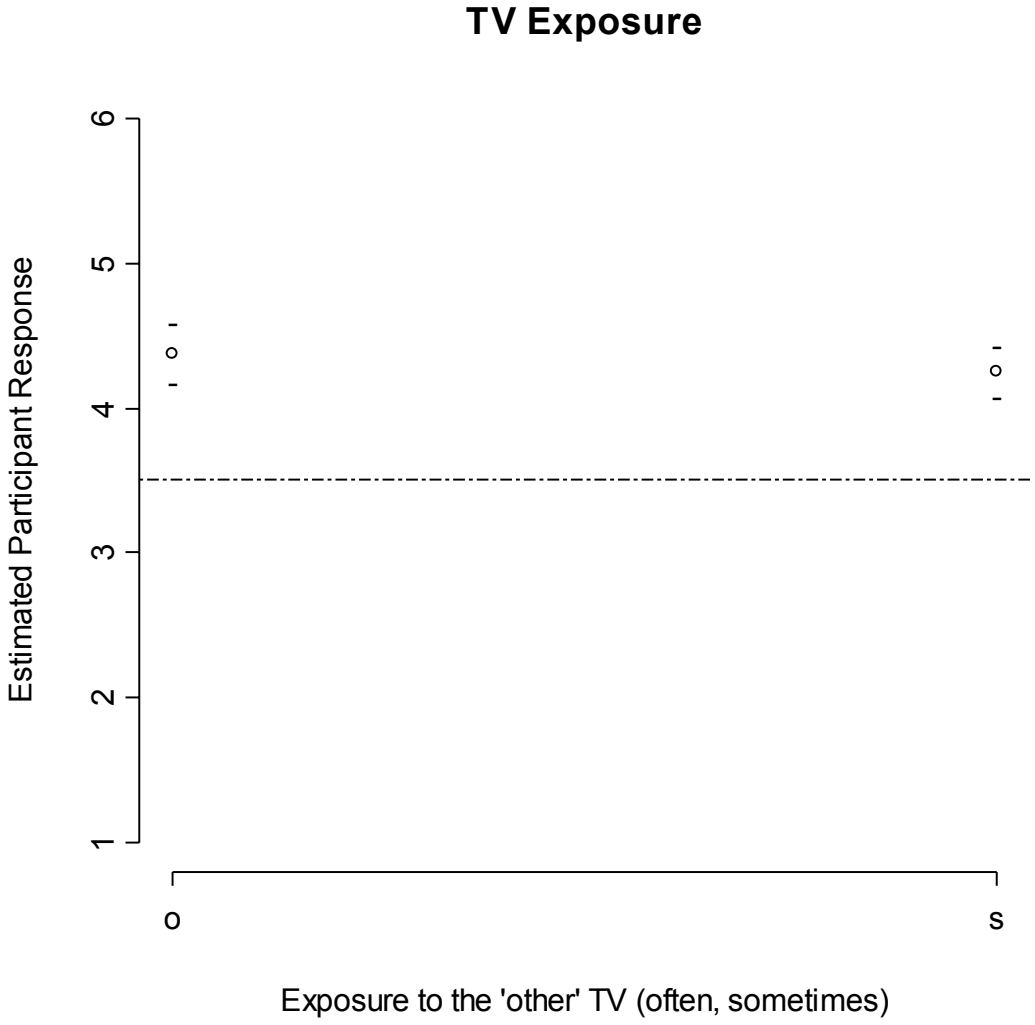

Figure 5.2: Response predicted by the model, as a function of TV exposure (Lines showing confidence intervals)

Furthermore, the degree to which a participant has been exposed to the other accent by the media has an effect on the response as can be seen in Figure 5.2.

Participants who “often” watch television programs from the other country tend to identify the stimuli as more Australian-like than participants who only “sometimes” or “never” watch TV programs in the other accent. The difference between people who “sometimes” watch TV and ones who “never” watch TV proved to be not significant, hence their data was collapsed under the label “sometimes”.

5.4 Two-way Interactions between Factors

Many interactions between the various factors proved highly significant with p-values <.0001. The factor of whether a word appears in its New Zealand or Australian variant interacts with the sex of the speaker, shown in Figure 5.3. The difference in ratings between the New Zealand and Australian ratings is greater for the female speakers than the male speakers suggesting that it is easier to distinguish between female speakers of New Zealand English and Australian English.

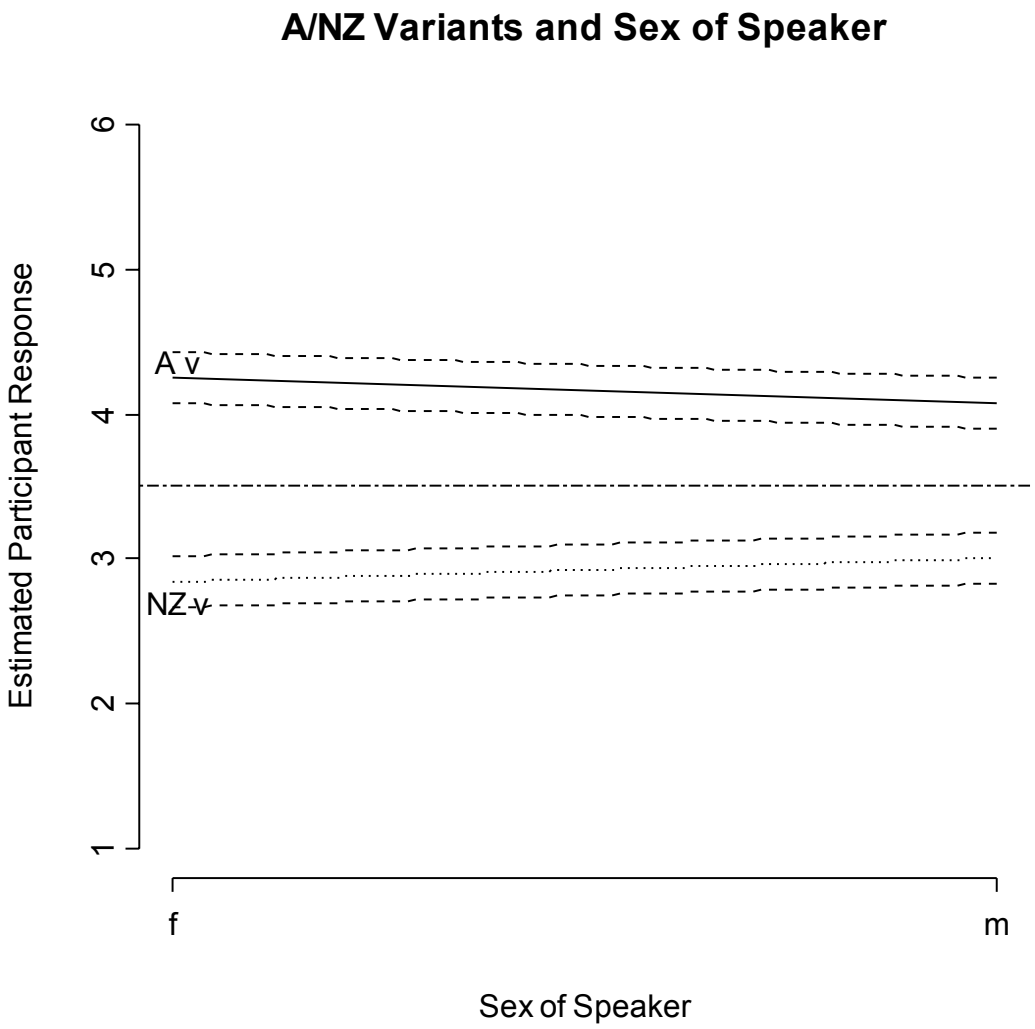

Figure 5.3: Response predicted by the model, as a function of variant and sex of the speaker (Dashed lines show confidence intervals)

The relationship between the type of variant and the nasality of the stimuli being nasal or non-nasal is illustrated in Figure 5.4. Nasal variants of an accent were more likely to be identified as that particular accent than the non-nasal variants. That is, New Zealand nasal variants received more NZ-like ratings than the non-nasal counterparts and Australian nasal variants received more Australian-like ratings than the non-nasal ones. This effect is stronger for the New Zealand variants. Nasality might have the effect of reinforcing the particular accent: The more nasal the variant is, the more distinguished the vowels are.

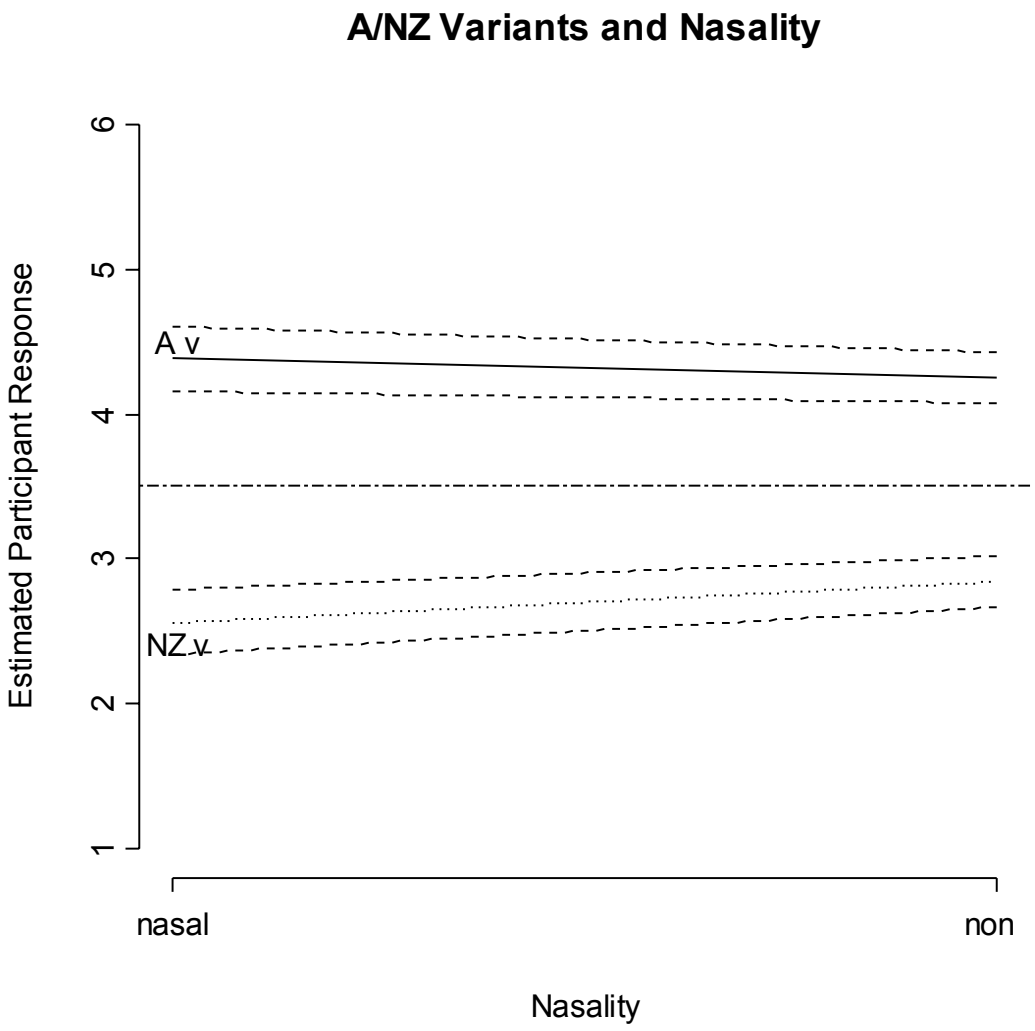

Figure 5.4: Response predicted by the model, as a function of variant and nasality (Dashed lines show confidence intervals)

Figure 5.5 shows the interaction for the two participant groups and the sex of the participant. The general tendency of both participant groups is to classify the speakers as coming from their own country. Female New Zealand as well as Australian participants, however, were increasingly more likely to rate the speakers as belonging to their own accent group than the males who were more likely to classify the speakers as coming from the other country.

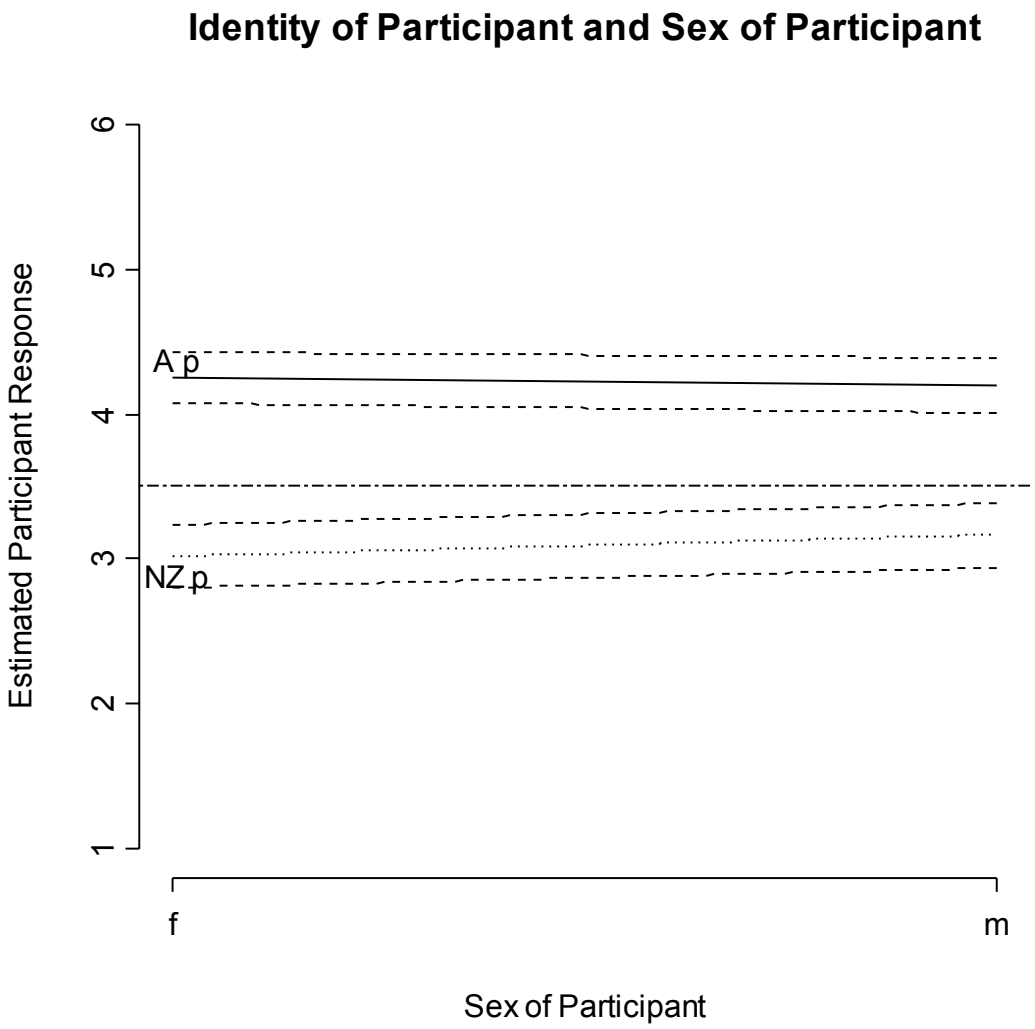

Figure 5.5: Response predicted by the model, as a function of participantID and sex of the participant (Dashed lines show confidence intervals)

Figure 5.6 illustrates the relationship between identity of the participant and nasality of the stimuli word. Generally, both groups, New Zealanders and Australians, are more likely to classify a nasal variant of a word as more Australian-like than a non-nasal version of a word, however this effect is considerably stronger for the New Zealand participants. The Australian participants do not seem to pay attention to nasality as much as the participants from New Zealand do.

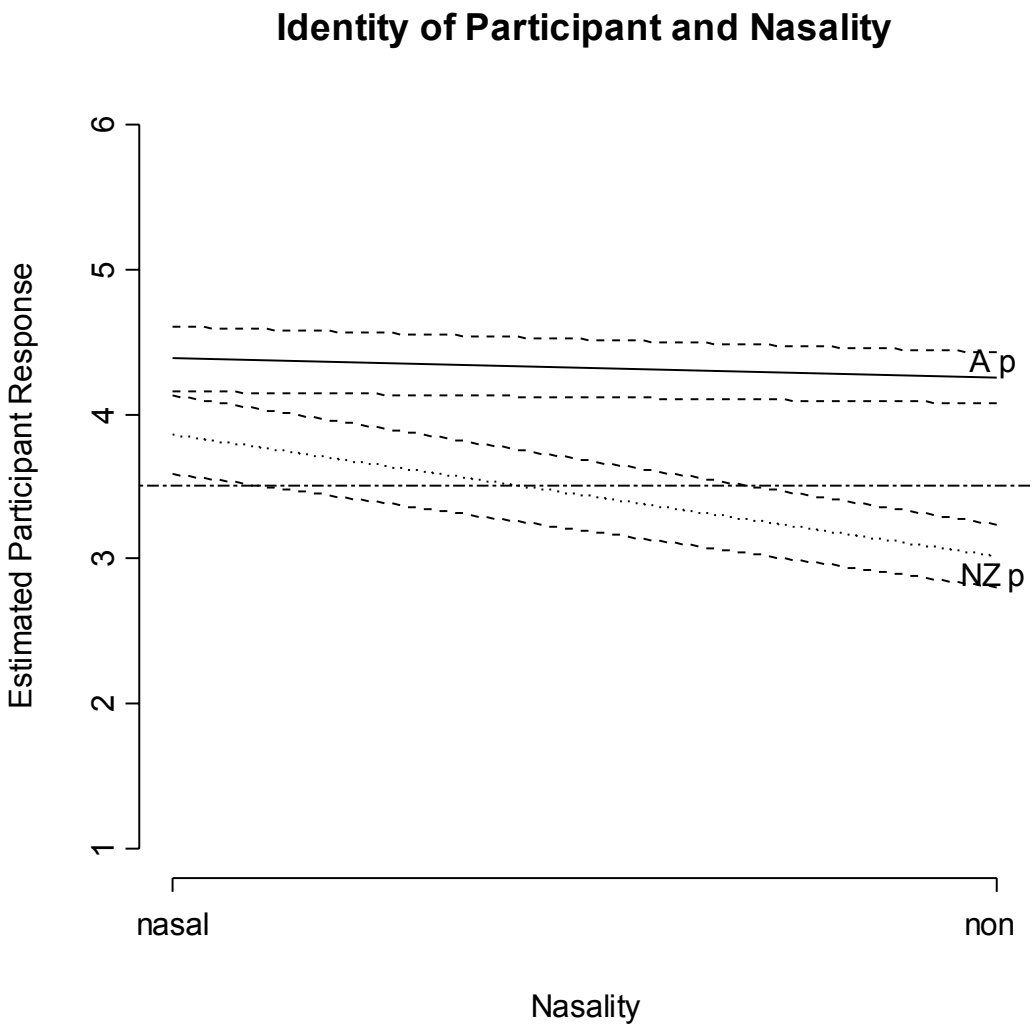

Figure 5.6: Response predicted by the model, as a function of participantID and nasality (Dashed lines show confidence intervals)

The factor of identity of the speaker appears in another interaction with the factor of age of the participant, as can be seen in Figure 5.7. The older a participant is the more he or she tends to identify a stimuli as belonging to his or her own accent. That is, older Australian participants are more likely to give more Australian-like ratings, older New Zealand participants tend to identify words as more New Zealand-like. The younger a participant is the more likely he or she is to classify words as exemplifying the other accent.

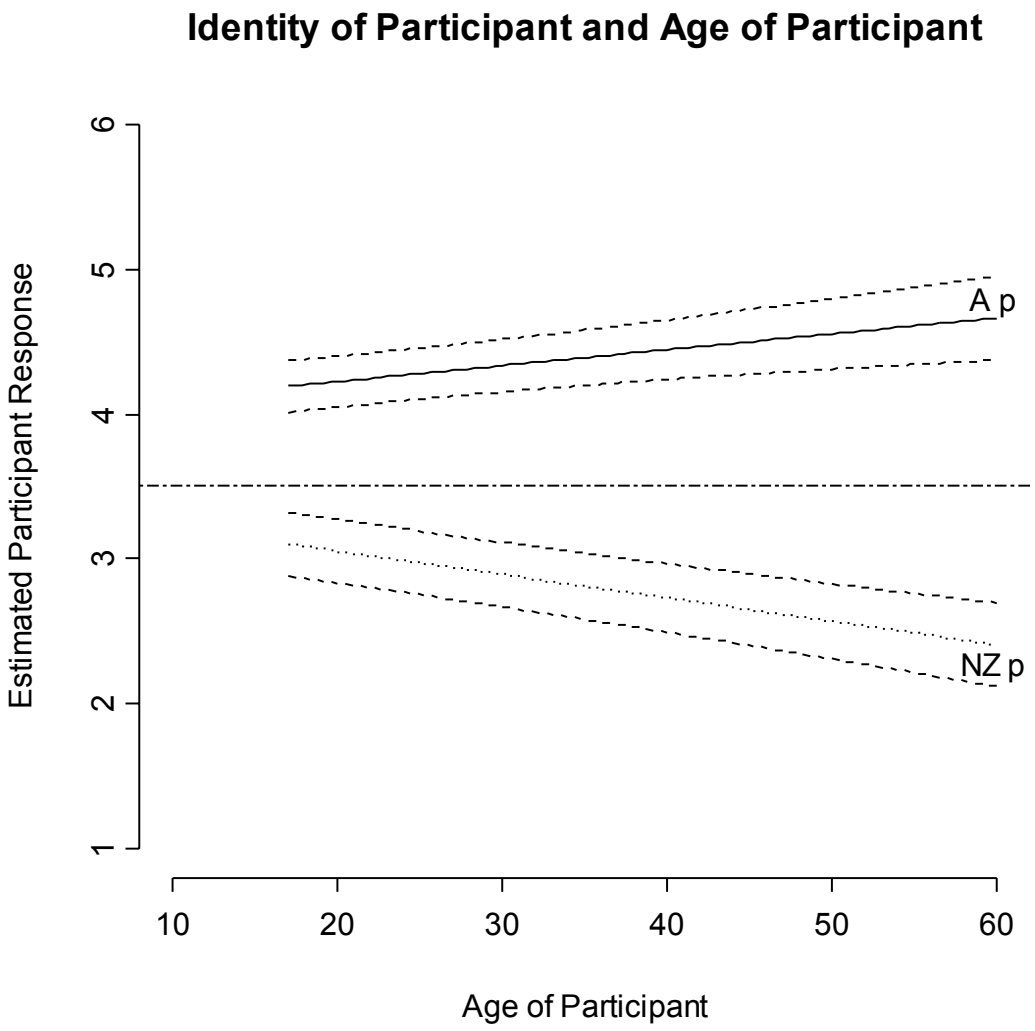

Figure 5.7: Response predicted by the model, as a function of participantID and age of participant (Dashed lines show confidence intervals)

5.5 Three-way Interactions between Factors

Two three-way interactions were found that turned out to be highly significant. Figure 5.8 shows how the vowel type, the type of variant and the identity of the participant interact. For clarity, the confidence intervals have been omitted in the graphs displaying the three-way interactions.

In the case of the New Zealand variants, nearly all of the vowels tended to be given a more New Zealand-like rating. NZ-NURSE and NZ-SCHOOL were more

likely to be given an Australian-like rating by the Australian participants. These two vowels also display the greatest differences in ratings between the two participant groups. The NZ-SCHOOL vowel tended to be identified as more Australian by the Australian participants in contrast to the New Zealanders who classified it as more New Zealand sounding. The same is true for the NZ-NURSE vowel. The difference was also considerably large for the NZ-DANCE vowel, which helped New Zealanders more in the task than the Australian participants. NZ-KIT A and NZ-SQUARE were both vowels that Australian participants were more likely to rate as more New Zealand-like than the New Zealand participants, yet the difference in ratings is not as great as for the other vowels. For NZ-DRESS, NZ-KIT B and NZ-TRAP, there was hardly any difference in rating at all between the two participant groups: they tended to be identified as more New Zealand-like by both groups.

The Australian variants tended to elicit greater differences in responses among the two participant groups. Just as with the New Zealand variants, the Australian vowel that the two participant groups disagreed most about seems to be the SCHOOL vowel. New Zealanders were more likely to identify A-SCHOOL as Australian than the Australian participants who tended to perceive the vowel as a New Zealand variant. The same is true for A-KIT A. The A-DRESS, A-NURSE, A-SQUARE and A-TRAP vowels all display the opposite pattern in that they are more likely to be accurately identified by the Australian participants than the New Zealand participants. Hardly any difference in response between the two groups can be observed for the A-DANCE and A-KIT B vowels.

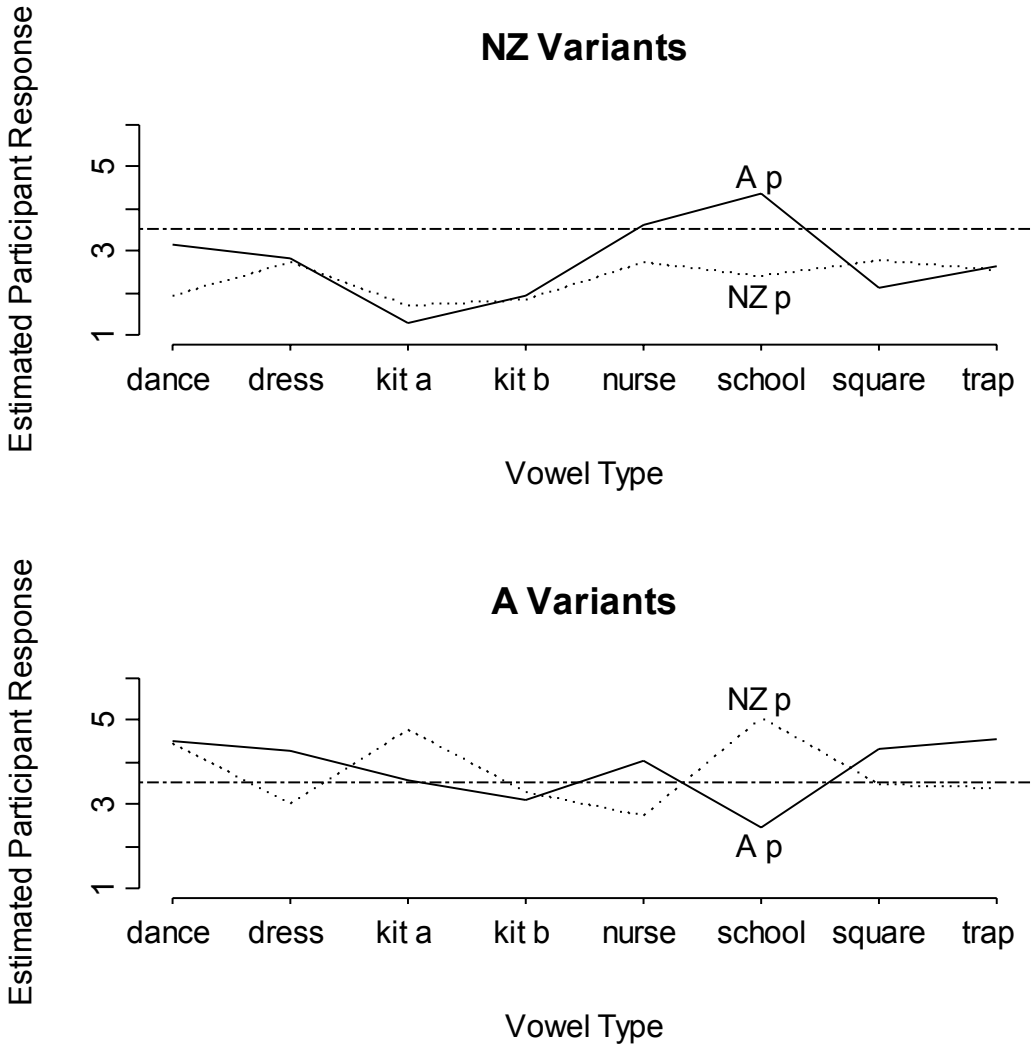

Figure 5.8: Response predicted by the model, as a function of variant, vowel type and participantID (version 1)

For clarification of the results, figure 5.9 displays the same interaction, but instead of the variants plots the participant groups in separate graphs. New Zealand participants tended to respond to the vowels in the different realizations in the way it was expected. The Australian variants were all more likely to be identified as more Australian sounding than the New Zealand variants by the New Zealand participants. This pattern had a different degree for each vowel type, as noted before. The KIT A, SCHOOL and DANCE vowels tended to elicit the most distinguished responses in their Australian and New Zealand realizations, followed by KIT B, TRAP and SQUARE. That is, KIT A, SCHOOL and DANCE served as the most reliable cues to New Zealanders in trying to tell apart the two accents. For the DRESS and the NURSE

vowels there was a minimal difference in response between the two variants suggesting that they helped New Zealanders least in the task.

The Australian participants, on the other hand, also responded to the vowels in their different realization in the expected way, except for the SCHOOL vowel. A-SCHOOL tended to be identified as more New Zealand-like and NZ-SCHOOL tended to be classified as more Australian-like. Apart from that, the KIT A, SQUARE and TRAP vowels tended to elicit the most distinguished responses in their respective realizations, followed by DANCE, DRESS and KIT B. For the NURSE vowel the difference in response between the two realizations is minimal suggesting that it helped the Australians least in the task. The vowels that served as most reliable cues for the Australian participants were KIT A, SQUARE and TRAP, followed by DANCE, DRESS and KIT B.

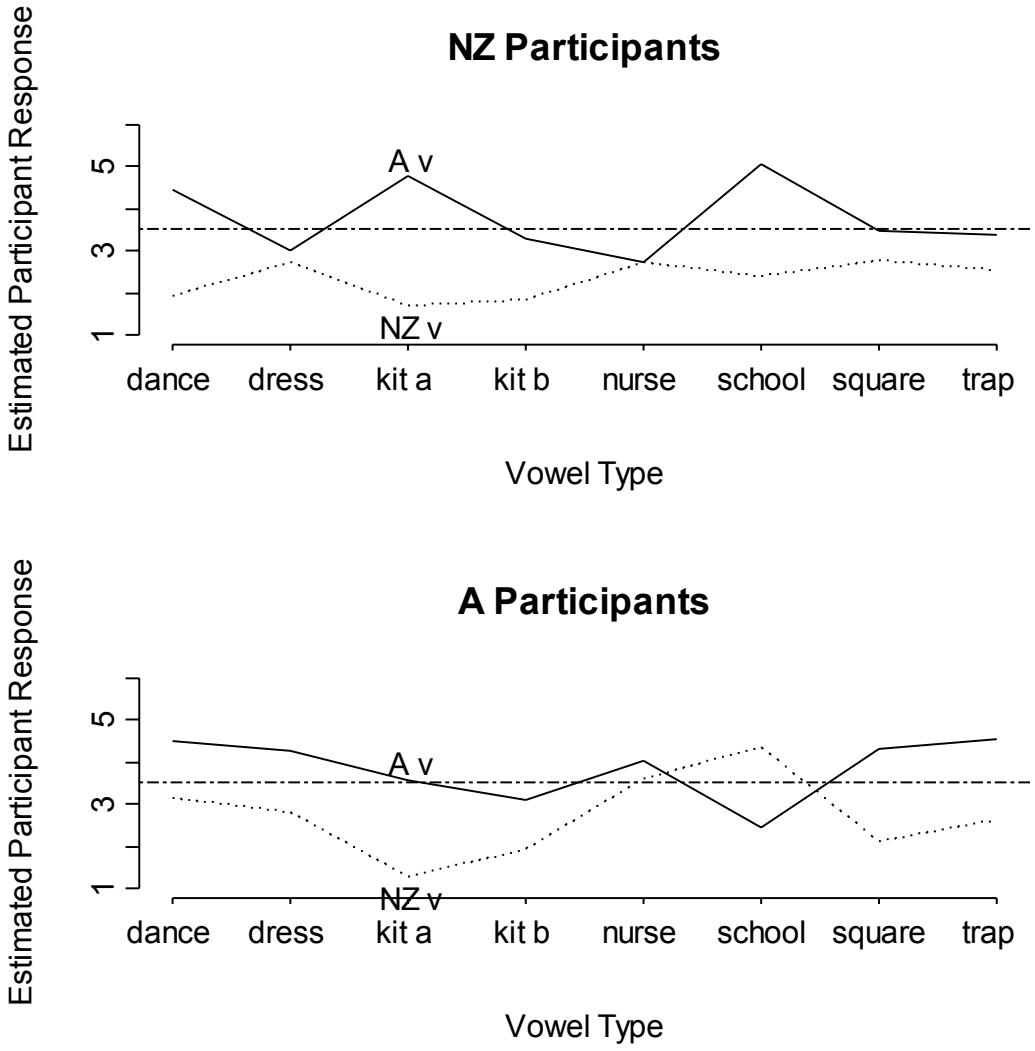

Figure 5.9: Response predicted by the model, as a function of variant, vowel type and participantID (version 2)

The interaction of the identity of the participant with the type of variant and type of word is presented in Figure 5.10. The New Zealand participants responded to the different types of words in the way it was expected, in both the New Zealand and the Australian condition. The New Zealand and Australian variants tended to receive the most distinct responses with the stereotypical words, followed by the frequent and the non-frequent ones. That is, a New Zealand speaker was more likely to be perceived as New Zealand sounding if he or she produced a stereotypical word than if a frequent or non-frequent word was the target word. This pattern also holds for the Australian variants. Stereotypicality and frequency of a word seem to enhance the perception of a particular accent, at least if the speaker is judged by a New Zealander.

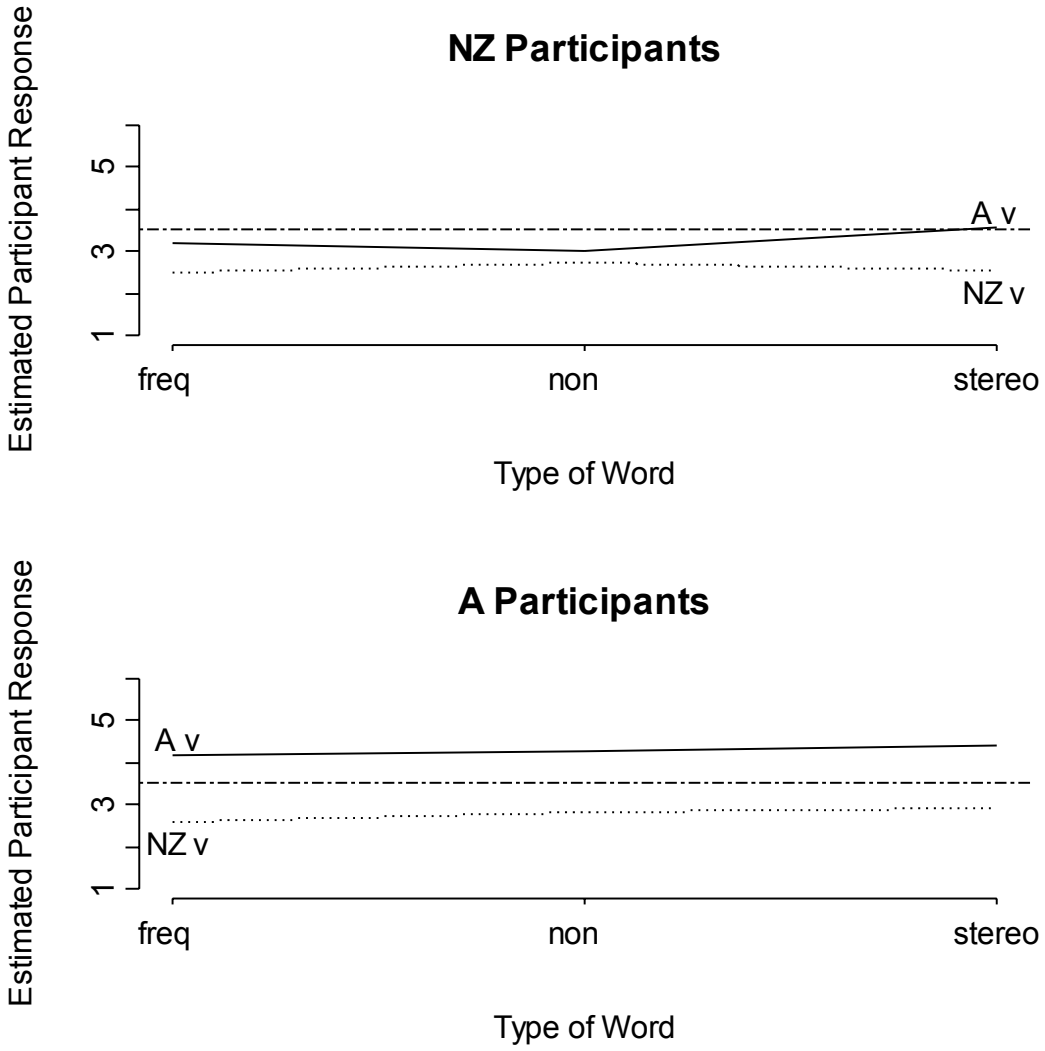

Figure 5.10: Response predicted by the model, as a function of variant, type of word and participantID

This same effect, however, is not replicated for the Australian participants. Frequent words tended to elicit a more New Zealand response among the Australian participant, for both New Zealand and Australian variants whereas non-frequent and stereotypical words were slightly more likely to be identified as Australian-like.

Chapter 6 - Discussion

6.1 Introduction

The findings of this study clearly show that New Zealanders and Australians are quite accurate at telling apart the two accents and that a wide range of factors, like the type of vowel, the gender of the speaker, nasality and lexical effects, influenced them in this perception task. The discussion will be structured as follows. Effects of the stimuli will be discussed in section 6.2, followed by participant effects (section 6.3). More minor effects that occurred in the raw data will be discussed in the last section 6.4.

6.2 Stimuli Effects

6.2.1 Vowel Type

The main research question was to investigate how different vowels affect a listener's ability to identify an accent. Most interestingly, the results show that New Zealanders and Australians tune in to different vowels when trying to tell each other's accents apart despite the fact that in the experiment they are exposed to the same – synthesized – vowels in their Australian and New Zealand realization. This suggests that the perception of vowels is inherently different for New Zealanders and Australians.

Several interdependent factors might play a role here and in combination they can perhaps help to account for the results in this study. First of all, stereotypes might be a major influence. If a vowel is clearly stereotyped, it might lead people to more

explicitly tune in to the quality of the vowel. Different vowels are stereotyped in the two accents and to a different degree. And probably also the awareness of the stereotypes differs in the two countries with New Zealand being a much smaller country where stereotypes affect people more and are more pervasive than in Australia. Secondly, New Zealanders and Australians possibly perceive vowels inherently differently due to the different distributions of their vowel spaces. This experiment synthesized the variants at their mean values. But the entire distribution of variants produced in the dialect is not necessarily centered around the mean. And these means were based on clear, recorded speech. Both the values for the synthesis of the New Zealand vowels (Maclagan and Hay 2006) and the Australian vowels Cox (1996) were taken from recordings of speakers reading a wordlist which has been claimed to produce more formal variants (Labov 1966) because speakers are more aware of their speech. The vowel spaces are shaped by the exposure of speech from people in their own dialect - speech that can have a wide range of variation. The production of a specific vowel varies in natural speech, depending on the degree of articulation associated with the token (Lindblom 1963). Picheny, Durlach and Braida (1986) report significant acoustical differences between conversational and clear speech and found that not only the speaking rate decreases considerably in clear speech but that vowels are also reduced to a greater extent, than when articulated clearly. Vowels tend to become schwa-like in unstressed syllables and function words when not spoken in isolation. This process of vowel reduction is a common and widespread occurrence in many languages as it is rooted in "our universal tendency as speakers to hypo- rather than to hyperarticulate" (Lindblom 1983:230), also called 'undershoot' which requires less force over time.

This effect of less clear or more relaxed speech making the quality of a vowel further central may become relevant in dialect identification as well. Thus, a vowel that is less central/back than your own production might be easier to perceive as 'different' than a vowel that is more central and that might still be regarded as a relaxed production of your own accent. The following figures illustrate this concept for the KIT vowel.

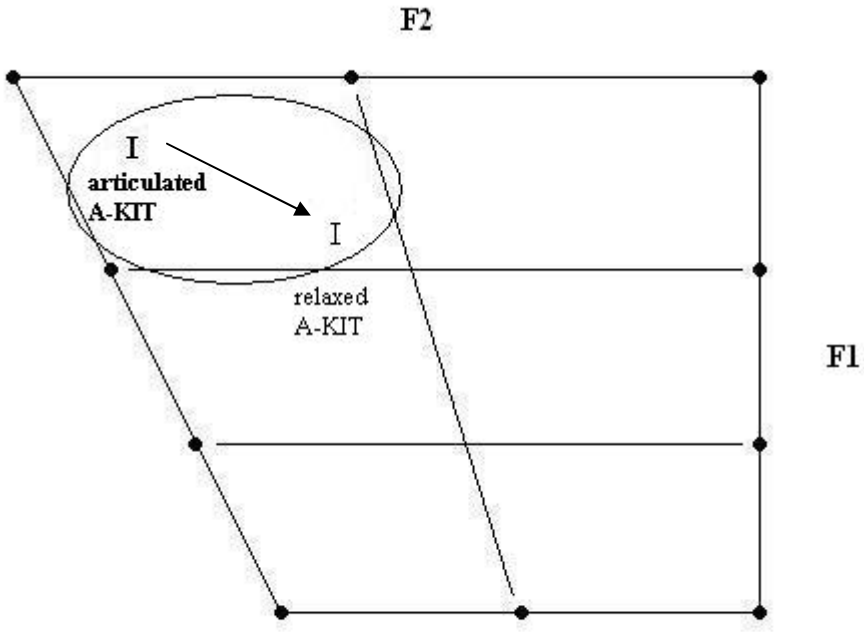

Figure 6.1: Production of the KIT vowel by Australians (**articulated**/relaxed)

Figure 6.1 shows the position of the KIT vowel in the vowel space when it is produced by an Australian (bold): it is a high, front vowel. The variation of the KIT vowel spans to include more central variants as well when it is less carefully articulated as it can be the case in natural speech. A central, New Zealand-like variant may then be perceived as a more relaxed version of an Australian-like KIT and not be recognized as 'different from my own accent'.

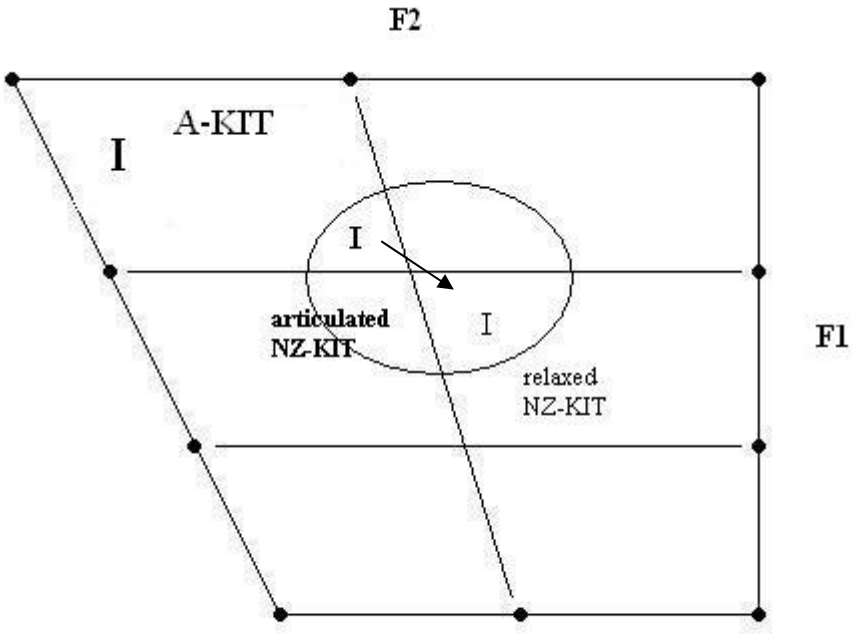

Figure 6.2: Production of the KIT vowel by New Zealanders (A-KIT/**NZ-articulated**/NZ-relaxed)

The New Zealand variant of the KIT vowel is more central, and varied, more relaxed realizations of it are even more central. For a New Zealander who has a default vowel space as it is illustrated in Figure 6.2 for the KIT vowel, a high, front Australian-like KIT vowel may be easier to perceive as 'different' since it probably cannot be mistaken as a New Zealand variant.

Hence, the perception of a vowel may depend on this default configuration of the vowel space that is possibly different for Australians and New Zealanders and may make departures from that configuration more or less detectable.

Thirdly, on top of this difference in the configuration of the vowel spaces, the social and regional distribution of the vowels differ in the two countries, an aspect that the synthesis of the stimuli with mean values did not fully cover. For example, the DANCE vowel in Australia is subject to regional variation and thus might serve the New Zealanders but not the Australians as a reliable cue in telling the two accents apart. Also, vowels currently undergoing change may have stigmatized variants, the production of which may be avoided in clear speech. In such cases, this might actually make opposite predictions about encountered distributions than the clear

speech argument, e.g. maybe for some sounds undergoing change, a relaxed production will involve a less centralized vowel which complicated the picture somewhat. Although it has been widely claimed that the short front vowel shift in New Zealand English is non-stigmatized, there has been evidence that for example the centralization of the KIT vowel may be in the process of becoming stigmatized (Maclagan, Gordon, Lewis 1999). These are all issues that have to be taken into account when looking at the results, especially since the synthesis was conducted with mean values. This calls for a vowel by vowel discussion.

6.2.1.1 SCHOOL

The SCHOOL vowel was the vowel that Australian and New Zealand participants most disagreed on in its different realizations. Its New Zealand variant is perceived as Australian-like by the Australians and as New Zealand-like by the New Zealanders. A possible explanation is that the rather back/central quality of the New Zealand variant is perceived by the Australians as still belonging to the range of variation that the realization of the Australian SCHOOL can take on in relaxed pronunciation. Thus, it is harder for them to hear the New Zealand variant as 'different'.

The fact that Australian SCHOOL, on the other hand, is identified by both groups as exemplifying the 'other' accent is possibly due to the quality of the synthesis. The Australian variant of SCHOOL vowel was the 'problem child' in the synthesis. Many participants mentioned in the informal conversation after the experiment that whenever a word sounded 'strange' or 'munted' they would classify it as being produced by a speaker from the other country.

6.2.1.2 DRESS

As a consequence of a push chain involving the short front vowels (Gordon et. al 2004), DRESS has raised to a high front position in New Zealand English. The Australian variant, on the other hand, is positioned further towards the centre of the

vowel space. Applying the clear speech account here would mean that a central Australian DRESS vowel could still be perceived as a more relaxed version of a DRESS vowel by the New Zealanders. This is indeed the case as DRESS in its Australian form was likely to be correctly identified by Australians but not by the New Zealand participants.

The other possibility for the fact that New Zealanders perceive the more central Australian DRESS as New Zealand-like involves the social variation of DRESS in New Zealand. DRESS is moving to a high front position to the extent that in some cases it overlaps with FLEECE (McKenzie 2005) and it is possible that its higher variants are becoming stigmatized. It is possible that New Zealanders perceive the lower variants as New Zealand-like because they have also experienced older New Zealanders producing them.

6.2.1.3 TRAP

The same explanation could hold for the TRAP vowel which, in its Australian, more central realization, tended to be correctly identified by Australians, but not by New Zealanders. Being involved in the short front vowel shift, TRAP has raised in New Zealand English. Hence New Zealanders might still perceive an Australian-like TRAP as a less clear pronunciation of a New Zealand TRAP. As TRAP varies socially in New Zealand English, it is also possible that the lower variants of it are identified as New Zealand-like because listeners have been exposed to older New Zealanders producing more conservative variants of TRAP. The New Zealand TRAP, however, is higher than any TRAPs encountered in Australian English, and so should stand out to Australians as clearly different.

6.2.1.4 DANCE

Given that the DANCE vowel in Australia is subject to regional and social variation (Bradley 2004), it is not surprising that Australians classify the New Zealand variant of DANCE as Australian-like. Having no variation of the DANCE vowel in

their country, New Zealanders are more likely to accurately identify both realizations of the DANCE vowel suggesting that the DANCE vowel is also perceptually "a shibboleth distinguishing Australian and New Zealand varieties of English" (Bauer and Warren 2004:590), but perhaps only for New Zealanders.

6.2.1.5 KIT

The other iconic vowel of the two accents that was investigated in the experiment was the KIT vowel. It is interesting that the more extreme version of it, KIT A, tended to be identified accurately by New Zealanders in its Australian realization, but not by the Australians who were more likely to rate it as New Zealand-like. The clear speech account would explain why New Zealanders perceive a high front production of a KIT vowel as different from their own accent. In New Zealand English, KIT has centralized, so a more relaxed version of it would possibly be even more central resulting in an Australian variant of it standing out perceptually (see Figure 6.2 in section 6.2.1).

It is puzzling, however, that the Australians perceived the Australian KIT vowel as more New Zealand-like. Since the synthesis was conducted from the speech of New Zealanders, a possible explanation is that there were other factors, e.g. duration, present in the speech that Australians picked up on as sounding strange, hence marked the speaker as coming from the other country.

Both groups do not perform largely differently in identifying the milder version, KIT B, which tends to be classified as New Zealand-like in its New Zealand variant and Australian-like in its Australian variant. This is perhaps not surprising as the two versions of the vowel are closer together than the KIT A variants. Consistent with the clear speech argument, the more central New Zealand KIT B could sometimes be perceived as Australian by Australians. The more front Australian KIT B, on the other hand, could sometimes be heard as New Zealand by New Zealanders because older New Zealanders would produce that form (Langstrof 2006).

6.2.1.6 NURSE

The NURSE vowel did not prove much help to either New Zealanders or Australians in telling each other's accents apart. This is not surprising since the vowel is hardly differently realized in the two accents and thus does not serve as a very reliable cue to differentiate the accents.

6.2.1.7 SQUARE

In the case of the SQUARE vowel, participants had to rate a NEAR variant (New Zealand) versus a monophthongal realization of SQUARE (Australian). As the results show, the SQUARE vowel mainly helped the Australians in the task while it was not of much help to the New Zealanders. This is not surprising since New Zealanders usually merge the NEAR and SQUARE vowel towards NEAR (Maclagan and Gordon 1996) and a link between production and perception has been found (Hay et al 2006b). So New Zealanders probably hardly perceived a difference between the two variants in this experiment, or, at the very least, they were probably not aware of perceiving a difference between them.

6.2.1.8 Asymmetry of vowel hierarchies

The observed asymmetry of vowel hierarchies in the raw data is intriguing. Australians seem to tune in to different vowels when listening to other Australians, namely DANCE and TRAP, than when trying to identify a New Zealander. When trying to identify a New Zealander, the KIT and SQUARE vowels become more salient. Obviously, if a central KIT vowel helps you to identify a New Zealander it does not necessarily mean that a fronted KIT vowel will help you to identify an Australian. It is similar for the New Zealanders: KIT and DANCE help them to identify other New Zealanders, while SCHOOL and KIT serve as the most reliable cues when identifying Australians. This asymmetry in the perception of the vowels is very interesting. It could possibly be ascribed to an ingroup/outgroup effect (Smith

and Zárate 1992) and the differing storage of the same exemplars, but exactly how this would work is not clear. Further research is needed to unravel why a certain vowel helps you to identify one accent but the opposite realization of the same vowel does not help you to identify the other accent.

The finding that the most distinguished responses are given by the New Zealanders on the KIT A, SCHOOL and DANCE vowels suggests that these vowels are possibly the most iconic accent markers for the New Zealanders. The KIT A, SQUARE and TRAP vowels, on the other hand, are the most salient ones that the Australians rely on in this task. This difference might also be due to different stereotypes in the two countries. The lexical effects are discussed in the following section.

6.2.2 Lexical Effects

As predicted, the stereotypicality and frequency of a word influences the ability of New Zealanders in telling apart the two accents. Stereotypical words were most easily identified since the exemplar categories of stereotypical words are more robust (Hay, Nolan and Drager (2006a)) and have higher activation levels which makes them more easily retrievable. The fact that frequent words were more readily identified than infrequent words can also be accounted for by an exemplar model which suggests that frequent words are encountered more often and hence have more distinct and robust distributions for the two dialects.

However, for the Australian participants this lexical effect is not present. This might be due to Australia being a much larger country with more regional variation and less – or different - stereotyped items. People in the much smaller country of New Zealand, on the other hand, may be more aware of stereotypes and thus are more influenced by them in this perceptual task.

These statistical findings are backed up by patterns in the raw data. The lexical effect is present among the New Zealand participants for the average responses of both New Zealand and Australian variants whereas the Australian participants display no such effect. Interestingly, if you look closer on specific vowel type, the lexical

effect does seem to be present for Australian participants when responding to a word containing the Australian variant of the KIT B vowel.

6.2.3 Gender of the Speaker

The predictability of the response based on the variant and the gender of the speaker suggests that participants find it easier to identify female speakers of the accents. This could be due to the participants having been exposed to more female speech overall since women have often been claimed to talk more than men. Lever (1976) for example found that girls engage more in talking than boys who prefer to play games outside. Another explanation is that female speakers display more (or more extreme) stereotypical markers of an accent. This is consistent with the common finding that women lead sound change and display more innovative forms than men (Labov 2001). Clopper, Conrey and Pisoni (2005) also found that listeners are sensitive to gender differences in speech production and are able to make use of these in a dialect categorization task. This gender effect is contrary to a previous study (Ludwig 2005) where male Australian speakers were rated more Australian-like than females.

The results from the raw data show a different pattern that is not present in the statistics, namely that female speakers, on average, are perceived as coming from the other country, whereas participants rate male speakers as sounding more like themselves. Although this trend only occurred in the raw data and is not statistically robust, it is still intriguing and worth following up in a future study. A possible explanation for this effect is that women are generally in advance of men in the development of linguistic change (Labov 2001) and hence display more innovative forms of an accent. These innovative forms can be stigmatized which might lead listeners to rate female speakers as coming from the other country whereas less stigmatized speech, produced by male speakers, makes them identify more with the speaker.

6.2.4 Nasality

Nasality has been shown to be associated with stronger negative sex-stereotypes (Bloom, Zajac and Titus 1999) raising the possibility that it may be linked to stronger stereotypes in general. There is evidence in this study that this might be the case: Nasality seems to evoke stronger stereotypes of a particular accent and function as an intensifier of a particular accent, be it Australian or New Zealand English, as the results in section 5.4 show. Participants may tune in more to the quality of a vowel when it is stereotyped (as discussed in section 6.2.1) and this stereotypicality is enhanced even more if a stimuli is nasalized. Thus, the more nasal a variant is, the more able participants are to perceive the differences between the two accents. This effect is stronger for the New Zealand participants and suggests that nasality is perceived to be a stereotype more so in New Zealand than Australia.

These findings are contrary to a previous study where New Zealand participants reported a perceived link between nasality and Australianness, but not a link between nasality and their own accent. It might be possible that New Zealanders are not fully aware of their own accent being nasal as well.

If this is true, however, that nasality serves as an amplifier in perception, the interaction that nasality has with the identity of the participant is rather odd. It shows that overall nasality is indeed associated with Australianness even by the Australian participants. This is possibly consistent with Mackiewicz-Krasowska (1976, cited in Pittam and Gallois 1986), who suggests that nasality is associated with the low-prestige, broad variety of Australian English.

One possibility is that the speech of Australians in general is more nasal and that New Zealanders pick up on this feature more than the Australians since often you are not fully aware of your own accent markers or people in New Zealand might be more aware of stereotypes generally.

This trend of nasality being more strongly associated with Australianness is backed up by an effect observed in the raw data. In rating words with the DRESS vowel, New Zealanders relied on nasality while for Australians the type of variant, New Zealand or Australian, seemed to serve as the decisive factor. The raw data also

shows that the effect of nasality and Australianness is stronger for female variants than male variants, a trend that would be interesting to follow up on.

There are two intriguing trends: Nasality intensifies the perception of differences between the two accents and overall, nasality is associated with being an Australian feature. This is also consistent with the impressions the participants put down when asked about features of the two accents prior to the experiment. Both participant groups, first and foremost, associated nasality with Australian English, and more New Zealanders did so than Australians. Future research would help to unravel if there is indeed a difference in nasality between the two accents and how people perceive it.

6.3 Participant Effects

6.3.1 Age

The results in section 5.4 show that older Australian participants are more likely to give more Australian-like ratings, and that older New Zealand participants tend to identify words as more New Zealand-like. This effect of age seems to be consistent with results in Hay et al. (2006b) where the error rate of identifying NEAR and SQUARE words decreased with increasing age. There the effect is due to the differing exposure of younger and older speakers. A possible explanation for the fact that older participants in this study are responding with more extreme ratings than younger participants might be the following. If you live in New Zealand, the rate at which you are exposed to new New Zealand exemplars is much higher than the rate at which you are exposed to new Australian exemplars. Thus, the older you are, the higher the ratio of stored New Zealand exemplars versus Australian exemplars, and the more robust your New Zealand distribution relative to the Australian distribution and vice versa if you live in Australia. Due to their age, younger participants, on the other hand, have a lower ratio of stored exemplars of their own accent relative to the other accent, and so may be more likely to identify an accent as ‘other’.

6.3.2 Gender

Not only did the age of a participant turn out as a predictor of response, but also the gender had an effect on the ratings. Female New Zealand as well as Australian participants were increasingly more likely to rate the speakers as belonging to their own accent group than the males who were more likely to classify the speakers as coming from the other country. The effect of the gender of the participant and the regional identity of the participant in this experiment seems to reflect a general tendency in speech perception for female and male participants to behave significantly. In Hay et al.'s (2006b) study, males misidentified words at a greater rate than women and the error rate decreased with increasing age. Hay et al. (2006a) had two groups of New Zealanders match a KIT vowel to synthesized continua ranging from New Zealand-like to Australian-like KIT with the only difference of one group having 'New Zealander' written on top of their answer sheet and the other 'Australian'. They found that female participants performed the way it was predicted, namely that they were more likely to respond with a more central vowel in the New Zealand condition than females in the Australian condition while male participants tended to respond in the opposite direction. This shows that is important to take into account that female and male participants seem to perceive speech differently from one another. In this study, an alternative explanation might possibly be that the females were more cooperative than men, while men are more competitive and do not engage in the experiment as much as women would. Hence they are less willing to cooperate and maybe also more likely to think they are being tricked. Thus, they are more likely to rate speakers as not belonging to their own accent area and rate them as 'the other'.

6.3.3 Social Class

The effect of social class of the participant is rather puzzling: Professionals were more likely to give more Australian ratings than participants from the other social classes. Hay, Nolan and Drager (2006a) investigated the influence of apparent dialect area of a speaker in a vowel-matching task by manipulating a label written on

top of the answer sheet which was in one condition ‘New Zealander’, in the other ‘Australian’. They report a similar social class effect in their study, where participants with higher social class scores are more influenced by the ‘Australian’ label. They ascribe this effect to participants with a higher social class having been more exposed to Australian English through travel. This, however, cannot be confirmed by the results of this study where the exposure through visits to the other country was investigated and turned out not significant. (However, it is interesting to note this from a previous study (Ludwig 2005).)

It seems that it must be something about the social class itself that makes professionals give more Australian-like ratings altogether. A possible speculation is that professionals are not only aiming high in life but also on the scale that was given in the experiment where 1 represents ‘definitely New Zealand’ and 6 stands for ‘definitely Australian’. That is, they simply give higher ratings on scales suggesting that the use of scales might differ among individuals. In future research, it would be interesting to use an inverse scale to further investigate this matter.

6.3.4 TV exposure

It is intriguing and somewhat puzzling that the degree of exposure to the other accent through television influences the performance of participants in the way that the more exposure a participant had, the more Australian the speakers sound to him/her.

This might be due to the fact that New Zealand TV shows in Australia are rather rare (the odd one is broadcast in Australia though), on the other hand Australian TV shows are quite frequently shown in New Zealand. So that participants who specified they watch TV from the other country “often” actually only really watched Australian TV shows and hence were exposed to more Australian exemplars than New Zealand ones which led them to respond with more Australian ratings in the task. It would be interesting to follow up on this effect of TV exposure and more closely investigate how it could influence the perception of the dialects. Also it would be interesting to include another variable of exposure, namely how many people from the other country a participant has in his or her circle of friends which seemed to be

another big factor that participants considered when doing the task. A few participants noted down in the post-experiment question or informal conversation that they would imagine a friend from the other country say the word that they were about to hear and then match this production against the actual stimuli to ascertain where the speaker was from.

However, it is interesting to note that the degree of exposure to the accent by visits to the other country did not seem to have a significant effect on the participants' performance, as it has been observed in a previous study (Ludwig 2005).

6.4 Minor Effects

6.4.1 Overall accuracy

Overall, New Zealanders were more accurate than Australians. It is possible that this effect could have been carried by the responses to the SCHOOL and KIT A vowels which received very accurate ratings for the Australian variant by the New Zealand participants. This finding is contrary to previous dialect identification studies which found that Australasians were best at identifying their own accent (Weatherall and Gallois 1998). The fact that both groups performed better on the New Zealand variants suggests that the New Zealand variants sounded more authentic. The values used for the synthesis of the New Zealand variants were possibly more accurate. Furthermore, just one Australian variant does not encompass the variety of the regionally differing accents in Australia. The distribution of responses also shows that both participant groups were more confident with giving out the "1" (NZ) than the "6" (A). Moreover, the synthesis is based on the speech of a New Zealander, so other factors may have made the synthesis of the Australian vowels non-authentic, e.g. duration, voice quality, pitch, higher formants, diphthongization, etc. Duration was a feature that one Australian participant commented on after the experiment. He would have expected the Australian variants to be longer, and felt they were cut short in the experiment. Differences in vowel duration between New Zealand and Australian English is an aspect that has hardly been explored at all.

6.4.2 City

The variable of the city that the participant currently resides in is not statistically robust, but there are minor effects in the raw data. Australian participants from Christchurch seem to be better at identifying Australian speakers than Australians from Sydney or Melbourne, yet they were at the same time worse at identifying New Zealanders than Australians from the big continent. It is possible that it was easier for Australians from Sydney and Melbourne to detect speakers that sound different to them than speakers that sound more similar to their own speech. Australians living in Christchurch, then, are fully immersed in the speech of New Zealanders and thus are better at singling out speakers sounding different to what they are used to – in this case Australians. These results might suggest that for the Australians living in Christchurch a shift in group membership has taken place concerning the ingroup/outgroup division (Smith and Zárate 1992). Perhaps, they increasingly identify themselves with the New Zealanders resulting in a better ability to identify Australians, now processed as outgroup members, due to an increasing focus on category-defining features, in this case the accent. The accuracy in identifying in-group members – New Zealanders – may decline as "more attention is devoted to the individuating (…) attributes of the self" (Smith and Zárate 1992:14) and less focus is put on the accent. Australians living in Australia, on the other hand, could consider fellow Australians as the in-group resulting in a poorer accuracy to identify them. These results have to be treated with caution though because only 8 Australians were recruited from Christchurch, compared to 21 from Melbourne and 31 from Sydney.

6.4.3 Exposure to accent by visits to the other country

Previous research (Clopper and Pisoni 2004, Ludwig 2005) has shown that the degree of exposure to linguistic variation improves a listener's ability to identify speakers from a different accent area. This study did not replicate this effect, but the

raw data shows another interesting pattern in that the Australians become slightly better at identifying Australian speakers the more time they have spent in New Zealand, but at the same time get worse at identifying New Zealand speakers. This, again, suggests an in-group/out-group effect. It seems that the more New Zealanders are considered as 'normal' the more they are processed as an ingroup. This weakens the ability to perceive them as different from oneself. The ability to identify Australians, on the other hand, enhances the more time is spent away from Australian and the more Australians are regarded as outgroup members.

6.5 Summary

A wide array of factors seems to affect dialect perception. Stereotyped vowels may influence listeners in that they more closely tune in to the quality of that particular vowel. Further, New Zealanders and Australians possibly perceive vowels inherently differently due to the different distributions of their vowel spaces in that the mean values used for the synthesis in this experiment do not necessarily reflect the centre of the entire distribution of variants produced in the dialect. Issues of clear speech versus conversational speech that is known to demonstrate vowel reduction become important here as well as issues of sound change in that stigmatized variants may be avoided in clear speech. These two accounts may occasionally make opposite assumptions about the perception of a vowel, but are nonetheless both to be taken into account. (For example, the clear speech account predicts that a vowel that is less central than your own production might be easier to perceive as 'different' than a vowel that is more central. But maybe if a vowel is undergoing change, a relaxed production will involve a less centralized vowel.)

Moreover, the asymmetry in perception between the New Zealanders and the Australians concerning the type of vowel requires future research. Obviously, if a central KIT vowel helps you to identify a New Zealander it does not necessarily mean that a fronted KIT vowel will help you to identify an Australian.

As predicted, lexical effects played a role as well. Exemplar categories of stereotypical words are more robust, hence more easily retrievable and lead listeners to identify these words most easily. The fact that Australians did not seem to be

influenced by this might be due to Australia having different stereotyped items. There is evidence in this study that nasality, possibly linked to stronger stereotypes in general, intensifies stereotypes of Australian and New Zealand English and is overall associated with Australian English.

The observed participant effects concerning age and gender can possibly be accounted for by changing ratios of exposure to Australian and New Zealand exemplars and ingroup/outgroups effects.

Conclusion

The purpose of this study was to gauge the accuracy of New Zealanders and Australians in trying to identify each other's accents, and also to reveal the degree to which stereotypical accent markers influence listeners' perception and identification of the two accents. Dialect identification, so far, has mostly been explored concerning British and American dialects. Studies in the Australasian area have been insufficient due to the use of small speech samples. Furthermore, no one has examined the pivotal cues that listeners make use of in this task. This study improved on previous attempts to investigate the accuracy of New Zealanders and Australians at identifying one another's accents, and beyond that employed an entirely novel method in dialect identification research - the use of synthesized vowels as stimuli. This has provided new and stimulating insights into the perception of accents.

Forty New Zealanders and sixty Australians participated in an experiment which tested the perception of the following vowels: DRESS, DANCE, KIT, NURSE, SCHOOL, SQUARE and TRAP. For each of these vowel classes, six words that contain the particular vowel were used as stimuli, and Australian and New Zealand variants of the vowels were synthesized. To investigate lexical effects and frequency, words were chosen that displayed different degrees of frequency and carried a stereotype. Participants were asked to rate the stimuli on a scale from 1 (definitely NZ) to 6 (definitely Australian).

The results demonstrate that dialect identification is a complex process that requires taking into account many different interacting factors of speech perception, social and regional variation of vowels and issues of clear speech versus conversational speech. The most intriguing finding seems to be that the salience of certain variants differs among New Zealanders and Australians. One possible explanation is that the default configurations of their vowel spaces are inherently different not only in the means, but also in the distribution of forms encountered. Due

to natural speech being variable, vowel spaces can overlap and make it harder for listeners to perceive tokens as distinct. That is, both mean values for the dialects used in this experiment may fall inside or close to the distribution for one group but not the other. As shown, this has clear implications for a dialect perception task in that vowels realized in a fashion typical of the other accent can be perceived as sounding like your own accent when articulated in a more relaxed, central fashion. A different account draws on sound change predicting the opposite in that a less central production could be due to avoiding a stigmatized variant. This becomes especially important for the vowels involved in the front vowel shift in New Zealand English.

Moreover, the perceptual asymmetry between the New Zealanders and Australians concerning the type of vowel is intriguing. A central KIT vowel might help you to identify a New Zealander, however, this does not entail that the opposite production, a front KIT vowel, will assist you in identifying an Australian.

Given the stereotype-laden nature of the two accents, the perception of the vowels was bound to be affected by lexical items that have become stigmatized in the distinction of the two accents. Also, the stimuli provided were only short words which "can trigger the full suite of stereotypes associated with that dialect" (Bayard et. al 2001:41). It seems possible though that the stereotypes in this study mostly catered for the New Zealand participants suggesting that Australians might draw on quite different stereotypical accent markers than the New Zealanders, an issue that requires further research. It would be interesting to follow up on this and see to what extent Australian stereotypes differ from the New Zealand ones and how they affect the perception of vowels. Furthermore, nasality, hardly touched upon in the literature, offered a new avenue of exploring dialect perception and has proven a captivating effect functioning as an intensifier of a particular accent, and possibly enhancing the stereotypicality of an accent. Overall, it has been shown to be associated with Australian English. This is another area for continuing exploration to investigate if the two accents do indeed differ in nasality.

Reinforcing exemplar models of speech perception, it has also been shown that frequency of a word influences a listener's accuracy in identifying an accent. At least for the New Zealand participants, more frequent words were more accurately identified. Being more often encountered, frequent words have more distinct and robust distribution for the two dialects.

This study has also put forth interesting findings concerning gender issues that have permeated recent speech perception studies. More research is required to disentangle in more detail why it is easier for listeners to identify female speakers of a particular accent than male speakers and why females seem to identify themselves more with speakers than males who were more likely to classify the speakers as coming from the other country. These findings also indicate that it might be worth investigating further the idea of an integration index in terms of male/female Australian/New Zealand friends that the participant knows.

Another promising path to take for future studies would be to synthesize different regional and social variants of vowels in their New Zealand and Australian realization, an issue that might lead to even more intriguing results and factors that influence listeners in distinguishing the *fush* from the *cheeps*.

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Appendix

paradigm	type	word	variant	nasality	speakerID	group-hearing
DANCE1	freq	chance	A	non	f1	A
DANCE1	freq	chance	NZ	non	m1	a
DANCE1	non	lance	A	non	f1	a
DANCE1	non	lance	NZ	non	m1	a
DANCE1	stereo	dance	NZ	non	f1	a
DANCE1	stereo	dance	A	non	m1	a
DANCE2	freq	answer	NZ	non	f2	a
DANCE2	freq	answer	A	non	m2	a
DANCE2	non	sample	NZ	non	f2	a
DANCE2	non	sample	A	non	m2	a
DANCE2	stereo	example	A	non	f2	a
DANCE2	stereo	example	NZ	non	m2	a
DRESS1	freq	set	NZ	nasal	f3	a
DRESS1	freq	set	A	non	f3	a
DRESS1	freq	set	NZ	non	m3	a
DRESS1	non	fret	A	nasal	f3	a
DRESS1	non	fret	A	non	f3	a
DRESS1	non	fret	NZ	non	m3	a
DRESS1	stereo	pen	A	non	m3	a
DRESS1	stereo	pen	NZ	non	f3	a
DRESS2	freq	then	A	non	m1	a
DRESS2	freq	then	NZ	non	f1	a
DRESS2	non	den	NZ	non	f1	a
DRESS2	non	den	A	non	m1	a
DRESS2	stereo	ten	NZ	non	m1	a
DRESS2	stereo	ten	A	non	f1	a
KIT A1	freq	big	A	nasal	f2	a
KIT A1	freq	big	A	non	f2	a
KIT A1	freq	big	NZ	non	m2	a
KIT A1	non	dig	NZ	nasal	f2	a
KIT A1	non	dig	A	non	f2	a
KIT A1	non	dig	NZ	non	m2	a
KIT A1	stereo	six	NZ	non	f2	a
KIT A1	stereo	six	A	non	m2	a
KIT A2	freq	ships	NZ	non	f3	a
KIT A2	freq	ships	A	non	m3	a
KIT A2	non	sips	NZ	non	f3	a
KIT A2	non	sips	A	non	m3	a
KIT A2	stereo	chips	NZ	non	m3	a
KIT A2	stereo	chips	A	non	f3	a
KIT B1	freq	wish	NZ	nasal	f1	a
KIT B1	freq	wish	A	non	f1	a
KIT B1	freq	wish	NZ	non	m1	a
KIT B1	non	dish	NZ	nasal	m1	a
KIT B1	non	dish	A	non	f1	a
KIT B1	non	dish	NZ	non	m1	a
KIT B1	stereo	fish	A	non	m1	a
KIT B1	stereo	fish	NZ	non	f1	a
KIT B2	freq	business	A	non	m2	a
KIT B2	freq	business	NZ	non	f2	a
KIT B2	non	kidney	NZ	non	f2	a
KIT B2	non	kidney	A	non	m2	a

KIT B2	stereo	Sydney	A	non	f2	a
KIT B2	stereo	Sydney	NZ	non	m2	a
NURSE1	freq	work	A	nasal	m3	a
NURSE1	freq	work	NZ	non	f3	a
NURSE1	freq	work	A	non	m3	a
NURSE1	non	jerk	A	nasal	f3	a
NURSE1	non	jerk	NZ	non	f3	a
NURSE1	non	jerk	A	non	m3	a
NURSE2	freq	turn	A	non	f1	a
NURSE2	freq	turn	NZ	non	m1	a
NURSE2	non	stern	A	non	f1	a
NURSE2	non	stern	NZ	non	m1	a
NURSE3	freq	girl	NZ	non	f2	a
NURSE3	freq	girl	A	non	m2	a
NURSE3	non	whirl	A	non	f2	a
NURSE3	non	whirl	NZ	non	m2	a
SCHOOL1	freq	rule	A	non	f3	a
SCHOOL1	freq	rule	NZ	non	m3	a
SCHOOL1	non	ghoul	NZ	non	f3	a
SCHOOL1	non	ghoul	A	non	m3	a
SCHOOL1	stereo	school	NZ	non	f3	a
SCHOOL1	stereo	school	A	non	m3	a
SCHOOL2	freq	tool	NZ	non	f1	a
SCHOOL2	freq	tool	A	non	m1	a
SCHOOL2	non	drool	A	non	f1	a
SCHOOL2	non	drool	NZ	non	m1	a
SCHOOL2	stereo	pool	A	non	f1	a
SCHOOL2	stereo	pool	NZ	non	m1	a
SQUARE1	freq	air	NZ	non	f2	a
SQUARE1	freq	air	A	non	m2	a
SQUARE1	non	fare	A	non	f2	a
SQUARE1	non	fare	NZ	non	m2	a
SQUARE2	freq	hair	A	non	f3	a
SQUARE2	freq	hair	NZ	non	m3	a
SQUARE2	non	heir	NZ	non	f3	a
SQUARE2	non	heir	A	non	m3	a
SQUARE3	non	ware	A	non	f1	a
SQUARE3	non	ware	NZ	non	m1	a
SQUARE3	freq	where	NZ	non	f1	a
SQUARE3	freq	where	A	non	m1	a
TRAP1	non	mat	NZ	nasal	f2	a
TRAP1	non	mat	NZ	non	f2	a
TRAP1	non	mat	A	non	m2	a
TRAP1	freq	that	NZ	nasal	m2	a
TRAP1	freq	that	NZ	non	f2	a
TRAP1	freq	that	A	non	m2	a
TRAP2	freq	man	NZ	non	m3	a
TRAP2	freq	man	A	non	f3	a
TRAP2	non	pan	NZ	non	m3	a
TRAP2	non	pan	A	non	f3	a
TRAP3	freq	back	A	non	f1	a
TRAP3	freq	back	NZ	non	m1	a
TRAP3	non	pack	A	non	m1	a
TRAP3	non	pack	NZ	non	f1	a

paradigm	type	word	variant	nasality	speakerID	group-hearing
DANCE1	freq	chance	NZ	non	f1	b
DANCE1	freq	chance	A	non	m1	b
DANCE1	non	lance	NZ	non	f1	b
DANCE1	non	lance	A	non	m1	b
DANCE1	stereo	dance	A	non	f1	b
DANCE1	stereo	dance	NZ	non	m1	b
DANCE2	freq	answer	A	non	f2	b
DANCE2	freq	answer	NZ	non	m2	b
DANCE2	non	sample	A	non	f2	b
DANCE2	non	sample	NZ	non	m2	b
DANCE2	stereo	example	NZ	non	f2	b
DANCE2	stereo	example	A	non	m2	b
DRESS1	freq	set	A	nasal	m3	b
DRESS1	freq	set	NZ	non	f3	b
DRESS1	freq	set	A	non	m3	b
DRESS1	non	fret	NZ	nasal	m3	b
DRESS1	non	fret	NZ	non	f3	b
DRESS1	non	fret	A	non	m3	b
DRESS1	stereo	pen	NZ	non	m3	b
DRESS1	stereo	pen	A	non	f3	b
DRESS2	freq	then	NZ	non	m1	b
DRESS2	freq	then	A	non	f1	b
DRESS2	non	den	A	non	f1	b
DRESS2	non	den	NZ	non	m1	b
DRESS2	stereo	ten	A	non	m1	b
DRESS2	stereo	ten	NZ	non	f1	b
KIT A1	freq	big	NZ	nasal	m2	b
KIT A1	freq	big	NZ	non	f2	b
KIT A1	freq	big	A	non	m2	b
KIT A1	non	dig	A	nasal	m2	b
KIT A1	non	dig	NZ	non	f2	b
KIT A1	non	dig	A	non	m2	b
KIT A1	stereo	six	A	non	f2	b
KIT A1	stereo	six	NZ	non	m2	b
KIT A2	freq	ships	NZ	non	m3	b
KIT A2	freq	ships	A	non	f3	b
KIT A2	non	sips	A	non	f3	b
KIT A2	non	sips	NZ	non	m3	b
KIT A2	stereo	chips	A	non	m3	b
KIT A2	stereo	chips	NZ	non	f3	b
KIT B1	freq	wish	A	nasal	m1	b
KIT B1	freq	wish	NZ	non	f1	b
KIT B1	freq	wish	A	non	m1	b
KIT B1	non	dish	A	nasal	f1	b
KIT B1	non	dish	NZ	non	f1	b
KIT B1	non	dish	A	non	m1	b
KIT B1	stereo	fish	NZ	non	m1	b
KIT B1	stereo	fish	A	non	f1	b
KIT B2	freq	business	NZ	non	m2	b
KIT B2	freq	business	A	non	f2	b
KIT B2	non	kidney	A	non	f2	b
KIT B2	non	kidney	NZ	non	m2	b
KIT B2	stereo	Sydney	NZ	non	f2	b
KIT B2	stereo	Sydney	A	non	m2	b
NURSE1	freq	work	NZ	nasal	f3	b

NURSE1	freq	work	A	non	f3	b
NURSE1	freq	work	NZ	non	m3	b
NURSE1	non	jerk	NZ	nasal	m3	b
NURSE1	non	jerk	A	non	f3	b
NURSE1	non	jerk	NZ	non	m3	b
NURSE2	freq	turn	NZ	non	f1	b
NURSE2	freq	turn	A	non	m1	b
NURSE2	non	stern	NZ	non	f1	b
NURSE2	non	stern	A	non	m1	b
NURSE3	freq	girl	A	non	f2	b
NURSE3	freq	girl	NZ	non	m2	b
NURSE3	non	whirl	NZ	non	f2	b
NURSE3	non	whirl	A	non	m2	b
SCHOOL1	freq	rule	NZ	non	f3	b
SCHOOL1	freq	rule	A	non	m3	b
SCHOOL1	non	ghoul	A	non	f3	b
SCHOOL1	non	ghoul	NZ	non	m3	b
SCHOOL1	stereo	school	A	non	f3	b
SCHOOL1	stereo	school	NZ	non	m3	b
SCHOOL2	freq	tool	A	non	f1	b
SCHOOL2	freq	tool	NZ	non	m1	b
SCHOOL2	non	drool	NZ	non	f1	b
SCHOOL2	non	drool	A	non	m1	b
SCHOOL2	stereo	pool	NZ	non	f1	b
SCHOOL2	stereo	pool	A	non	m1	b
SQUARE1	freq	air	A	non	f2	b
SQUARE1	freq	air	NZ	non	m2	b
SQUARE1	non	fare	NZ	non	f2	b
SQUARE1	non	fare	A	non	m2	b
SQUARE2	freq	hair	NZ	non	f3	b
SQUARE2	freq	hair	A	non	m3	b
SQUARE2	non	heir	A	non	f3	b
SQUARE2	non	heir	NZ	non	m3	b
SQUARE3	non	ware	NZ	non	f1	b
SQUARE3	non	ware	A	non	m1	b
SQUARE3	freq	where	A	non	f1	b
SQUARE3	freq	where	NZ	non	m1	b
TRAP1	non	mat	A	nasal	m2	b
TRAP1	non	mat	A	non	f2	b
TRAP1	non	mat	NZ	non	m2	b
TRAP1	freq	that	A	nasal	f2	b
TRAP1	freq	that	A	non	f2	b
TRAP1	freq	that	NZ	non	m2	b
TRAP2	freq	man	A	non	m3	b
TRAP2	freq	man	NZ	non	f3	b
TRAP2	non	pan	A	non	m3	b
TRAP2	non	pan	NZ	non	f3	b
TRAP3	freq	back	NZ	non	f1	b
TRAP3	freq	back	A	non	m1	b
TRAP3	non	pack	NZ	non	m1	b
TRAP3	non	pack	A	non	f1	b

University of Canterbury
Department of Linguistics

INFORMATION SHEET

Speech Perception Experiment
(for speakers)

You are invited to participate as a subject in a research project investigating New Zealand and Australian English.

Your participation in this project will involve reading a list of words. These will be recorded on a tape. The task will take no longer than 5 minutes.

The recordings will be synthesized and then used in a dialect identification experiment. The recordings will be kept at the Department of Linguistics, and only authorized people will have access to it.

You have the right to withdraw from the project at any time, including withdrawal of any information provided.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public. To ensure anonymity and confidentiality, you will be identified by number and not by name.

The project is carried out by Ilka Ludwig, who is a Master's student at the Department of Linguistics. She can be contacted at ilu10@student.canterbury.ac.nz or at 03-364-2987 ext 8321. She will be pleased to discuss any concerns you may have about participation in the project.

Researcher: Ilka Ludwig **Participant # _____**

Contact Address: Department of Linguistics
University of Canterbury
Private Bag 4800
Christchurch
New Zealand
03-364-2987 ext 8321
ilu10@student.canterbury.ac.nz

CONSENT FORM

Speech Perception Experiment

I have read and understood the description of the above named project. On this basis I agree to participate as a subject in the project, and I consent to publication of the result of the project with the understanding that anonymity will be preserved.

I agree that the results of this experiment be:

1. held at the University of Canterbury linguistics archives
2. made available to bona fide researchers
3. quoted anonymously in published work
4. used for teaching purposes

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

Signature: _____

Date: _____

University of Canterbury
Department of Linguistics

Accent Evaluation Experiment
INFORMATION SHEET

You are invited to participate as a subject in a research project investigating how accurate New Zealanders are at identifying New Zealand and Australian English.

Your involvement in this project will involve listening to words spoken by a variety of speakers. You will be asked to rate their accent on a scale from 1 (definitely New Zealander) to 6 (definitely Australian). The experiment will take approximately 12 minutes.

You have the right to withdraw from the project at any time, including withdrawal of any information provided.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: the identity of participants will not be made public without their consent. To ensure anonymity and confidentiality, you will be identified by number and not by name.

The project is carried out by Ilka Ludwig, who is a Masters student at the Department of Linguistics. She can be contacted at ilu10@student.canterbury.ac.nz or at 03-364 2987 ext. 8321. The project is being conducted under the supervision of Dr Jen Hay, jen.hay@canterbury.ac.nz, 03 3642242. Both Jen and Ilka would be pleased to discuss any concerns you may have about participation in the project.

(NZ participant #_____) Group:

University of Canterbury.
Department of Linguistics.
Accent Evaluation Experiment.

Background Information Sheet.

Age:_____

Gender:_____

Occupation:_____

Highest Educational Qualification:_____

Where did you grow up?:

_____

Have you been to Australia before? If yes, for how long?:

_____

How often do you watch Australian TV shows (*Home and Away*, *McLeod's Daughters*, *Rove Live*,…)?

Never Sometimes Often

How well do you think you can hear the difference between NZ and Australian English?:

not at all **very accurately**

1 2 3 4 5 **6**

What do you think are typical features of Australian English?:

_____

What do you think are typical features of New Zealand English?:

_____

Researcher: Ilka Ludwig

Contact Address: Department of Linguistics
University of Canterbury
Private Bag 4800
Christchurch
New Zealand
03-364-2987 ext. 8321
ilul0@student.canterbury.ac.nz

Date: September 2006

Consent Form

Accent Evaluation Experiment

I have read and understood the description of the above-named project. On this basis I agree to participate as a subject on the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved.

I understand also that I may at any time withdraw from the project, including withdrawal of any information I have provided.

Signature:

Date:

Experiment instructions

You will be played 106 words, spoken by a variety of speakers. You will hear each word twice and then be required to provide a rating for the passage on a scale like this:

	definitely NZer					**definitely Australian**
word	**1**	2	3	4	5	**6**

Don't worry if you are not sure about your answer, we are only interested in your first intuition. However, it is very important that you give a rating for EVERY word.

Rating Sheet

word		**definitely NZer**					**definitely Australian**
1.	that	**1**	2	3	4	5	**6**
2.	then	**1**	2	3	4	5	**6**
3.	fret	**1**	2	3	4	5	**6**
4.	heir	**1**	2	3	4	5	**6**
5.	den	**1**	2	3	4	5	**6**
6.	fish	**1**	2	3	4	5	**6**
7.	sample	**1**	2	3	4	5	**6**
8.	dish	**1**	2	3	4	5	**6**
9.	stern	**1**	2	3	4	5	**6**
10.	pen	**1**	2	3	4	5	**6**
11.	kidney	**1**	2	3	4	5	**6**
12.	that	**1**	2	3	4	5	**6**
13.	hair	**1**	2	3	4	5	**6**
14.	dig	**1**	2	3	4	5	**6**
15.	chips	**1**	2	3	4	5	**6**

		definitely NZer					**definitely Australian**
16.	pool	**1**	2	3	4	5	**6**
17.	girl	**1**	2	3	4	5	**6**
18.	dance	**1**	2	3	4	5	**6**
19.	heir	**1**	2	3	4	5	**6**
20.	jerk	**1**	2	3	4	5	**6**
21.	pool	**1**	2	3	4	5	**6**
22.	pen	**1**	2	3	4	5	**6**
23.	rule	**1**	2	3	4	5	**6**
24.	dish	**1**	2	3	4	5	**6**
25.	girl	**1**	2	3	4	5	**6**
26.	sample	**1**	2	3	4	5	**6**
27.	pan	**1**	2	3	4	5	**6**
28.	wish	**1**	2	3	4	5	**6**
29.	den	**1**	2	3	4	5	**6**
30.	dig	**1**	2	3	4	5	**6**

31.	rule	**1**	2	3	4	5	**6**
		definitely NZer				**definitely Australian**	
32.	ten	**1**	2	3	4	5	**6**
33.	Sydney	**1**	2	3	4	5	**6**
34.	back	**1**	2	3	4	5	**6**
35.	six	**1**	2	3	4	5	**6**
36.	ships	**1**	2	3	4	5	**6**
37.	kidney	**1**	2	3	4	5	**6**
38.	mat	**1**	2	3	4	5	**6**
39.	dance	**1**	2	3	4	5	**6**
40.	dig	**1**	2	3	4	5	**6**
41.	chips	**1**	2	3	4	5	**6**
42.	pack	**1**	2	3	4	5	**6**
43.	answer	**1**	2	3	4	5	**6**
44.	lance	**1**	2	3	4	5	**6**
45.	fare	**1**	2	3	4	5	**6**
46.	big	**1**	2	3	4	5	**6**

		definitely NZer					definitely Australian
47.	hair	**1**	2	3	4	5	**6**
48.	school	**1**	2	3	4	5	**6**
49.	example	**1**	2	3	4	5	**6**
50.	wish	**1**	2	3	4	5	**6**
51.	pan	**1**	2	3	4	5	**6**
52.	air	**1**	2	3	4	5	**6**
53.	fret	**1**	2	3	4	5	**6**
54.	back	**1**	2	3	4	5	**6**
55.	set	**1**	2	3	4	5	**6**
56.	business	**1**	2	3	4	5	**6**
57.	whirl	**1**	2	3	4	5	**6**
58.	work	**1**	2	3	4	5	**6**
59.	answer	**1**	2	3	4	5	**6**
60.	drool	**1**	2	3	4	5	**6**
61.	jerk	**1**	2	3	4	5	**6**

		definitely NZer					definitely Australian
62.	dish	**1**	2	3	4	5	**6**
63.	man	**1**	2	3	4	5	**6**
64.	mat	**1**	2	3	4	5	**6**
65.	ghoul	**1**	2	3	4	5	**6**
66.	turn	**1**	2	3	4	5	**6**
67.	ghoul	**1**	2	3	4	5	**6**
68.	ware	**1**	2	3	4	5	**6**
69.	tool	**1**	2	3	4	5	**6**
70.	ware	**1**	2	3	4	5	**6**
71.	chance	**1**	2	3	4	5	**6**
72.	tool	**1**	2	3	4	5	**6**
73.	drool	**1**	2	3	4	5	**6**
74.	chance	**1**	2	3	4	5	**6**
75.	big	**1**	2	3	4	5	**6**
76.	where	**1**	2	3	4	5	**6**

77.	Sydney	**1** definitely NZer	2	3	4	5	**6** definitely Australian
78.	example	**1**	2	3	4	5	**6**
79.	wish	**1**	2	3	4	5	**6**
80.	air	**1**	2	3	4	5	**6**
81.	whirl	**1**	2	3	4	5	**6**
82.	lance	**1**	2	3	4	5	**6**
83.	work	**1**	2	3	4	5	**6**
84.	business	**1**	2	3	4	5	**6**
85.	pack	**1**	2	3	4	5	**6**
86.	where	**1**	2	3	4	5	**6**
87.	fare	**1**	2	3	4	5	**6**
88.	sips	**1**	2	3	4	5	**6**
89.	big	**1**	2	3	4	5	**6**
90.	jerk	**1**	2	3	4	5	**6**
91.	turn	**1**	2	3	4	5	**6**
92.	that	**1**	2	3	4	5	**6**

93.	fret	**1** definitely NZer	2	3	4	5	**6** definitely Australian
94.	fish	**1**	2	3	4	5	**6**
95.	then	**1**	2	3	4	5	**6**
96.	mat	**1**	2	3	4	5	**6**
97.	sips	**1**	2	3	4	5	**6**
98.	ships	**1**	2	3	4	5	**6**
99.	set	**1**	2	3	4	5	**6**
100.	six	**1**	2	3	4	5	**6**
101.	stern	**1**	2	3	4	5	**6**
102.	ten	**1**	2	3	4	5	**6**
103.	set	**1**	2	3	4	5	**6**
104.	school	**1**	2	3	4	5	**6**
105.	man	**1**	2	3	4	5	**6**
106.	work	**1**	2	3	4	5	**6**

After having done the task ….

….how difficult do you think the task was?:

very difficult					**very easy**
1	2	3	4	5	**6**

….have you changed your opinion about what might be typical features of Australian English?:

_____