Synthesis of sign and speech in a New Zealand Sign Language-target session: oral channel variation of hearing bimodal bilingual children of Deaf parents

by

Kaitlyn Smith

A thesis
submitted to Victoria University of Wellington in partial fulfilment of the requirements for the degree of Masters of Humanities in Linguistics

Victoria University of Wellington
2017

Abstract

This thesis investigates the uniquely "bimodal" bilingual language production of some of the New Zealand Deaf community's youngest members—hearing and cochlear-implanted Deaf children who have Deaf signing parents. These bimodal bilinguals (aged 4-9 years old) are native users of two typologically different languages (New Zealand Sign Language (NZSL) and English), and two modalities (visual-manual and auditory-oral). The primary focus of this study is the variation found in the oral channel produced by these bimodal bilingual children, during a sign-target session (i.e. a signed conversation with a Deaf interlocutor), involving a game designed to elicit location and motion descriptions alongside a sociolinguistic interview.

The findings of this study are three-fold. Firstly, the variation of audible and visual volumes of the oral channel (the spoken modality) between and within participants' language sessions is described. Notably, audible volume ranges from voiceless, whispered, and fully-voiced productions. Audible volume is found to have an inverse relationship with visual volume, in that reduced auditory cues reflect an increase in visual cues used for clarification. Additionally, a lowered audible volume (whispers or voiceless mouthings) is associated with reduced English, aligning with some NZSL grammatical structures, while full-voice is associated with intact English grammatical structures. Transfer in the opposite direction is also evident during descriptions of a motion event, in that English structures for encoding 'path' surface in the manual channel (the signed modality). Bidirectional transfer also occurs simultaneously, where structures of both languages surface in both linguistic channels.

Secondly, the coordination of the oral and manual channels during descriptions of location and motion is described. Notably, the linguistic channels are tightly temporally synchronised in the coordination of meaning. The oral channel can function gesturally by modifying or emphasising meaning in the manual channel; a similar function to co-speech gesture used by hearing users of spoken languages. Thirdly, this thesis details the children's attitudes towards their use of NZSL and English, highlighting their sensitivity to the uniqueness of their heritage language, the movement between Deaf and hearing worlds and associated languages, and their role in passing on their sign language to other hearing people. Their Deaf/Coda and hearing cultural identification is found to be entangled in use of both oral and manual channels. The oral channel is multifaceted in the ways it functions for both the bimodal bilingual child and

their Deaf interlocutor, and thus operates at the intersection of language, cognition and culture. Bimodal bilinguals' use of the oral channel is influenced by the contact situation that exists between Deaf and hearing communities, the cognitive cost of language suppression, and the interactional setting.

This study contributes to growing global research conducted on the language production of bimodal bilinguals. It provides preliminary insight into oral channel features of young native NZSL users as a way of better understanding bimodal bilingual language development, the connections between audiological status and language, the interplay of codes across linguistic channels, and the role that modality plays in shaping meaning across all human languages.

Acknowledgements

Warm thanks to everyone within the School of Linguistics and Applied Language Studies at Victoria University of Wellington for inspiring me to continue to pursue Linguistics research. Thank you to Victoria University of Wellington for the Masters by thesis scholarship.

Many thanks to my supervisor, Corinne Seals, whose mentorship and friendship was paramount to the completion of this study, and for sparking my interest in heritage language research.

Special thanks to Rachel McKee and the McKee family for introducing me to the fruitful and fascinating research area of bimodal bilingualism and for many significant conversations which helped me engage more deeply with the data.

Thanks to Vanessa Petroj for welcoming me into the conversation about whispering of ASL-English bimodal bilinguals.

To my beautiful family—my two big sisters (and their partners), my three parents, and grandparents—thank you for encouraging me at every step and with every endeavour. I am so proud to have an international passionate support crew only a phone call or text message away, forming a willing human editing machine.

To my friends and fellow post-graduate students, thank you for the daily words of encouragement. I am especially grateful for those cups of tea, pizzas, hugs, and laughs. Big thanks to Micky Vale for carefully reading parts of my thesis.

The biggest thank you goes to the enthusiastic, and frankly, awesome children involved in this study, and their parents. When asked by people what I am researching, one of the first things I delighted in sharing was how I get to analyse the language of such incredible (and adorable!) people. Thank you for your time, even if you were fighting a cold or a little nervous—I hope you enjoyed the strange game you played! I hope you read this when you are older.

Table of Contents

Abstract i

Acknowledgements iii

Table of Contents iv

List of Tables vi

List of Figures vii

Chapter 1: Introduction 1

- 1.1 Research motivation 1
- 1.2 Research questions 2
- 1.3 Language synthesis 3
- 1.4 Bimodal bilingual children 5
- 1.5 Sign-target sessions 7
- 1.6 The roles of the oral channel in signed languages 8
- 1.7 Location and motion language 9
- 1.8 Gesture and oral channel in communication 10
- 1.9 A note on terminology 11
- 1.10 Overview of thesis 12

Chapter 2: Literature Review 13

- 2.1 New Zealand Sign Language across the ages 13
- 2.2 A comparison of NZSL and English 16
- 2.3 Oral channel in Deaf communities 22
- 2.4 The Language Synthesis Model 27
- 2.5 The effect of code-blending on oral and manual channels 29
- 2.6 Bimodal bilinguals as heritage signers 31
- 2.7 Language development of monolingual and bilingual d/Deaf and hearing children 35
- 2.8 Chapter summary 37

Chapter 3: Research design and methodology 39

- 3.1 Participant Recruitment 39
- 3.2 The pre-study logistics 42
- 3.3 Data collection 44
- 3.4 Ethical considerations 49
- 3.5 Analysis 50
- 3.6 Positionality 53
- 3.7 Chapter summary 55

Chapter 4: Auditory-visual volume variation in the oral channel of code-blends 56

- 4.1 Whispering, mouthing, voicing 57
- 4.2 Grammaticality of the oral channel 66
- 4.3 Bidirectional transfer 78
- 4.4 Chapter summary 83

Chapter 5: Variation in the coordination of meaning in code-blended descriptions of location and motion 85

5.1 A case study of the coordination of meaning in code-blends 86
5.2 Children's attitudes towards their use of NZSL and English 100
5.3 Chapter summary 102

Chapter 6: Discussion—Synthesis of signs and speech 104

6.1 The cognitive role of synthesis 105
6.2 Socio-cultural roles of the oral channel 110
6.3 Code-blending and co-speech gesture compared 116
6.4 Chapter summary 119

Chapter 7: Conclusion 121

7.1 Contribution of study 121
7.2 Research implications 123
7.3 Practical implications 124
7.4 Limitations 125
7.5 Future research 126
7.6 Concluding remarks 127

Appendices 129

Appendix A: Follow up questionnaire for the participants' parents 129
Appendix B: Transcription conventions 132
Appendix C: SEESAW variants 135
Appendix D: The major handshapes in Auslan 136
Appendix E: Interview schedule 137
Appendix F: Ethics approval 141

References 142

List of Tables

Table 2.1: NZSL and English typological differences (adapted from Emmorey et al. (2008) and McKee (2015)) 16
Table 3.1: Tier description for annotation of oral channel types. 51
Table 3.2: Language synthesis and volume variation 53
Table 4.1: Instances of different oral channel types in the game section of the language session 58
Table 4.2: Instances of signs, spoken words, manual channel only and oral channel only 59
Table 4.3: Lucas' NZSL-aligned fully voiced utterances 69
Table 4.4: Catie's NZSL-aligned whispered utterances 71
Table 4.5: Stephen's NZSL-aligned whispered utterances 72
Table 4.6: Dominic's NZSL-aligned whispered utterances 73
Table 4.7: Jasper's NZSL-aligned mouthed/whispered utterances 75
Table 4.8: Nina's NZSL-aligned mouthed/whispered utterances 77
Table 4.9: Interlocutors' use of verbs depicting motion 78
Table 5.1: Instances of information expressed in the oral channel with depicting signs 99

List of Figures

Figure 2.1 The Language Synthesis Model (Lillo-Martin et al., 2014, p. 2) 28
Figure 3.1: The configuration of language session.....45
Figure 4.1: Auditory volume and visual volume continua 65
Figure 6.1: The Language Synthesis Model (Lillo-Martin et al., 2014, p. 2) 105

Material from the *Online Dictionary of New Zealand Sign Language* (http://nzsl.vuw.ac.nz) (McKee et al., 2011) reproduced in this thesis is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

Chapter 1: Introduction

The diverse nature of language is phenomenal, yet our understanding of it will remain incomplete if we do not take modality into due consideration. Natural signed languages used by Deaf communities are produced and perceived in the visual-manual modality, in contrast with the auditory-oral modality of spoken languages. This study sets out to explore how separate languages reveal themselves in the oral and manual channels of children who are bilingual in a signed and a spoken language (bimodal bilinguals). The cross-linguistic influence of bilinguals' languages has been widely researched, however previous research has primarily focused on language production of unimodal bilinguals (speech-speech bilinguals more so than sign-sign bilinguals). Bimodal bilingualism (or speech-sign bilingualism) offers remarkable insight into bilingual language production, particularly given the ability to produce both languages simultaneously as the two languages have non-competing oral and manual articulators. This study thus examines how and why the oral channel is employed in sign-target language sessions (signed conversation with a Deaf interlocutor) of six New Zealand Sign Language (NZSL)-English bimodal bilingual children aged four to nine years of age. These children include five who are hearing and one Deaf child with a cochlear implant—all whom have at least one Deaf parent.

1.1 Research motivation

This research project is an empirical study, detailing use of the oral channel by bimodal bilingual children; a necessary addition to the majority of studies of signed languages that focus primarily on the manual channel. I was inspired to focus specifically on the oral channel due to my own observations in my acquisition of NZSL as a hearing second language learner. As turning 'voice off' was encouraged by my sign language teachers in order to focus on communicating in sign, naturally the 'unedited' use of voice by the bimodal bilinguals in this study led me on a quest to discover more about the role of the oral channel in bimodal bilingual children language production—additionally my interest extends to Deaf parents using voice with hearing children (and with other Deaf adults) which I have observed within and outside of this study.

Moreover, this study contributes to the growing effort to support and better understand the patterns of language use in the NZSL-English contact situation in New Zealand by looking to some of the youngest signers of the Deaf community. Amidst concerns within the New Zealand Deaf community about current and future threats to NZSL (including cochlear implantation) (McKee & Manning, 2015), I embarked on this research project with the aim of benefiting the families involved. Although cochlear implantation often leads to prioritisation of spoken language development (especially in families with hearing parents), it is interesting to consider the language use of Deaf children, who can hear due to cochlear implants, and have signing parents who transmit a sign language to them, alongside children who are born hearing with Deaf parents. McKee and Manning (2015) point out that a priority of the Deaf community is "ensuring the acquisition and transmission of NZSL in early childhood and in education, as well as establishing Deaf community leadership in the strategic promotion and maintenance of its language" (p. 483). Examining the language choices of children growing up as bimodal bilingual contributes to this priority, providing an account of their linguistic experience and behaviours. As McKee and Manning (2015) outline, "the most critical factor in assessing language vitality is whether children are learning the language, the quality of their language, and whether they can use the language in important contexts" (p. 49).

1.2 Research questions

By investigating the effect simultaneity has on the linguistic channels during bimodal bilingual language production in a sign-target session, this study aims to answer the central question:

> *What role(s) does the oral channel play in blended language use of bimodal bilingual children in the context of a sign-target session? In other words, is language synthesis produced for the sake of the child, the Deaf interlocutor, or both?*

Deriving from the above central point of inquiry, this thesis centres primarily around three key research questions:

1) What auditory-visual[1] volumes of the oral channel do bimodal bilingual children use in a sign-target language session, and do different audible volumes correspond with the grammar of the spoken or the signed language?

[1] Visual volume in this thesis refers to reinforced mouth shapes – an underresearched area of study.

2) How is meaning expressed across oral and manual channels in location and motion narratives produced by bimodal bilinguals in a sign-target language session?
3) How do sociolinguistic factors, including bimodal bilingual children's attitudes towards their use of NZSL and English, influence the use of language synthesis?

1.3 Language synthesis

Bilinguals can draw on or synthesise their languages in a number of ways. While *code-switching* (the sequential alternation from one language to another within a single conversation) is common in the language production of bilinguals, bimodal bilinguals have been found to prefer *code-blending* (sometimes referred to as code-mixing).[2] Code-blending, a term coined by Emmorey, Borinstein, and Thompson (2005), is defined as "the phonological output of both spoken language and signed language simultaneously" (Palmer, 2015, p. 4), so that one or more signs are co-produced with one or more mouthed English words. Due to bimodal bilinguals' two linguistic channels, lexical items do not need to compete for production at the level of articulation, unlike the case for unimodal bilinguals, who instead code-switch (Lillo-Martin, de Quadros, Chen Pichler, & Fieldsteel, 2014; Branchini & Donati, 2016). While some studies class voiced (including whispered) articulations as code-blends (Petroj, Guerrera, & Davidson, 2014), the current study also classes voiceless mouthings as code-blends (paralleling van den Bogaerde & Baker, 2008). Importantly, code-blending should not be confused with Manually Coded English systems, such as Australasian Signed English (ASE) (Johnston & Schembri, 2007). Such systems were artificially designed by educators during the oralist (exclusively speech and lip-reading) tradition era of education in order to communicate in English with the hands (see Chapter 2).[3] Conversely, code-blending is an organic outcome of bimodal bilinguals' dual languages and modalities (Palmer, 2015; see Image 1.1, in which Stephen[4], a participant of the current study, is whispering and signing simultaneously).

[2] However, bimodal bilinguals (Codas and interpreters) have been known to produce code-switches around other bilinguals; for example, "vocalizing a nonmanual feature of a sign rather than using an English lexical item, for example, "Pah! You've arrived!" (Napier, 2006, p. 41).
[3] There have been reports (e.g. Lillo-Martin, Quadros, Chen Pichler, & Fieldsteel, 2014) that many educators in America have been led to believe that (unimodal and bimodal) bilingualism has negative impacts on language acquisition, and in particular, that code-mixing is erroneously linked to confusion. Investigating the bilingual language use of young children from Deaf signing families is with the overt aim of minimising the potency of this belief and maximising awareness of code-mixing as a natural phenomenon.
[4] All of the participants' names in this study are pseudonyms.

Image 1.1: Stephen code-blending

Code-switching has been found to be less common than code-blending to the extent that in Palmer's (2015) study of American Sign Language(ASL)-English bilinguals' word order choice there were no instances of code-switching found in unimodal bilingual production. Instead, there were switches between one language to a code-blend and vice versa. Switches are considered *language-mode switches* (a term coined by Palmer [2015]).

Moreover, due to *cross-linguistic influence* or *transfer* (Cummins, 1991; Pavlenko & Jarvis, 2002; Brown & Gullberg, 2011), the morphosyntax of bilinguals' utterances may more or less align with either language, and in bimodal bilingual production, certain signed or spoken language grammar features may exhibit in either modality. Thus, it is possible for sign language features to appear in the oral channel, and spoken language features in the manual channel. For instance, the signed string may be grammatically intact while the spoken string is morphologically reduced to align with the grammar of the signed language (Branchini & Donati, 2016). This may occur even when only one linguistic channel is overtly expressed; as such, "the language of the surfacing lexical items may not necessarily be the language governing the syntax of the production" (Petroj et al., 2014, p. 2). The Language Synthesis Model, described in Chapter 2 (Section 2.4), accounts for the aforementioned synthesis types in both bimodal and unimodal bilingual language production. Bimodal bilinguals have been found to use their codes in ways appropriate to the sociolinguistic context (Emmorey et al., 2008; cf. Chapter 2, Section 2.6).

1.4 Bimodal bilingual children

Research conducted on bimodal bilingualism has primarily focused on adult cohorts (Bishop et al., 2006; Emmorey et al., 2008). Recent research has begun to delve into the language production of cohorts of children (van den Bogaerde & Baker, 2008; Lillo-Martin, Koulidobrova, Quadros, & Chen Pichler, 2012; Davidson, Lillo-Martin, & Chen Pichler, 2014), but childhood bimodal bilingualism has largely been overlooked in research on bilingualism. This research project explores a previously underdescribed pocket of the New Zealand Deaf community.

NZSL is used by approximately 20,235[5] people, according to the 2013 Census (Statistics New Zealand, 2015). This unique linguistic population of Aotearoa/New Zealand includes Deaf[6] people, interpreters, and hearing family and friends of Deaf people. An important subset of any minority linguistic population are the children who natively acquire and use the language. Often bimodal bilinguals, hearing Children of Deaf Adults (Codas) who sign, and Deaf Children (who can hear due to cochlear implants) of Deaf Adults (DDCI) and sign, are unlike unimodal bilinguals as they have acquired languages produced in separate modalities. Bimodal bilinguals therefore have two modalities and languages at their disposal for language production. As Codas and DDCI have at least one Deaf parent, they have early exposure to both spoken and sign languages: they acquire sign language through their parent(s) and other signing family members, and spoken language through other hearing relatives, formal education, and the majority of hearing people who use a spoken language (van den Bogaerde & Baker, 2008). This study will focus on five Codas, and one DDCI, between four and nine years old.

Codas' and DDCI's implicit linguistic competence (cf. Paradis, 2007) gained through native sign language acquisition is what sets these children who have Deaf parents apart from deaf bimodal bilinguals born to hearing parents. Also, unlike hearing and Deaf second language learners of NZSL, Codas and DDCI have not necessarily received formal sign language training (Bishop, Hicks, Bertone, & Sala, 2006). Additionally, while many Deaf people have

[5] This figure was the total number of people who ticked the box that indicated that they could hold a conversation "about a lot of everyday things" in NZSL. A possible problem with this figure is that it is likely to include second language learners who are not fluent.

[6] In signed language and Deaf studies literature, the capitalised *Deaf* form refers to Deaf people who view deafness as a part of their cultural identity rather than as a disability (Chen Pichler, Hochgesang, Lillo-Martin, & Quadros, 2010). Capital D Deafness generally requires involvement with the Deaf community, and competence in the sign language of that community.

learnt to sign as well as to write, read, and sometimes speak, Deaf people who have successful cochlear implants (CI) may have more auditory access to spoken language than Deaf people who do not. Deaf children (without CI) of Deaf parents (DCDP) are excluded from this study as they "do not have direct access to the spoken language, unless they are trained to speak through explicit teaching sessions often lasting many years" (Branchini & Donati, 2016, p. 7). Also, many Deaf people, although bilingual, prefer not to speak (Emmorey et al., 2008). However, some Deaf people in Aotearoa/New Zealand do use their voices while signing (McKee, 2015). Furthermore, while early communication of Deaf children from Deaf families is fairly well-researched (Harris, 2011), less is known about the language use of DDCI or Codas who are also native signers. It is paramount that we capture the full spectrum of child language use in signed contexts (Lillo-Martin et al., 2012).

As is the case in most Deaf communities (Harris, 2011), Deaf children in Aotearoa/New Zealand who are born to Deaf native signers are in the minority. Excluding the approximately 10% or less of Deaf people who are born to Deaf parents (Mitchell & Karchmer, 2004), most deaf people are born to hearing parents, often receive cochlear implants, are encouraged to speak, and sometimes acquire NZSL later in life as non-native signers (McKee & McKee, 2007). Few DCDP have cochlear implants (i.e. DDCI) (although there are a growing number who do receive them [Rinaldi & Caselli, 2014, p. 79]). Thus, deaf children with cochlear implants born to hearing parents (CIH) are the focus of most research concerning the link between language use and cochlear implantation—often with a focus on their development of spoken language. In order to capture a more inclusive picture of both the language use of all CI users, and the language use of all types of bimodal bilinguals who have Deaf parents, researching language use of DDCI is important. In recent studies (see Chapter 2), this group proves to have different (more advanced) patterns of spoken language use and development compared to deaf children with cochlear implants who do not acquire a sign language—such findings have been attributed to their native acquisition of a sign language. Instead, DDCI pattern more with hearing Codas with regards to their language acquisition and development (Davidson et al., 2014; Rinaldi & Caselli, 2014). Ironically, Codas make up the majority (greater than 90%) of children who have Deaf native signing parents. Hence, while many deaf children do not grow up with a sign language, more than 60% of Codas are native signers, making them "the succeeding generation in the Deaf world" (Hoffmeister, 2007, p. 190).

The current study situates bimodal bilingual children's language use in relation not only to their individual audiological experience (born hearing, or born deaf and receiving cochlear implant[s]), but also their home experiences of language within their families and their school experiences of language with peers and teachers. Given the recent conceptualization of Codas as heritage signers (Reynolds et al., 2015), this study also taps into family language strategies, language contact at a societal level, and the linguistic vitality and maintenance of NZSL. For the purposes of this project, I have limited my focus to signers who are experiencing language through recent heritage (Seals, 2016)—children who have been exposed to NZSL from birth, or after early cochlear implantation, with at least one Deaf signing parent. This aligns with studies of spoken language development that "take it as given that normative data should come from studies of children who have at least one parent who is a fluent speaker of the language that is being acquired" (Harris, 2011, p. 321). As the bimodal bilingual children are the users of the language analysed in this thesis, their reflections on and attitudes towards their use of NZSL and English are drawn into the discussion of the role(s) of the oral channel during code-blending.

1.5 Sign-target sessions

Observing and analysing linguistic features of bimodal bilinguals, even in interactions which necessitate solely one language (in this project, signing with a Deaf interlocutor), is found to provide insight into how these languages may interact in the brain and in practice (Lillo-Martin et al., 2014, p. 2). As the aim of the current study is to determine how bimodal bilinguals use the oral channel in tandem with the manual channel, a sign-target session (i.e. a session where the child's interlocutor was a Deaf signer) was the context most likely to elicit use of both languages, rather than speech-target sessions. Indeed, Lillo-Martin et al. (2014) researched discourse separation in the language production of American and Brazilian Codas who were between the ages of one and three years old (who respectively are native ASL-English and native Libras- [Brazilian Sign Language] Portuguese bilinguals), and found that the proportion of speech and sign was dependent on the target language of the session: speech-target sessions produced speech with very little sign, while sign-target sessions produced sign with a lot more speech. Lillo-Martin et al. (2014) suggest this is due to the sociolinguistic environment favouring a spoken language as the majority language with higher social status, while sign language is the minority language. In the current study, therefore, hearing interlocutors were

not chosen as they would have likely elicited less sign language than Deaf interlocutors. Instead, language sessions were conducted in NZSL by Deaf interlocutors.

1.6 The roles of the oral channel in signed languages

The role of the oral channel has received scattered attention in sign language linguistics research (Bishop & Hicks, 2005; Emmorey et al., 2008; Lillo-Martin et al., 2012; Kanto, Laakso, & Huttunen, 2016), however it is under-researched. In particular, the use of different volumes of speech used during sign language production of bimodal bilinguals is a fairly untapped area of research (Petroj et al., 2014). The presence of the oral channel even in Deaf native sign language production (mainly in the form of so-called 'mouthings' and 'mouth gestures') sparks plenty of questions, and researchers are beginning to query assumptions about the universality of different types of mouth actions used across spoken and signed languages:

> "[A]re the silent mouthings of spoken language words simply borrowings from the respective majority community spoken language(s)? Are those mouth actions that are not silent mouthings of spoken words conventionalized linguistic units proper to each signed language, culturally linked semi-conventional gestural units shared by signers with members of the majority speaking community, or even gestures and expressions common to all humans?" (Johnston, Van Roekel, & Schembri, 2015, p. 1)

In this thesis, I contend that the variation in the oral channel produced by hearing and Deaf cochlear-implanted bimodal bilinguals is pivotal in answering these broader questions. In particular, whispering was a striking feature of my early investigations. Variation in voice is clearly more marked in communication with a Deaf interlocutor for whom speech is inaccessible, compared to modulating volume with a hearing interlocutor for whom acoustic cues are accessible. Nevertheless, bimodal bilingual voice variation in the speech used in sign-target language sessions is relatively under-researched compared to voice used by those who only know spoken language(s).

It is evident whispered speech used by bimodal bilinguals needs more investigation; to date, only one study in America focuses on this area (Petroj et al., 2014)[7], which means the current

[7] However, this research is ongoing (Petroj, to appear).

study is one of the first on whispering of bimodal bilinguals. In Petroj et al.'s (2014) study, whispered speech occurred the most when bimodal bilingual children were communicating with Deaf native signers, while full-voice speech was used the most when communicating with hearing signers. Furthermore, Petroj et al. (2014) found that over time (from aged 2 to 7), fully-voiced utterances were increasingly produced with English grammar, while whispered utterances were produced with a similar amount of ASL-dominant grammar over time. Petroj et al. (2014) conclude that the oral channel is produced because language suppression is cognitively more costly for bilinguals than simultaneous production of both languages. Whispering is thus argued to be a way of maintaining the speech signal in an ASL-dominant mode (Petroj et al., 2014). Looking to the volume of the oral channel certainly provides insight into the role of the oral channel, and an aim of this study is to investigate whether the patterns found by Petroj et al. (2014) align with those in the language production of NZSL-English bilinguals.

1.7 Location and motion language

The influence a language has on the production of the other in bilingual language production is made apparent by focusing on linguistic features which are typologically different. Not only are the bimodal bilinguals in this study acquiring two separate modalities (visual-manual and oral-auditory), but their two languages, NZSL and English, also differ typologically (see Chapter 2, Section 2.2. for more details). Unique to signed languages is their meaningful use of space in a visual-manual modality. There exists a striking typological difference between English and NZSL regarding how location and motion language is expressed, which poses an interesting linguistic site for examining how the two modalities are used to express meaning. Signers can make use of the visual-gestural mode to communicate spatial descriptions in a fairly iconic way. While English encodes spatial information separately in a verb and prepositional phrase, as in *the dog* ***jumps over*** *the fence*, NZSL (like many other sign languages, including ASL) encodes spatial information together in *depicting signs* (see Chapter 2 for more information, and Image 1.2 of Dominic, a participant in this study signing ‘the seesaw tipped and the people fell off’). As *depicting signs* are “very much a part of everyday interactions between signers”, particularly in creative story-telling (Johnston & Schembri, 2007, p. 164), location and motion language leant itself well to the creation of a game for the children to play, with the aim of making participation more enjoyable for the children, who otherwise could be reluctant to produce language in front of a camera.

Image 1.2: Dominic signing 2hCL-B:seesaw-tips 2hCL-O:people-slide-off

1.8 Gesture and oral channel in communication

This thesis is situated in two historically contentious areas of sign language linguistics—the gestural nature of depicting signs and the oral channel's ubiquity across signed languages.

Rejecting the presence and role of gesture in sign languages has "led to strong dualisms between notions of language and gesture in the field" (Hodge & Johnston, 2014, p. 263). For instance, location, motion, and handling signs in sign languages have historically been described as types of *classifier constructions* akin to verbal classifiers in spoken languages or polymorphemic words (Supalla, 1982). The relatively recent label adopted in this thesis, *depicting signs*, interprets these signs as partly visual and linguistic representations (Schembri, Jones, & Burnham, 2005), and their gestural elements have been recognized, especially given the recent recognition of gesture as integral to language in general (Kendon 2004; McNeill, 1992).

Hence, it is important to note that in reality, oral and manual modalities are not restricted to either speakers or signers of a language respectively. They are potentially available and used by all (monolingual and bilingual) language users in linguistic and gestural ways, as the hands and mouth afford humans an array of possibilities in our daily interactions. As Hodge and Johnston (2014) point out, "speakers and signers co-construct meaning using various multimodal strategies combining speech, sign, gesture and enactment (i.e. semiotic signs of different types) to produce embodied spatio-temporal utterances ('composite utterances')" (p. 264). While the main means of language production for speakers is the oral channel, spoken language is more often than not produced with co-speech gesture (cf. McNeill, 1992), in which the hands (and non-manual gestures, such as head and body movements) are used concurrent

with the oral channel. Emmorey et al. (2008) found that the *manual* channel in code-blends was used in a similar way to co-speech gesture regarding "the timing and coexpressiveness of the vocal and manual modalities, but differed with respect to the conventionality, combinational structure, and dependency on speech" (p. 51). Thus, it is interesting to consider whether or not the *oral* channel fulfils a similar role to co-speech gesture, when it is concurrently produced with the manual (and non-manual) channels in the sign language production of bimodal bilinguals.

This study explores how children utilise gesture, sign, and speech as parts of meaningful bimodal bilingual production. In doing so, this thesis feeds into macro-level explorations of the language politics around language systems and modalities, and targets the diversity present in human language across both the manual and oral channels.

1.9 A note on terminology

People who have Deaf parents are referred to by many names in the relevant literature and Deaf community settings. "Koda" stands for young "kids of Deaf adults", while "Coda" is often used more broadly to stand for "Children of Deaf Adults", including those who are now adults. "Coda" was coined by Millie Brother who founded the CODA organisation in America in 1982 to create a space for Codas in the Deaf world, recognising and uniting a community of children who have a shared experience of growing up with Deaf parents (Bishop & Hicks, 2005). In the literature on children from Deaf families, "Coda" refers specifically to hearing children of Deaf parents (HCDP). Although DCDP also have Deaf parents, the term excludes DCDP, as they do not necessarily share the same salient cultural and linguistic experiences which come with having a different audiological status to their Deaf parents. Deaf families are culturally different to hearing families in many ways, such as their use of distinctive communication strategies and behaviours, which are sensitive to the audiological status of the interlocutors (Emmorey et al., 2008). Thus, hearing kids with Deaf parents are often bilingual and bicultural due to their access to both Deaf and hearing worlds and languages—and the term "Coda" acts as an identity marker for many of them (Bishop & Hicks, 2005).

Deaf children with cochlear implants who have Deaf parents are referred to by the acronym DDCI (cf. Petroj, to appear), and Deaf children with CI who have hearing parents are referred to by the acronym CIH (cf. Cruz, Kozak, Pizzio, Quadros, & Pichler, 2012). The Codas and

DDCI participating in this study are mainly referred to as bimodal bilinguals. It is acknowledged that regardless of audiological status, DCDP, Codas and DDCI all have Deaf parents, and this provides motivation for them instead to be categorised together somehow. Indeed, Napier (2014) calls for a less divisive term, People of Deaf families (PDF), which includes Deaf or hearing people who are growing up with one or more Deaf family members (parents and/or siblings). However, to avoid confusion in this thesis, the separate terms "Coda" and "DDCI" will also be used where necessary to clarify which particular group is being referred to.

1.10 Overview of thesis

This chapter has addressed the theoretical underpinnings of this thesis and my personal motivation for researching bimodal bilinguals. Chapter 2 reviews the relevant literature regarding bimodal bilingualism with regards to culture, cognition and language. Chapter 3 outlines the project's methodology, including the design of an original language elicitation game for the participants to play in addition to a sociolinguistic interview in language sessions with Deaf interlocutors, as well as outlining participant recruitment, ethical considerations, limitations, researcher positionality, and coding and analysis methods. Chapter 3 also outlines the principles of Interactional Sociolinguistics which this study draws on.

To determine how the six bimodal bilingual participants used the oral channel during language synthesis in sign-target sessions when the interlocutor is Deaf, in Chapter 4, I firstly describe the visual and audible characteristics of the oral channel in the bimodal bilingual data, in terms of the audible and visual volumes of the oral channel (Chapter 4, Section 4.1). Additionally, I establish whether there is a connection between volume and the morphosyntactic form of oral and manual channels, as English and NZSL are, in many respects, typologically opposing languages (Chapter 4, Section 4.2). In Chapter 5, I investigate the coordination of semantic information expressed in code-blends, and the gestural nature of the oral channel (Section 5.1), and the bimodal bilingual children's attitudes towards their use of NZSL and English (Section 5.2). The sixth chapter draws together the findings presented in preceding findings chapters, to discuss some child-specific and non-linguistic (cognitive, cultural, and interactional) factors involved in language synthesis, and the role of the oral channel in a sign-target language session. The concluding chapter summarises the contributions of the study, and discusses practical and research implications of the study.

Chapter 2: Literature Review

It is clear that bimodal language production—in particular, code-blending—has implications for our understanding of language production in general. Variation in bilingual language production appears to hinge on a combination of cognitive, cultural and linguistic factors. The first two sections of this chapter outline the role of children in the history and future of New Zealand Sign Language (NZSL), and focus on typological differences between NZSL and English. The third, fourth and fifth sections focus on the use of the oral channel by Deaf and hearing signers, the Language Synthesis Model (Lillo-Martin et al., 2012) as one way of representing the bimodal bilingual language production process, and phonological and semantic effects of oral channel use during code-blending. The final two sections then review research which has framed bimodal bilinguals as heritage signers, the experiences of Codas and DDCI within Deaf and hearing communities, and compares language development across bilingual and monolingual hearing and d/Deaf (with and without CI) children cohorts.

2.1 New Zealand Sign Language across the ages

2.1.1 Evolution of NZSL and its role in the education system

Children were key in NZSL's emergence and development. Today, the ways in which children acquire and use NZSL in adolescence, and later as adults, is regarded as a predictor of NZSL's survival (McKee & Manning, 2015). NZSL evolved during interactions within the tight-knit networks of Deaf children in three residential Schools for the Deaf in Aotearoa/New Zealand. However, British Sign Language (BSL) and Australian Sign Language (Auslan) influenced NZSL early on, before and after the first School for the Deaf opened in Christchurch in the 1880s (McKee & McKee, 2011, p. 490). From 1880, Deaf education in Aotearoa/New Zealand had an approximately 100 year period of enforced oralism (exclusively speech and lip-reading), which was relatively long compared to the oralist period in Australia and Britain, and resulted in disrupted intergenerational transmission of NZSL (Johnston & Schembri, 2007). During this time, NZSL only survived through Deaf children who used it in secret as an underground language in schools, who then continued to use it as adults. The oralist education period was followed by a period of Australasian Signed English (ASE) instruction from 1979 until 1993, as NZSL had not been recognised as a fully-fledged language at the time (McKee & McKee,

2011). ASE saw another influx of Auslan signs, as ASE is a system that combined Auslan signs, as well as American Signed English (SEE), and contrived signs, created by an Australian-New Zealand committee (Johnston & Schembri, 2007). Due to the delayed recognition of NZSL as a means for education early on in its development, NZSL is less established and standardised compared to many other sign languages of the world, and is characterised by considerable lexical and phonological variation (McKee & McKee, 2011).

Thus, NZSL is historically and linguistically related to BSL and Auslan, and is considered to be a part of the British Sign Language family (BANZSL) (McKee & McKee, 2011). These sign languages are lexically (McKee, Schembri, McKee, & Johnston, 2011), syntactically (Schembri et al., 2010), and phonologically similar (Schembri et al., 2009). Nevertheless, they are not identical, given their core vocabularies are diverging from one another over time (Johnston & Schembri, 2007; cf. McKee and Kennedy's (2000) lexicostatistical comparison of equivalent signs in NZSL, Auslan, BSL and ASL). NZSL core vocabulary items which differ from Auslan and BSL suggest that the underground language use in Aotearoa/New Zealand was not necessarily related to BSL or Auslan (Johnston & Schembri, 2007). For example, see Image 2.1 and 2.2 for variants of MOTHER; first, an initialised-M fingerspelt form used by both NZSL and Auslan users, whereas the other form is a 5-handshape located on the side of the head, used only by NZSL users.

Image 2.1: variant of MOTHER (McKee, McKee, Pivac Alexander, Pivac, & Vale, 2011)

Image 2.2: variant of MOTHER (McKee et al., 2011)

Conducting research on the language use of bimodal bilingual children is timely in light of the current socio-political context of the New Zealand Deaf community. Despite improved recognition and opportunities to use NZSL, it has a “vulnerable status” due to NZSL being

side-lined as an *option* for Deaf education, and the decreasing community size as bilateral cochlear implants (which are publicly funded) are increasingly becoming an option for deaf children. As a result, the linguistic experience of many deaf children is becoming more spoken language focused. Today, deaf children's access to NZSL is limited not only by the choices of their parents but also by the education system. Since 1993, NZSL has played a role in Deaf education, primarily in a bilingual capacity alongside English in two Deaf Education Centres which were previously Schools for the Deaf. These centres enrol a small number of deaf children (Reffell & McKee, 2009), and many other deaf children are educated in mainstream schools, significantly impeding the intergenerational transmission of NZSL. An inquiry conducted by the Human Rights Commission into the use of NZSL from 2012 to 2013 highlighted a critical need for more institutional and intergenerational support of NZSL acquisition, including educational resources for NZSL acquisition for parents with deaf children under five years, as well NZSL-fluent teachers, for school-aged children (McKee & Manning, 2015). It is evident that children (inclusive of Codas, DDCI and DCDP) growing up with NZSL, who continue to use NZSL as adults, will increase the likelihood for NZSL to survive and be used by future generations.

In a study on the sociolinguistic variation in NZSL, McKee and McKee (2011) found lexical variation to be most strongly associated with different age groups. They found evidence of dialect levelling[8] in the language of the youngest group of signers (aged 18-39) who used fewer and more standardised variants which had been acquired through schooling, or signs which had been adopted from other signed languages and accommodation in middle-aged and older groups to the variants of the younger group. An even younger cohort under 18 years old was not included in the McKee & McKee (2011) study, and use of NZSL by these signers has not yet been described. To continue the tracking of linguistic change and variation across age groups and social groups, such as Codas who form the majority of children born to Deaf signing parents, and evolving social groups such as DDCI, it is important to focus on children to track the development of the social and linguistic aspects of their language use (McKee & Manning, 2015).

[8] Dialect leveling refers to when dialect differences decrease in a population; which is the case for the younger group of signers in the McKee and McKee (2011) study, who use fewer variants than older signers.

Before looking further into existing literature on child bimodal bilingual language production, typological differences of NZSL and English, as well as use of the oral channel in sign language production are outlined.

2.2 A comparison of NZSL and English

2.2.1 Modality and Language

NZSL has a grammatical and phonological system distinct in many ways from English. Table 2.1 outlines some typological differences between NZSL and English.

NZSL	ENGLISH
Main phonological features/articulators are manual	Main phonological features/articulators are oral
Freer word order than English (including, but not limited to SVO)	Subject Verb Object (SVO) word order
No copula verb 'to be'	Copula verb 'to be'
Null-subject language	Not a null-subject language
Causation is generally expressed by sequencing and rhetorical questions	Causation is generally expressed by conjunctions
No determiners, although indexing signs can function similar to determiners	Determiners *a* and *the* are used
Tense is expressed lexically through temporal adverbs	Tense is marked morphologically on verbs
Grammatical inflection is expressed through modification to location, movement, and repetition of verbs and nouns	Grammatical inflection is marked morphologically on verbs and nouns
Spatial information (e.g path, manner) is encoded in depicting signs	Spatial information (e.g path, manner) is encoded in prepositions

Table 2.1: NZSL and English typological differences (adapted from Emmorey et al. (2008) and McKee (2015))

As is outlined in Table 2.1, NZSL and English are expressed by different articulators—NZSL with manual and non-manual articulators and English with oral articulators. The phonological structure of a sign consists of the *handshape*, *location* on the body or in space, the path, direction and manner of *movement* and the *orientation* of the palm (cf. McKee, 2015, p. 33).

While English is restricted to a Subject-Verb-Object (SVO) word order, NZSL has a freer word order (including, but not limited to, SVO word order) (McKee, 2015). Furthermore, many of NZSL clauses are composed of a subject, identifying "who, or what a statement is about" and predicate, "which tells what the subject is, what it is like, or what action it does" (McKee, 2015, p. 81). The predicate is not necessarily a verb—for instance, NZSL does not have a copula linking verb. Furthermore, NZSL refers to animate and inanimate entities by utilising the visual modality in a number of ways. It can be achieved by deictic pointing to present entities, or by allocating non-present entities to locations (loci) in the visual space in front of the signer (McKee, 2015). Unlike English, in NZSL, the subject can be left unexpressed (null-subject), particularly when it is expressed as a noun phrase in the previous clause (McKee et al., 2011). Additionally, while grammatical inflections are frequently affixal in English, NZSL expresses this information through modification to location, movement and repetition of verbs and nouns. Moreover, a signer can systematically set up relations between referents, often by inflecting verbs between referent-specific loci, or by using *depicting signs*, a spatial verb (McKee, 2015). *Depicting signs* and indexical signs make up the non-core native (productive) lexicon of NZSL (cf. [Johnston & Schembri, 2007] for information on the *core 'frozen'* and *non-core* native lexicons). Many of the typological differences described here and in Table 2.1 are relevant to my later analyses of the language production of native users of both English and NZSL. Below I describe in more detail how spatial information is encoded in NZSL, which is relevant to the upcoming analyses of location and motion descriptions produced by bimodal bilingual children (in Chapter 4 and 5).

2.2.2 Depicting Signs

Depicting signs are partly linguistic and partly gestural lexical items (Johnston & Schembri, 2007). They are similar across signed languages, including Auslan and ASL (Ferrara, 2012). In depicting signs, "handshape morphemes specify object type and the position of the hands in signing space schematically represents the spatial relation between two objects" (Emmorey et al., 2005, p. 832). Depicting signs iconically depict: the location of an entity, the shape, size, extent, distribution, and arrangement of entities, and the path, motion or action of an entity (Liddell, 2003), representing how they are in real life, like precise onomatopoeic three-dimensional imagery (McKee & McKee, 2007). The various types of handshapes have been grouped into categories, including: *Size and Shape Specifiers* (SASS), *Handling* and *Entity* handshapes (McKee, 2015; Johnston & Schembri, 2007), as described below.

Size and Shape Specifiers (SASS) are usually neutral handshapes, which describe how objects look in terms of shape and dimension, such as fineness, depth, and arrangement. Some SASS become lexicalised vocabulary items of the frozen lexicon, such as the sign TABLE, which began as a SASS handshape outlining a table surface with a flat handshape (see Image 2.3 below).

Image 2.3: TABLE

Handling or instrumental handshapes reflect the real world enactment of how an object is held, touched, or used. The handshape reflects the location and shape of the object, often moulding the hand to the imagined object. McKee and McKee (2007) suggest that "this category has the most overlap with natural gestures that non-signers might use to talk about objects and actions through mime" (p. 78). For example, the sign DRINK (Image 2.4) is a lexicalised handling handshape, as the shape of the hand and the upward movement towards the mouth iconically depict the act of holding a cup.

Image 2.4: CUP or DRINK[9]

[9] http://nzsl.vuw.ac.nz/signs/4264

The visual form of an *entity handshape* (Johnston & Schembri, 2007) (or *object classifier* [McKee, 2015]) represents a referent—such as body parts, quantity, arrangement, or extent of entities (McKee, 2015). These signs are often referred to as proforms, or verbs of motion and location, as they simultaneously express the pronoun of a noun and a verb predicate (McKee, 2015). Due to the visual-gestural modality and use of space, signed languages tend to be *verb-framed* languages (Slobin, 2004), meaning multiple pieces of information can be simultaneously produced in the enactment of depicting signs, such as manner of the action, path, and location of the entity. This may also be done serially, with differing frames of reference, for example, someone rock climbing can be expressed through "a 2 legs handshape to show upwards path movement, followed by the use of the two-handed bent 5 handshapes to characterise the manner of climbing" (Johnston & Schembri, 2007, p. 172). As is exemplified in Image 2.5, an index finger represents a person (CL-1) and the elliptical movement depicts the person turning and walking away. Crucially this is distinct from English where such information tends to not be encoded in a single lexical item. English is a *satellite-framed* language meaning it typically expresses spatial events in linear sequential constructions (Brown & Gullberg, 2011), encoding manner in the verb (e.g. turn, walk), and locative information in a prepositional phrase (e.g. away) (however, English also has some Latinate path verbs, such as 'ascend', which encode path and manner in one word, yet they are used more formally).

Image 2.5: CL-1:turn and walk away

Schembri et al. (2005) compared gesture from adult non-signers, and the sign language production of signers of Auslan, ASL, and Taiwan Sign Language (TSL), by eliciting motion event narratives from short video clips. They found that location and motion appear similar between participants, whereas handshape sets them apart, and they therefore argue that locative and movement units are blends of linguistic and gestural elements, and handshape configurations are more conventionalised in signed languages than in co-speech gesture.

Acquisition of depicting signs, particularly motion events, is also connected to the acquisition of motor and cognitive skills, which are "necessary for the accurate representation of motion events" (Schembri et al., 2005). Singleton and Newport (2004) found that DCDP native in ASL aged 6;1 to 10;10 use similar movement and locative units to ASL native targets, but less developed handshapes (Schembri et al., 2005). Thus, bimodal bilingual children in this study are not expected to produce depicting signs at the same level as NZSL-dominant adult Deaf signers.

2.2.3 Non-native lexicon of NZSL

As Bishop, Hicks, Bertone, and Sala (2006) point out, "the majority of the world's signed languages have a concurrent relationship with a spoken language" (p. 83), and contact between signed and spoken languages manifest in similar ways cross-linguistically, even for those which have low rates of lexical commonality such as ASL which is viewed as mutually unintelligible from BANZSL languages[10] (cf. McKee & Kennedy, 2000). Due to the contact between English as a majority language and NZSL as a minority language in Aotearoa/New Zealand, NZSL has been influenced by English at morphological, syntactic and lexical levels. Thus, researching bimodal bilingual language variation involves consideration of how different languages influence one another both at individual-level, and societal-levels of language contact. One could argue there exists a continuum of contact phenomena—ranging from established loans, less-established loans, and variable code-switched or code-blended English features which have not yet been integrated into the non-native lexicon. According to Sutton-Spence (2000), "[a]lthough certain loans must be considered established loans, purely on the grounds of their widespread use within BSL, it is often difficult to know when a form from English is an established loan and when it is an instance of code-mixing or a nonce loan" (p. 367).

Spoken and written language influences both the manual channnel (in the form of 'loan signs', morphological additions, and fingerspelling (spelling out each letter or initialising), and the oral channel (McKee & McKee, 2011). For instance, NZSL borrows from meanings of English words in loan translations (cf. McKee, McKee, Pivac Alexander, and Siu's (2016) study of place name reference in NZSL). Additionally, syntactic constructions have also been borrowed

[10] However, they have similar word ordering, iconicity, and increasing numbers of ASL signs borrowed into NZSL given ASL's international status (cf. Johnston & Schembri, 2007)

from English in NZSL (McKee & McKee, 2007), and English-influenced signed prepositions ON and conjunction BECAUSE have also been found in ASL (Lucas and Valli, 1992). Overall, the intensity of contact, restricted access to full sign language models, and the signer's degree of competence in spoken and signed languages determine the type of borrowing that might occur (Sutton-Spence, 2000). Napier (2006) studied language influence in the language production of Auslan-English interpreters and Deaf signers in formal university lectures, and found that rather than a difference between hearing interpreters and Deaf signers, there was more transference for the Deaf and interpreters who were non-native signers (who used marked fingerspelling and mouthing), compared to Deaf signers and interpreters who had natively acquired Auslan (who used less marked fingerspelling, and more Auslan mouthing).

2.2.5 Signing in English vs contact signing

The presence of a spoken or written language in one's signing is referred to as a *natural sign system* (NSS) rather than a *natural sign language* (Fischer, 1998). Two types of NSS which Johnston & Schembri (2007) observe in an Australian context include "'signing in English' (intentionally fully-representing each English word) or using a type of 'contact signing' (representing a mixture of Auslan and English in various proportions)" (Johnston & Schembri, 2007, p. 38). *Signing in English* often occurs naturally and spontaneously within the signing community to represent English writing (Johnston & Schembri, 2007) as opposed to contrived systems such as Australasian Signed English (ASE). Content words in English are represented by signs, and prefixes and suffixes are often fingerspelled, unlike ASE which uses contrived signs. Mouthing or vocalisation is used simultaneously with the hands (Johnston & Schembri, 2007). It is used by those who are adept in Auslan and English, with interlocutors who are adept in Auslan and English (2007). Furthermore, communication with hearing people is found to lead to more English-like signing and mouthings (Johnston, 2002). *Contact signing,* on the other hand, involves a synthesis of NZSL and English lexical items, syntactic structures from either language (including spatial and non-manual features and English word ordering [Johnston & Schembri, 2007]) and morphological features represented by fingerspelling and mouthing, resulting in a large degree of variation (Johnston & Schembri, 2007). This type of NSS is often used by non-native signers, although Lucas and Valli (1992) found in the American context that contact signing is used by Deaf signers—especially during formal contexts with familiar interlocutors, and less so if wanting to index a Deaf identity. The next section narrows in on the different oral channel types found across hearing and Deaf signers.

2.3 Oral channel in Deaf communities

2.3.1 Oral channel types

In many sign languages, "[t]he mouth is a prominent site of non-manual activity and movements of the mouth are an obvious accompaniment to manual signing" (Johnston et al., 2016, p. 3). The oral channel can be drawn on in a number of ways by signers, including use of *mouthings* and *mouth gestures* (Woll, 2001), as well as *whispers*, *full-voice*, *Deaf voice* and *vocalisations*.

Mouthings are voiceless articulations derived from spoken words where "no auditory production is present" (Petroj et al., 2014), produced while signing. Mouthings usually have a semantic correspondence with a sign produced at the same time (McKee, 2015). They are often used to disambiguate manually homonymous forms (e.g. the sign WORK can simultaneously be mouthed with a word (e.g. *task*) in English to specify a meaning that does not have its own sign [McKee, 2015]). A further use of mouthing seems to be as a way of providing emphasis: for example McKee (2007) states that "adding a mouthing component to a particular sign phrase increases the visual volume to make part of a message stand out" (p. 4). Mouthings are also used with fingerspelled abbreviations and are often dropped once the sign and mouthing have been established together in a particular context (Johnston & Schembri, 2007). Mouthings may be fully articulated, or present as partial articulations of the word, in which "vowels are sometimes reduced and changes to the mouth shapes of the consonants can occur" (Johnston & Schembri, 2007, p. 184), and often only the first syllable is articulated (Bank et al., 2015). Mouthings can be produced on and off throughout a signed utterance, and have been found to occur more with morphologically simple signs such as nouns, and less so with morphologically complex *indicating verbs* and *depicting verbs* which have been modified in some way (Johnston et al., 2016, p. 3). The use of mouth varies according to the signer and other sociolinguistic factors, such as interlocutor and situation, and therefore it is "difficult to say whether mouthing should be considered part of the formational structure of particular signs or simply a result of contact between English and Auslan" (Johnston & Schembri, 2007, p. 184).

In 1985, Schermer stated: "the existence of a pure sign language, without the occurrence of any speech, among deaf adults, is more or less a theoretical construct" (p. 288). However, she predicted a decrease in the use of the oral channel with increasing distance from the oralist education tradition. Yet, Bank, Crasborn, and van Hout (2015) note mouthings are still ubiquitous in Sign Language of the Netherlands (NGT). On the contrary, in NZSL, mouthing

progressively decreases across descending age groups: in a 2007 study, the age 65+ cohort mouthed 85% of the time, the 40-64 cohort mouthed 79% of the time, and the 15-39 cohort mouthed 70% of the time (McKee, 2007). This was suggested to indicate the changing attitudinal importance of mouthing and the increasing status of signing (McKee, 2007). The youngest cohort in McKee (2007) corresponds with the age of the parents/interlocutors in the current thesis, and therefore their typical rates of mouthing likely match. Mouthing is noted as a feature of 'clear communication' (McKee, 2007). The use of mouthing by bimodal bilingual children has not yet been documented in Aotearoa/New Zealand.

Mouth gestures are idiomatic gestures produced by the mouth, not thought to originate from spoken language (Sutton-Spence, 2000). In NZSL, some mouth gestures are lexical, "fixed parts of a multi-channel sign" (McKee, 2007), such as Image 2.6, in which a mouth gesture involving the release of puffed cheeks is concurrently produced with the sign BREAK-DOWN. Other mouth gestures may be affixes, signalling adverbial information, such as manner and degree. Adverbial mouth gestures include 'th' for 'careless or lazy manner', or 'mm' for 'relaxed'. Johnston et al. (2016) investigated mouth actions used by near-native Auslan signers and they conclude that while mouth actions work as part of a signed utterance, they are not necessarily specific to sign languages but are gestural expressions available for all humans. As Johnston et al. (2016) express "many mouth actions appear to be either part of the oral and facial expression repertoires used by all humans–moderated by local cultural norms and, for hearing people, constrained by the use of speech–or are co-articulated mouth patterns derived from the relevant ambient spoken language" (p. 4).

Image 2.6: BREAK-DOWN, COLLAPSE[11]

Variation of voice used by hearing and Deaf signers is underresearched. Due to the socio-historical context of oralism and spoken languages as majority languages, the oral channel is

[11] http://nzsl.vuw.ac.nz/signs/5630

often dismissed as a feature of ‘pure’ native signing, at least in America (Lucas & Valli, 1992). In spite of wide acknowledgment of the role of mouthing in sign language use, it is often assumed that this mouthing is silent, and the use of audible voice is discouraged for hearing learners of sign languages (Te Kete Ipurangi, 2016). While there is some evidence that some New Zealand Deaf signers do produce audible mouthing (McKee, 2015), there is very little research on variation in voice use. However, there is evidence bimodal bilinguals use voice in signing contexts. The most relevant study in this area is Petroj et al. (2014) who focused on whispering produced by American bimodal bilinguals.

It has been argued that in order to produce mouthings, the signer does not need to know the source language, while voiced articulations require the speaker to know the phonology of that language (Ebbinghaus & Hessmann 1996; Sutton-Spence, 2000). As such, while some researchers define code-blending as any use of the oral channel (mouthing, whispering, full-voice) (van den Bogaerde & Baker, 2009), most researchers only count simultaneous *voicing* or *whispering* and signing to be code-blending (Petroj et al., 2014). As van den Bogaerde and Baker (2005) point out, “[m]outhings can be seen as part of the sign language or as part of a mixed system, according to the perspective of the researcher. Words that are produced with phonation can also be viewed in the same way. There is no clear consensus in the literature” (p. 154). While voiceless mouthings were not analysed by Petroj et al. (2014), the current thesis aligns with van den Bogaerde & Baker (2005) by considering whispered, fully-voiced and voiceless mouthings (while signing) as code-blends (i.e. phonation is not a criterion for exclusion).

Bimodal bilingual *whispering* is different to voiceless mouthings, or fully-voiced articulations, and is defined by Petroj et al. (2014) as “the use of English lexical items produced with little or no vibrations of the vocal cords by bimodal bilingual children to accompany signing, not in a “quiet” or “secretive” context” (p.2). While mouthing is characteristic of many Deaf people, and full-voice is characteristic of many bimodal bilinguals, whispering while signing appears from the outset relatively marked/salient, yet under-researched (Petroj et al., 2014). In spoken language communication, some widely recognised types of whispering include: whispering as a way of disguising your voice to communicate privately (often to express secret information), to communicate without disrupting others in typically quiet areas, and “stage whispering”, used by actors and singers for dramatic purposes which can be understood by their audiences (cf.

Alatis, 1990; Poyatos, 2002; Gobl & Ni Chasaide, 2003; Cirillo, 2004).[12]

Bimodal bilingual whispering appears to serve a different function to secretive whispering amongst hearing interlocutors. The corpus which Petroj et al. (2014) utilised to investigate whispering, includes data from a range of ages and different target language settings. English-targeted language sessions were conducted by interlocutors who were hearing native English speakers; speech and sign-targeted language sessions were conducted by native signing Coda experimenters; and sign-targeted language sessions were conducted by Deaf experimenters and Deaf parents. Petroj et al. (2014) note that out of ten bimodal bilingual children, eight produced whispered speech while signing, four of whom had cochlear implants. They do not give details about the remaining two participants' oral channel use; instead they focus on four of their participants who whispered the most (3 DDCI and 1 Coda). They found that whispering occurred the most in ASL target sessions, with Deaf native signers. Additionally, they found that whispering occurred more often with Deaf experimenters than with Deaf parents. Furthermore, Petroj et al. (2014) found that over time (from aged 2 to 7), fully-voiced utterances were increasingly produced with English grammar, while whispered utterances were produced with a similar amount of ASL-based grammar over time. They conclude that the speech signal is produced because the alternative—that is, language suppression—is cognitively more costly for bilinguals (than simultaneous production of both languages). Whispering is argued to be a way of keeping the speech signal active with ASL-influenced grammar in a volume appropriate for communication with a Deaf interlocutor (Petroj et al., 2014). Petroj et al.'s (2014) research was preliminary in nature, and reflected a need for more cross-linguistic research, alongside follow up research on whether or not the ASL influence is occurring due to the grammar of the manual channel.

Branchini and Donati (2016) investigated the voice use of Codas while using LIS (Italian Sign Language). They found that "where LIS word order is imposed to both strings, the LIS string is phonologically fluent and follows a normal rhythm, while the Italian string displays a disrupted prosody and what has been called the deaf voice" (p. 15). A reviewer of Branchini and Donati's (2016) study suggested that there may be parallels between the whispering of bimodal bilinguals of Petroj et al. (2014), and use of the *Deaf voice* of Codas in their study. In

[12] See Gordon & Ladefoged (2001) and Konnai (2012) for detail on the acoustic properties of whispering, and the strenuous nature of whispering, in contexts of speech therapy.

response, Branchini and Donati (2016) note that Petroj et al. (2014) did not give specific examples of morphosyntactic degradation, which would be necessary to cross-check findings. The current study aims to compare these findings with specific examples from bimodal bilingual research participants. This language influence also appears to be related to a form called Coda-talk. For instance, Bishop and Hicks (2005) found morphosyntactic features of ASL such as sentences without copulas, auxiliary verbs, modals, prepositions, and no overt subjects or objects have been found to surface in emails between American Codas. These ASL-aligned structures somewhat mirrored the Italian Sign Language-aligned structures surfacing in the disourse between adult Codas (aged 29-5) who are native in Italian Sign Language and Italian.

Voice is recognised as not only a feature in the discourse of hearing signers, but is also used by many Deaf signers in Aotearoa/New Zealand (McKee & Wallingford, 2011), although perhaps less so in other Deaf communities (voice was not addressed as a feature of the Deaf interlocutors in [Petroj et al., 2014]). Deaf voice includes "a pervasive nasalization, a distortion of the prosody towards the extremes of highs and lows, and strong assimilation processes leading to a loss of syllables" (Branchini & Donati, 2016, p. 15), due to a lack of auditory feedback. Deaf people may use their voices in contexts with hearing people involved, and Deaf parents may use voice as a means for gaining attention or communication within their families. A Deaf person's voice may not be intelligible for people outside of the family (Hoffmeister, 2007), and may lead to children taking on these variants, such as Walton (2006) a New Zealander Coda, who describes how she used the word 'carburger' for 'hamburger', as this is what she interpreted her parent as saying—until she learned of the 'correct' form from her hearing peers. Hoffmesiter (2007) compares these voices to the accents of immigrant parents. Within the family, Deaf voice is often received by Codas as "normal and natural and in some cases lovingly warm" (Hoffmeister, 2007, p. 211). Often used as a part of Coda-talk, Codas have also been found to deliberately imitate Deaf voice in their own language production amongst other Coda for in-group identity and humour (Bishop et al., 2006).

Emmorey et al. (2008) explored *vocalisations* in code-blending and code-switching during bilingual interactions involving the narration of a motion event of a Canary Row cartoon (originally used to elicit co-speech gesture) featuring Tweety Bird and Sylvester (1950) between hearing ASL-English fluent adults (aged 22-53 years). Participants were told "to have both languages 'on'" so they were in bilingual mode. Emmorey et al. (2008) described the use

of vocalisations as being either sound effects "a type of iconic vocal gesture" (p. 49), or vocalizations akin to mouth gestures used by Deaf signers (such as *eh eh eh* for durational meaning). They noted that sound effects were characteristics of hearing non-signers, but vocalisations akin to mouth gestures were not. However, it was suggested that "additional cross-linguistic work is needed to determine the extent to which the ASL-influenced English (Coda-talk) […] is a phenomenon that is or is not unique to bimodal bilinguals" (Emmorey et al., 2008, p. 11). Intersentential code-switching to vocalized non-manual features in spoken English utterances is also mentioned by Napier (2006). Furthermore, some written representations of Deaf voice have been found to be used in written emails between Codas (Bishop & Hicks, 2008). In order to capture the different ways the modalities and languages of bimodal bilinguals interact, the *Language Synthesis Model* is described in the next section.

2.4 The Language Synthesis Model

2.4.1 Code-blending, language-mode-switching, cross-linguistic transfer

The *Language Synthesis Model* (see Figure 2.1) provides a description of the inner workings of bilingual language production by considering bimodal bilinguals' acquisition of two grammars, as well as their dual articulatory resources used to simultaneously produce a linguistic output with features from either language (Lillo-Martin et al., 2012). The model accounts for various forms of language synthesis found in child and adult language, including: cross-linguistic transfer, code-switching, and code-blending (see Chapter 1 for definitions; cf. Valli & Lucas, 2000; Ann, 2001; Emmorey, Borinstein, & Thompson, 2005; Bishop et al., 2006; Emmorey et al., 2008; Lillo-Martin, Quadros, Chen Pichler, & Fieldsteel, 2014; Koulidobrova, 2014). The model is a representation of both bimodal and unimodal bilingual production, and posits that "the language faculty makes forms from both languages available and children simply make use of those forms" (Palmer, 2015, p. 19). The model draws on the Minimalist approach to code-switching proposed by MacSwan (2000), and fits within the framework of Distributed Morphology (Halle & Marantz 1993). This model is particularly relevant for the contact situation in which Codas/ DDCI find themselves (described further in Section 2.6).

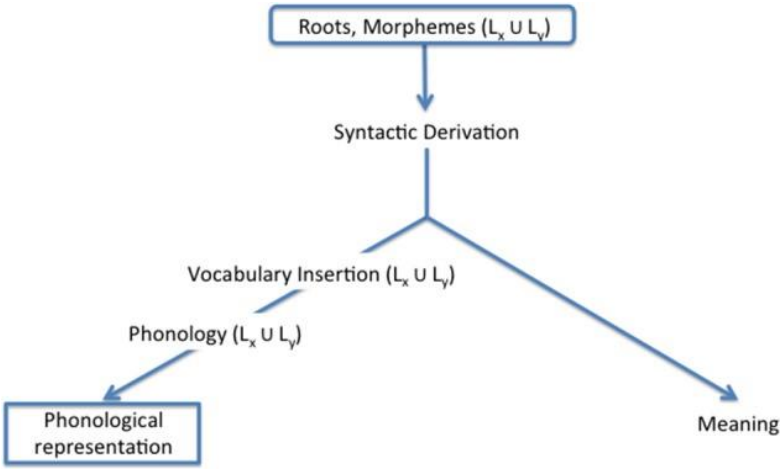

Figure 2.1 The Language Synthesis Model (Lillo-Martin et al., 2014, p. 2)

The stages in the Language Synthesis Model are as follows: at the level of syntactic derivation, roots and morphemes from either language (L_y or L_x) are active to "satisfy the featural requirements" of that utterance, which creates the possibility for grammatical structures of one language to influence the other (cross-linguistic transfer) (Lillo-Martin et al., 2014, p. 2). At the level of vocabulary insertion, either language (L_y or L_x) can be chosen, leading to code-switching. At the level of phonology, all articulators are available for use, which may lead to code-blending. As code-switching (or language-mode switching) has been found to be relatively uncommon compared to code-blending in many other studies on bimodal bilingual language production[13] (van den Bogaerde & Baker, 2005; Emmorey et al., 2008; Palmer, 2015), code-blending is a necessary component of a language production model (but not accounted for in many other models of bilingualism which instead focus on speech-speech bilingualism).

As both languages are active under this model, unimodal bilinguals who switch between languages use cognitive resources to inhibit one language while the other is produced[14] (these are referred to as *inhibitory control mechanisms* in Green's [1998] Inhibitory Control Model).

[13] Code-blending is more common than code-switching in bimodal bilingual production. Both children acquiring spoken French and Langues des Signes Québécoise (LSQ) (Petitto et al., 2001), and adults (Bishop et al., 2006) were identified as producing more code-blends than code-switches in their language production.
[14] The possibility for simultaneous production of lexical items in speech-speech bilingual production is limited, and generally spoken word blends are avoided, or produced as errors (Warren, 2012) or for word play, such as the merging of English *Spring* and German *Frühling* to produce *Springling* (Green, 1986). However, while reading or hearing words in one language, bilinguals "activate their translation equivalents in the other language" (Morford et al. 2011; Branchini & Donati, 2016, p. 6).

Bimodal bilingualism can add further insight to this phenomenon as bimodal bilinguals do not need to suppress the articulation of either language at a given time as they have access to two linguistic channels, which means their languages do not need to compete for articulation (Branchini & Donati, 2016, p. 2). The preference to simultaneously express two lexical representations (code-blending) rather than sequentially (code-switching) has been argued to imply that lexical inhibition is more cognitively costly than selection (Emmorey, 2005). As Branchini and Donati (2016) posit "it is reasonable to assume that code-blending is what code-switching looks like when the usual articulatory constraint imposing just one channel is suspended" (p. 7). The Language Synthesis Model has been supported by several studies in the field of bimodal bilingualism (Lillo-Martin et al 2010; Koulidobrova 2012; Lillo-Martin et al. 2012; Chen Pichler et al. 2014; Petroj et al., 2014), all of which demonstrate how both languages are active in the production process, leading to varied combinatorial possibilities. It is evident that Codas utilise their ability to draw on the two languages and two modalities which are active in their discourse, and "exploit the resources of both languages in a variety of ways" (Bishop et al., 2006). Language synthesis suggests that the two language systems in bilinguals, while not integrated, are still interconnected (Paradis et al., 2000; Petitto et al., 2001; Plaza-Pust, 2014). The following section considers phonological and semantic effects of utilising both languages simultaneously.

2.5 The effect of code-blending on oral and manual channels

2.5.1 Phonological considerations

Although the rate of a single sign is twice the duration of a single word, signed and spoken language utterances are produced at similar rates, accredited to their nonconcatenative inflectional and derivational morphology, through simultaneous modification of manual and non-manual features, as opposed to sequential stringing of morphemes (Grosjean, 1977). In the case of code-blends, both the signed and spoken word or utterance may undergo phonetic and prosodic changes, such as altering the timing and speed of the sign and/or spoken utterance (Bank et al., 2015). For instance, mouthings can be spread or stretched over more than one sign, "to bind constituents of noun phrases, to bind verbs with subjects and to bind larger prosodic units" (Bank et al., 2015, p. 43; cf. Boyes Braem, 2001). Also code-blends may be described as *multi-word continuous code-blends*, in which more than one word may be expressed with one sign, when the spoken stream is uninhibited. Conversely, *single sign code-blends* involve one mouthing produced in a signed utterance (Emmorey et al., 2008).

2.5.2 Semantic considerations

Moreover, code-blends in effect produce two lexical items in the different linguistic channels, which may or may not be semantically equivalent. Although semantically distinct propositions have been found, code-blends are generally semantically equivalent (Emmorey et al., 2008; Emmorey, Petrich & Gollan, 2012; Donati & Branchini, 2013). Emmorey et al. (2005) found 95% of code-blends were of semantically equivalent signs and words. However, sometimes incongruent code-blends were produced, whereby a sign and English word produced simultaneously different information. These occurred when the English translation differed from the sign, when the incorrect sign was retrieved, or when there was a timed mismatch in the alignment of a sign and word (Emmorey et al., 2005). These findings suggest that semantic equivalence is strongly preferred even when in principle, the two channels of bimodal bilinguals could produce two completely separate lexical propositions at the same time. The implication is that code-bends are not only subject to biological constraints (in the case of unimodals), but also to information processing constraints (Emmorey, et al., 2008).

Petitto et al. (2001) compared hearing French-English bilinguals and French-LSQ bilinguals over one year from ages at onset approximately 1;0, 2;6 and 3;6, and found they both met the linguistic milestones of both of their languages. Petitto et al., (2001) found that by two years old (unimodal and bimodal) bilingual children have been found to code-mix intra-sententially, in a systematic way by which they introduce words from a separate language in utterances in "semantically appropriate ways", as well as grammatically appropriate ways (for both languages) so as to protect the integrity of both languages' constraints (cf. Paradis, Nicoladis, & Genesee, 2000).

In interactions between Codas, Emmorey et al. (2008) found a higher frequency of code-switched verbs in adult bimodal bilingual production, contrasting with spoken language bilinguals who tend to intrasententially code-switch nouns. They noted this as unsurprising given the ability for signed verbs to provide adverbial information, such as the manner of an action, through mouth gestures. They also found that LIS-Italian Codas would sign an uninflected verb with the verb's tense specified in spoken Italian. The majority of intrasentential switches were insertions of signs into spoken sentences, yet with the sign coming before the spoken word "suggesting that the lexical item had been accessed first in LIS" (p. 93). As the current study investigates the language used during communicaton

between bimodal children and Deaf interlocutors, with NZSL being the target language, different patterns are expected to occur.

2.6 Bimodal bilinguals as heritage signers

Bimodal bilinguals have recently been compared to children who are growing up with a heritage spoken language—both heritage signers and speakers are similar due to their frequently overlapping minority and majority cultural and linguistic experiences (Palmer, 2015). A heritage language is defined as a language that has an ancestral or home connection to a person, and it is a minority language (not the dominant community language) that is transmitted by family (Hornberger, & Wang, 2008). A notable difference between signed and spoken heritage languages, however, is that the transmission and loss of a sign language tends to be one-generation-thick, considering most Deaf parents have hearing children who also then have hearing children, and more often than not sign language is not transmitted. It usually takes three generations for bicultural immigrant families to lose their first language (Fishman, 1966). Although there has been considerable research on heritage spoken languages (Lo Bianco & Peyton, 2013; Seals & Peyton, 2016), few studies conceptualise Codas and/or DDCI as heritage signers (see Compton, 2014; Chen Pichler, Lee, & Lillo-Martin, 2014; Reynolds et al., 2015; Palmer, 2015 for exceptions).

2.6.1 Language dominance

Language dominance may influence the way in which the signed and spoken languages are employed (cf. Genesee, Paradis & Crago, 2008; Vanto et al., 2016). To make bimodal bilingual language development situation even more complex, many bimodal bilinguals' Deaf parent(s) learnt sign language later in life at school from Deaf peers or teachers as their parents were most likely hearing (Mitchell & Karchmer, 2004). Thus, bimodal bilinguals are learning from L2 signers who possibly have non-native signing (and English). However, interestingly, as Hoffmeister (2007) points out, "even if the parents are not fluent signers, DCDP will operate on the signed language input and make it a more fluent language. There is no reason not to believe that the same situation happens with Codas. This suggests that the first generation of Coda signers will be the first generation of fluent [sign language] users" (p. 194) (cf. Goldin-Meadow, 2003; Singleton & Newport, 2004; Quadros & Cruz, 2011).

Although achieving fluency in sign language is possible for bimodal bilinguals, a key factor in heritage language development is that heritage languages are frequently less widespread in the social environment outside of the family context. As such, bimodal bilinguals with Deaf parents typically have a wide range of proficiency in their heritage language (Reynolds et al., 2015), and for instance are similar to heritage speakers regarding their acquisition difficulty acquiring complex morphological features of their heritage language (Palmer, 2015). It has been suggested that because native bilinguals acquire two different languages at the same time, they lack the input space which would enable them to acquire both of their languages' structures completely and separately (Compton, 2014). Reynolds et al. (2015) attributes influence of English on ASL to a bilingual effect whereby Codas' sign language grammar is developing, and therefore is displaced by English grammar (cf. the gap-filling hypothesis, Paradis et al., 2000). Language shift from the minority language to the majority language is common for unimodal and bimodal bilinguals as they grow up. However, one must consider factors that influence language competence and shift, which may vary from individual to individual: when the child learnt each language (the onset of bilingualism), the amount of exposure to each language, and the setting of acquisition and use, motivation for language use including how many Deaf parents the child has, and the language strategies of the parents (Rinaldi & Caselli, 2014).

However, it is also the case that bimodal bilingual children do not necessarily stop language synthesis, as it is an organic part of their linguistic experience, whereby bimodal bilinguals consider both the structural features of their languages as well as the sociolinguistic reasons for utilising one language or modality over another (Lillo-Martin et al., 2014). For instance, as previously mentioned, adult Coda-talk is widely used, in which adult bimodal bilinguals utilise sign language structures in spoken language (Bishop et al., 2006; Emmorey et al., 2008) or written language (Bishop & Hicks, 2005). In addition, as children "are less exposed and less sensitive to the social stigma prohibiting the use of mixed utterances" (Branchini & Donati, 2016, p. 8), they may be more inclined to use language synthesis. Furthermore, as Swanwick (2016) elucidates, a bimodal bilingual's dual use of sign and speech may demonstrate more advanced use of lexical items and syntactic structures compared to the use of only one of their languages. Likewise, van den Bogaerde & Baker (2008) suggests code-mixing is a specific skill only used once children are proficient in both languages.

2.6.2 Parental input and interlocutor sensitivity

Parents play a pivotal role in the language production of bimodal bilingual children. In particular, Deaf parents or caregivers of hearing children have been found to draw on both languages and modalities in interactions with their children (Petitto et al., 2001; van den Bogaerde & Baker, 2008). Pettito et al. (2001) found that the French-English and French-LSQ bilingual children's language mixing mirrored their parents' language mixing, and that these Codas showed sensitivity with their modality use to their interlocutor by age 11 months. The strategies used by parents also influence children's use of language. For instance, van den Bogaerde (2005) tracked the language use of three hearing Dutch Codas until 3 years old, and the input given to them by their Deaf mothers in interactions. Codas used more code-blended utterances than their mothers and Deaf children counterparts, and differed in their use of NGT. This is suggested to be due to the language use that mothers accepted from their child—in other words, they adopted a *bilingual strategy* (van den Bogaerde & Baker, 2008).

2.6.3 Coda and DDCI experience and involvement within the Deaf community

Like the Spanish-English speaking community in the USA (Bishop & Hicks, 2005), and I add the Māori-English speaking community in Aotearoa/New Zealand, Deaf communities are minority cultures, with their own cultural norms often not widely understood by the majority who are hearing people. Codas are often granted passports into the Deaf world, and may share certain cultural experiences and backgrounds as Deaf people (McKee, 1996). As Bishop et al. (2006) point out, "[f]rom a deaf perspective, these hearing children are essentially deaf because they understand and assimilate to Deaf cultural norms" (p. 81). As some deaf people may not have had the same level of involvement in the Deaf community as Codas, or same level of competence in the respective sign language, many Codas are "more culturally Deaf than many Deaf people" (p. 196). As Walton (2006) remembers from her childhood as a Coda: "[m]y Dad used to tell me that I was Deaf with a capital 'D', meaning culturally Deaf" (p. 176).

Many New Zealand Deaf community gatherings and events involve Codas. They are invited to enrol in bilingual programs and Deaf education (McKee, 1996). Codas often fill the interpreter role in settings which require them to bridge the Deaf and hearing divide (Pivac, 2009). However, communication issues may arise if they are not fully bilingual (Napier, McKee, & Goswell, 2010), as Codas vary in their sign language competency. In families with Codas, there is often an underlying aim to "expend effort to overcome potential communication barriers" (Pizer, Walters, & Meier, 2013, p. 75). However, some Deaf parents do not fully pass on sign

language to their hearing children, because of concerns about the effect sign language has on English language acquisition and development (Rinaldi & Caselli, 2014), and therefore communication between child and parents occurs through a restricted less accessible spoken language mode. This is comparable to the situation rife amongst deaf children whose hearing parents may prioritise their children's acquisition of a spoken language over a signed language, leading to communication difficulties within these families (Hoffmeister, 2007).

Many hearing children of Deaf parents live on the border of both Deaf and hearing worlds; a space that they uniquely occupy (Walton, 2006; Hoffmeister, 2007). Hoffmeister (a Coda himself) suggests that this liminal space challenges the Deaf-hearing binary. For instance, Codas may be more or less close to the border of Deaf and hearing worlds; their involvement with the Deaf community often decreases with age. Hoffmeister suggests that it is at the border where one can experience issues such as "learn[ing] to deal with two cultures, two languages, two sets of rules, behaviors, etc" (p. 196), and taking on their parents' experience and culture. Hoffmeister (2007) switches from viewing Codas as biculturally Deaf and hearing, to viewing Codas as an "uncategorized" group (as neither fully Deaf nor fully hearing)—certainly the Coda experience is at the overlap of Deaf and hearing worlds.

DDCI are also at the risk of being uncategorised as they are positioned neither fully in Deaf or hearing worlds, due to their shifting audiological status. They too occupy a liminal place which often isolates them from either culture; "[s]ome become what William Evans of the University of California has called 'culturally homeless,' neither hearing nor Deaf" (Solomon, 2014, p. 104), especially given CI remains a contentious issue in the Deaf community. However, DDCI often remain connected with the Deaf community; their parents choose for their child to be involved in both worlds. However, their parents' choice to give their child cochlear implants may be frowned upon by other Deaf members of the community. This experience differs from the "honorary Deaf" title given to many Codas, as DDCI have experienced being deaf themselves (Hoffmeister, 2007). In addition, many children with CI never completely experience the full range of hearing either (Geers & Nicholas, 2013), thus their categorization as hearing is variable.

2.7 Language development of monolingual and bilingual d/Deaf and hearing children

Children are highly adaptive to languages to which they are exposed. The stages of language development have been found to be variable, according to (but not limited to) an individual's access to language (Harris, 2011). If a child is given access to a language, the cognitive processes involved in vocabulary development are similar for both deaf and hearing children (Harris, 2011). Comparison of DDCI, Codas, DCDP and CIH in this section provides a foundation for understanding how the different linguistic environments and access to language within Deaf and hearing contexts breed varying linguistic outcomes, and outlines the insight that the study of bimodal bilingualism brings to child language development research. As cochlear implantation is increasingly becoming a viable option for Deaf parents with Deaf children, DDCI are increasingly included in bimodal bilingual research.

2.7.1 A note on children with cochlear implants

DDCI are exposed to a sign language through their Deaf parents and a spoken language through hearing assistive devices such as cochlear implants. As Guerrero Lopez et al., (2013) point out, "[c]ochlear implants may improve the majority of acoustic parameters of the voice better than [conventional hearing aids] for deaf children" (p. 523). However, cochlear implants are contentious in many Deaf communities, associated with disengagement from Deaf communities, and their success in helping people hear is highly variable (Geers & Nicholas, 2013).[15] The source of this variation is under investigation, but early age of implantation is thought to be a key predictor for success in spoken language development (Ching et al., 2009; Cruz, Kozak, Pizzio, Quadros, & Chen Pichler, 2014). Notably, an unsuccessful cochlear implantation may lead to language deprivation if language is not made accessible through other means (e.g. sign language) (Humphries et al., 2012). Nonetheless, many clinicians have discouraged parents of deaf children to sign, and are instead encouraged to direct their focus on their child's spoken language development (Rinaldi & Caselli, 2014). However, it has been found that receiving CI before age two or three has advantages for development of spoken language and vocal quality (Geers, Moog, Biedenstein, Brenner, & Hayes, 2009; Colletti, Mandalà, Zoccante, Shannon, & Colletti, 2011). Deaf signing parents may choose for their children to receive CI, but still raise their child with both a signed language and a spoken

[15] Hazrati, Ali, Hansen, & Tobey (2015) found that CI users had difficulty perceiving whispers. Note, however, Petroj et al. (2014) found that many of their CI participants whispered. These two findings suggest although CI users are capable of producing whispers, they are less able to perceive it.

language. As is outlined below, DDCI who receive CI before age three have been found to have comparable spoken and signed language performance.

2.7.2 Language production of bimodal bilinguals

Recent investigations into the earliest years of bimodal bilinguals is scant, yet growing, with longitudinal studies being conducted in America and Brazil. For example, *The Development of Bimodal Bilingualism* is a corpus project concerning families of Deaf parents who have hearing or Deaf cochlear-implanted children, who are acquiring English and ASL or Brazilian Portuguese and Libras. The researchers engage families in active involvement through "Language Fairs", which gather participants in a space to spend a few hours participating in language experiments (Chen Pichler, Hochgesang, Lillo-Martin, Quadros, & Reynolds, 2016). A number of studies have come out of this project, including some which are ongoing. In Davidson et al. (2014) bimodal bilingual native signing DDCI and Coda preschoolers were found to have comparable spoken language skills, regarding vocabulary, articulation, phonological awareness and syntactic complexity in spontaneous production. Codas and DDCI have also been found to be similar with regards to their signed and spoken production of null arguments (Koulidobrova, 2014), WH-questions (Lillo-Martin et al., 2012), and word order (Palmer, 2015). Additionally, Reynolds (2013) analysed temporal cohesive devices in ASL narratives told by Codas aged 5;11 to 6;09 to a familiar Coda and Deaf person. She found an overuse of sequencing adverbials (such as AND) in linear English-like constructions opposed to locative-verb constructs which are typically found in ASL.

English-ASL bilinguals are characterised as having different acquisition patterns of sign language than their monolingual Deaf counterparts. English-instructed education is suggested to have a negative impact on their development of ASL receptive skills (Palmer, 2016). Moreover, Reynolds et al. (2015) tracked the linguistic development of American Codas and DDCI compared to unimodal Deaf signers, and suggest that the limited (and mixed) input in ASL bimodal bilinguals experience parallels heritage bilingual speakers' limited input in their heritage language. Reynolds et al. (2015) found that the bimodal bilinguals used only one of three syntactic structures for WH-questions available in ASL (which was word initial WH-sign, paralleling English syntax), while the unimodal Deaf signers used all three different ASL syntactic structures available for WH-questions. They also found that the English-ASL bilinguals did not acquire noncanonical OV and VS word order of ASL as successfully or as quickly as Deaf signing children (Reynolds et al., 2015).

Furthermore, research suggests that the use of a sign language before and after cochlear implantation scaffolds spoken language acquisition as DDCI children are reported to perform better in spoken language skills than CIH monolingual spoken language users (Rinaldi & Caselli, 2014; Mayberry, Lock, & Kazmi, 2002). It is the "early, continuous, and high quality" (Rinaldi & Caselli, 2014, p. 384) language exposure that Deaf of Deaf children receive from their signing parents that means they often perform better than Deaf CI children of hearing parents (Jiménez, Pino, & Herruzo, 2009; Hassanzadeh, 2012; Cruz et al., 2014). Nevertheless, Rinaldi and Caselli (2014) stated that "the results of studies can be affected by the different means of collecting data, the different linguistic environments in which the children grow up, and the characteristics of the study participants themselves" (p. 800). It is clear that further research must be conducted to better understand CI Deaf bimodal bilingualism and "the impact of the exposure to sign language on linguistic development" (Rinaldi & Caselli, 2014). It has been found that the Coda linguistic environment does not hinder their phonological development, and their language use mirrors that of a monolingual (Toohey, 2010; Cruz et al., 2014). Thus, regardless of modality, first language acquisition is key for language development (Rinaldi & Caselli, 2014).

2.8 Chapter summary

Many Codas and DDCI grow up as bimodal bilinguals, with both a signed and spoken language. Research conducted on the language use of bimodal bilinguals focuses on language input and language strategies from parents, semantic, and grammatical structure of their languages, and their uniquely blended language use due to having two linguisic channels to produce their two languages. The socio-historical use of the oral channel in signed discourse is important when considering the forthcoming analyses in Chapters 4 and 5, which will then be more directly situated in the wider contact situation of the New Zealand Deaf community in Chapter 6. Bimodal bilingualism entails two languages and two modalities employed as linguistic resources, and therefore it is worthwhile investigating the language in their two linguistic channels on both syntactic and semantic grounds. This research contributes to the under-researched area of study in the field of bimodal bilingualism in childhood, not just in New Zealand but more broadly in sign language studies. By investigating blended language use of bimodal bilingual children in sign-target language sessions this research seeks to: (1), ascertain the auditory-visual volumes of the oral channel and whether different audible

volumes correspond with the grammar of the spoken or signed language; (2), analyse the coordination of oral and manual channels during co-expression of meaning in location and motion descriptions; and (3), determine how sociolinguistic factors, including attitudes to both NZSL and English, influence language synthesis. In doing so, this research project illuminates the roles that the oral channel plays in the blended language use of bimodal bilingual children.

Chapter 3: Research design and methodology

This chapter outlines the methodology for this study, including introducing the participants, pre-study logistics, the methods for collection, and data analysis. This study employs the creation of a language-based session consisting of a spatial language elicitation activity and a sociolinguistic interview, conducted by Deaf signing adults (henceforth, the 'interlocutors' or 'interviewers'). This elicitation method was employed to engage the six participating children (4-9 years) in a fun activity; an aim similar to *Bimodal Bilingual Project* (Pichler et al., 2016; Lillo-Martin, Quadros, Chen Pichler, & Fieldsteel, 2014; Petroj et al., 2014). Naturalistic language data from this minority (native bimodal bilingual children) within a minority (the New Zealand Deaf community) affords linguists a valuable window into the complexity of bilingual language acquisition and production. Ethical considerations, my positionality as researcher and presence within the language session, and some limitations of the methodology are explored throughout the chapter.

3.1 Participant Recruitment

3.1.1 Sample size

The data in this study involves approximately 100 minutes of interaction in total (between children and interlocutors). A small sample of bimodal bilinguals was recruited, including: five hearing Children of Deaf Adults (Codas) who sign, and one Deaf child (who uses a cochlear implant) with Deaf parents (DDCI), all of whom are native Pakeha NZSL users from the New Zealand Deaf community.

Participants were selected based on their native acquisition of NZSL, their audiological status (either born hearing, or are hearing-assisted due to CI), their age (4-9 years), and their parents' audiological statuses and language use (at least one Deaf signing parent) (see Appendix A). I set out to have more DDCI children; however, as this population is very small in Aotearoa/New Zealand, participant recruitment was challenging. Participant attrition also meant a second DDCI participant did not attend due to an illness. Although Demuth (1996) suggests that at least four participants are needed to have a representative sample of a group of language users, many studies focus on a much larger sample size. Although this study should be regarded as

preliminary in nature, considering even a small amount of rich data can provide insight into child language (Kelly, 2015), the data lend themselves to high quality in-depth research, and can form foundations for future research. Findings are at times presented as case studies of individual language differences and similarities (Duff, 2012), or purposefully grouped by language variant to draw attention to the participants' similar language use. Sections 4.1 in Chapter 4 and 5.1 in Chapter 5 draw on the language produced in the game section of the language sessions and exclude the data from the sociolinguistic interview section. The reason for this is to enable straightforward and in-depth comparisons of location and motion. Other analyses include all the interview language data and benefit from a conversational register.

3.1.2 Age range

The participants include a four-year-old, a five-year-old, two six-year-olds, a seven-year-old, and a nine-year-old. Initially, I set out to have participants in a closer age range (ages 4-6). However, due to both limited time and the limited pool of bimodal bilingual children in Aotearoa/New Zealand, I focused on two cities and welcomed interested families who met the criteria noted in 3.1.1. In general, child language research focuses on ages 0-8 years (Kelly, 2015), and the *Development of Bimodal Bilingualism Project* focuses on children in and around this age bracket (Quadros et al., 2012). This age range allows for exploration of the language use of bimodal bilinguals fairly early in their development of NZSL and English grammar systems. All of the children in this study are expected to have acquired phonological rules (by age 1), morphological rules (by age 2-4), and most of the current participants are at a stage when they have already mastered many expressive and receptive skills (by age 5) in at least one of their languages (Harris, 2011). Meeting these linguistic milestones affords the participants the ability to maintain a full conversation and participate in the language elicitation game created for the purposes of this study. However, the analysis of the data is carefully approached in consideration of ongoing language development.

3.1.3 The parents (the Deaf interlocutors)

All participants have at least one Deaf parent, and all have two parents who are fluent in NZSL. The parents were recruited as Deaf interlocutors in this study, although they were not paired with their own son or daughter. As child-directed speech (adjustments to adult language use when directed at children [Gordon & Watson, 2015]) is just as important as child language when studying language, the interlocutors were also filmed (opening up opportunities for future research, with participant consent).

All Codas acquired NZSL as a home language from birth, and the DDCI acquired NZSL after CI (before age one). Parents reported (through an additional questionnaire sent to them by email after the language sessions; Appendix A) that they use NZSL with their children. Most parents reported that they also use English with their child, thus all families are raising their children as bilinguals in NZSL and English.

The participants' parents are the means for NZSL transmission, so it is important to consider the parents' own acquisition of NZSL (whether through their own Deaf parents or at school later in life) and the home language environment. While three of the children have two Deaf parents (Dominic, Jasper and Stephen), three have one Deaf parent and one hearing parent (Lucas, Nina, Catie). However, the hearing parents of Catie and Nina are themselves Codas, and are native signers. Additionally, Dominic's father and Lucas' mother use hearing aids. Thus, language use at home is likely different from family to family, and parent to parent—as is outlined below.

3.1.4 The bimodal bilingual children

Of the six bimodal bilinguals involved in this project, four are boys and two are girls (see Appendix A for information and quotations in this section).

Lucas (Coda) is a four-year-old boy from the North Island. He has a Deaf mother (who uses a hearing aid), a hearing father, and one younger brother. Lucas' mother acquired NZSL as a teenager (her parents are hearing), and her initial sign language was Signed English. Lucas' father learnt NZSL from Lucas's mother. They report that Lucas is bilingual, and that they use NZSL most of the time with him.

Dominic (Coda) is a five-year-old boy from the North Island. He has two Deaf parents, and one hearing younger brother. Dominic's mother acquired NZSL from her parents who are Deaf, while his father acquired NZSL from his Deaf sister. Dominic's parents report that Dominic "is a bilingual. He uses English more of course because of school and communicating with his little brother". His mother reports she uses NZSL "fully" with Dominic, while his father, who uses a hearing aid, sometimes uses NZSL, and sometimes signs with spoken English.

Stephen (Coda) is a six-year-old boy from the South Island. He has two Deaf parents, and an

older hearing brother. Stephen's mother natively acquired NZSL from her parents who are Deaf, and Stephen's father learnt NZSL at age seven (as his parents are hearing). They report Stephen is bilingual, and that they only use NZSL at home, but that Stephen has an older brother with whom he speaks and sometimes signs.

Catie (Coda) is a seven-year-old girl from the South Island. She has a Deaf mother, hearing father (who is a Coda), and a younger sister. Both parents' first language is NZSL, as both of their parents are Deaf. They report Catie is bilingual and that they use both NZSL and English with her.

Jasper (Coda) is a nine-year-old boy from the South Island. He has two Deaf parents, and an older hearing sister. Both his mother and father have Deaf siblings, and they attended a Deaf School for at least a part of their schooling. When communicating with Jasper, his mother switches between using voice while signing, and signing without voice. His father is reportedly a strong signer. Jasper's parents report he is used to his parents' different communication styles.

Nina (DDCI) is a six-year-old girl from the South Island. She has a hearing mother (who is a Coda), a Deaf father, and a younger brother who is also a DDCI. Nina's mother acquired NZSL from her parents who are Deaf, and her father learnt NZSL "in the playgrounds of van Asch" (Deaf school in New Zealand). Nina and her brother are bilingual, but Nina "definitely has a preference in spoken English". Nina's parents use both NZSL and English with her. Nina's parents chose for their children to have cochlear implantation before the age of one as they were aware of the risks for spoken language development in late implantation, and the small signing community of children.

3.2 The pre-study logistics

3.2.1 Language sessions

I arranged two meet-ups—one in a North Island city with two families, and the second in a South Island city with four families. I initially emailed the families, and organised for a space for the language sessions to be held. Families gathered at one of the families' homes in the North Island, and at a Deaf Society building in the South Island—both are well-known and comfortable environments for the families. Although there were a few more families with bimodal bilingual children in the South Island city, time constraints only allowed for four

families to participate. Dominic and Lucas are the only Codas (and no DDCI) in the target age group in this North Island city, as far as I am aware.

3.2.2 The interviewers/interlocutors

Enabling naturalistic and casual language was paramount to this study, in order to capture data that were typical of the children's everyday language use. Deaf members of the local Deaf community, who are well known to the participants, were the interlocutors. These were Deaf parents from other participating families, so that parents were not paired with their own children; in other words, parents of family A interviewed children of family B, and vice versa. A few weeks before the meet-ups, the Deaf parents were asked by email to be interviewers if they were comfortable to do so. Sociolinguistic research has found that participants use more vernacular language when interviewed by people who are familiar to them, and use more formal language when interviewed by unfamiliar interviewers (Meyerhoff, Adachi, Nanbakhsh, & Strycharz, 2012). Although the majority of child language research involves child-caregiver interactions (Kelly, 2015), it was predicted that having their own parents present in the room could have discouraged the children from communicating, divulging certain information in the interview, or potentially from enjoying the game. All children appeared happy and comfortable being separated from their parents (in adjacent rooms). While there were six participants, there were only five interviewers, as one parent, Penelope, was the interlocutor for two children. Each interviewer was provided with the interview schedule a week before the interview took place. During the meet-ups, the interviewers had the opportunity to ask me any questions in NZSL before, during and after the interview

3.2.3 Building relationships with families

Throughout the research process, before and after the language session data collection, I was in contact with participating families via email. All of the families were pleased to have a record of their child using sign language (the video was sent to them afterwards) and happy to be involved in a project that furthers the study of their language. Informal meet and greets and familiar environments ensured a relaxed atmosphere, and after the sessions the parents engaged in conversations about their children's language use. As in Chen Pichler, Hochgesang, Lillo-Martin, Quadros, & Reynolds (2016) note, "through these practices, parents become partners with us in our exploration of their children's developing competencies in sign language and spoken language" (p. 385). The children were minimally aware about the game and reason for the language sessions prior to the day. The children's engagement and comfort were carefully

monitored (including getting them comfortable in front of the camera by having a go at filming something before the language sessions, or pulling a face for the camera). Before, between and after participating, the children spoke verbally to each other while playing and signed to their Deaf parent(s). On occasion they would reiterate in English to younger hearing siblings what their parents had signed.

3.3 Data collection

Each child's language-based session consisted of two parts: a language task (in the form of a game), which was designed to elicit location and motion language, and a sociolinguistic interview designed to elicit not only NZSL use, but also social and cultural factors influencing language use in the everyday lives of the children. This method builds on the ease of administrating a naturalistic recording, but constrained the topic to elicit location and motion descriptions (cf. Eisenbeiss, 2010; Kelly, Forshaw, Nordlinger, & Wigglesworth, 2015). Two video cameras were mounted on a tripod approximately two metres from the participant (cf. Schembri et al., 2005), positioned diagonally adjacent to the child and interlocutor, in order to capture both the child and the interlocutor (sound and video) (see Figure 3.1). I was present in the room, but at most times seated at a distance, by the video cameras, unless I was answering interlocutors' questions or demonstrating the motion event to the child. Field notes were taken throughout.

3.3.1 The motion event "seesaw" game

Descriptions of location and motion (see section 3.4 for specific variables analysed) were elicited through play—an interactive instructional story-telling activity, involving a motion event. The game took from three to seven minutes to complete, followed by a short interview lasting approximately seven minutes. The interlocutor used NZSL for the entire session. The interviewers were emailed the instructions and interview outline (Appendix E) one week before the meet-up, and then were provided with a printed copy on the day. Some of the interviewers had only skim read the instructions, leading them to ask me clarification questions throughout the session. Nevertheless, the situation remained casual and game-like. In retrospect, providing instructions to Deaf people in written English may be problematic, given the low literacy skills of some Deaf people compared to hearing people (McKee & Vale, 2014), and the potential for increased transference of what was written. For many Deaf people, English is their second language. Future researchers could offer the interviewers a video of a demo-language session

conducted in NZSL, to help them prepare in their preferred language.

The participating child was given a set of small objects (Figure 3.1) hidden inside a bag (wooden blocks and toys of different colours, shapes, and sizes), and was seated opposite the interlocutor on the floor, with a pop-up whiteboard in-between them so that they could not see the floor in front of their interlocutor. The interlocutor firstly asked the child what was inside the bag, so that the child and interlocutor had a shared sense of what objects they were going to be using, as well as to make sure each object had a 'name', so that the child could then later describe the motion event with ease. Following the interlocutor's introduction, and with their cue, I gesturally demonstrated the setting up and carrying out of the motion event to the child (Image 3.2 and 3.3). The reason for demonstrating the motion event without dialogue was to control the input of language, so that my language use did not influence the child's narration (cf. Reynolds, Palmer, Pichler, Quadros, Kozak & Lillo-Martin, 2015; Schembri, Jones, & Burnham, 2005). This 'secret' demonstration was carried out on the floor behind the barrier, so the interlocutor could not see it. The child firstly observed and then copied the motion event with the toys. Afterwards, the toys were handed to the interlocutor, and the child narrated the motion event to the Deaf interlocutor. The purpose of this was to give the interlocutor instructions so they could then construct the model himself/herself according to the child's instructions. Overall, the language elicited was an interaction involving a negotiated instructional narrative between child and interlocutor. As the South Island location was close to a main road, and other participating families were in the adjacent room, the recording picked up some loud background noise. However, all participants were positioned an equal distance from the camera, and the video camera was sensitive enough to capture the voices of the participant who whispered.

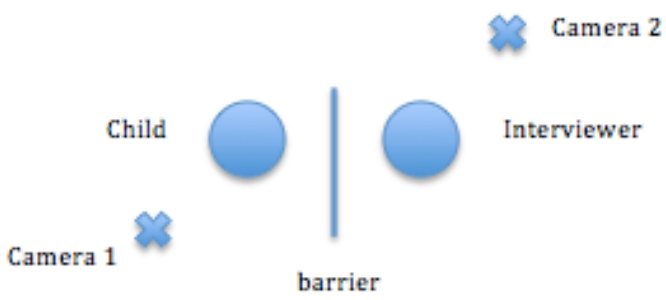

Figure 3.1: The configuration of language session

3.3.2 The toys involved in the motion event

The focal point of the motion event was a seesaw constructed by two small wooden blocks—one yellow rectangular block was balanced horizontally on top of a smaller, green, rectangular and vertically positioned block. Two toy people (one woman dressed in purple, one man in blue, and otherwise identical in shape and size) were then balanced on either end of the seesaw. A 'fence' was made of two blue, square blocks positioned to the side of the seesaw next to each other (only one is shown in Image 3.1-3.3). The main motion event involved a black and white toy dog jumping over the 'fence', and then onto the seesaw, subsequently unbalancing the seesaw so that the three objects slide down its slope (Image 3.3).

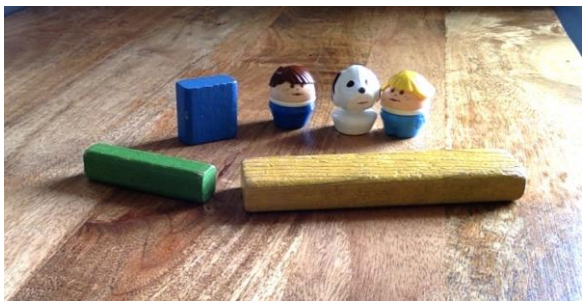

Image 3.1: the toys

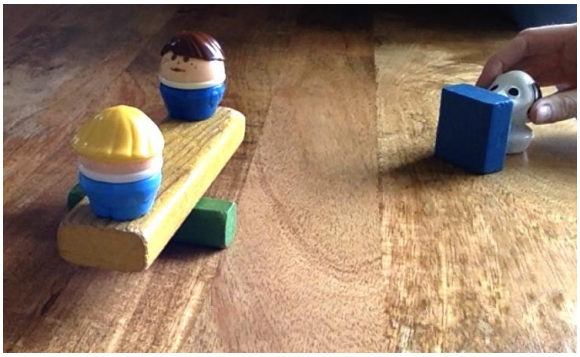

Image 3.2: the seesaw model set up

Image 3.3: the motion event in action

3.3.3 Design of the game

The creation of the game was inspired by a few key research projects which focus on location and motion. Namely, it drew on: the 'Toppling Blocks' task, designed by McComsey (2015) to elicit speech and co-speech gesture in a spoken language acquisition study; the retelling task of short two-minute videos of motion events without dialogue from the *Miniscule series* such as insects racing or fighting over a lollipop in a sign language acquisition study (Reynolds et al., 2015); and the Verbs of Motion Production (VMP) task in Schembri et al. (2005) where participants were shown videos of motion events with different manners, paths, movements, and shapes and sizes, to elicit gesture and signing from non-signers and signers. In the current study, the idea was to engage the children in interaction where they could enact the motion event rather than visualise it through a film (cf. McComsey's [2015] dissatisfaction with frequently used elicitation strategies involving videos of motion events, such as the "Canary Row" episode of Tweety and Sylvester, originally used by McNeill [1992]). Instead of replicating the task in the McComsey study, my method extends it, as the original appeared to be too simple to elicit both motion and referents in NZSL. The seesaw sequence was simple enough to be memorable for the child so that it could be retold as a narrative ("a source of complex data for studying language acquisition") (cf. Reynolds et al., 2015).

This study's method for elicitation was more controlled than the free-play sessions used by Quadros et al. (2015), where children were not restricted to the game that they played. Other longitudinal explorations into bimodal bilingual language development with this approach are underway in America and Brazil where parents of bimodal bilingual children are given a video recorder to film their child (aged 1.5 years and up) approximately once a week for one hour each time (Chen Pichler et al., 2016). This current research builds on and contributes to this growing field, and future research could return to the children in the study to investigate their language use with a longitudinal approach.

As in Schembri et al. (2005) the seesaw motion event consisted of a few objects, which collide and interact in various ways, creating multiple parts to the motion event—while remaining simple enough to be memorable. The objects moved in different manners (i.e. the dog ran fast, whereas the seesaw tipped slowly depending on where the dog landed on the seesaw), along different trajectories (diagonally, horizontally) (as in Schembri et al., 2005). The central object (the dog) moved in various ways—it runs in a straight line perpendicular to the seesaw, jumps over the fence, onto the seesaw, and then slides down the seesaw with the other objects. The

differently sized and shaped objects were chosen to elicit classifier handshapes. The movement of the dog was altered when it jumped onto the seesaw, and then slid down its length (manner). For simplicity, I use an A-to-B path type, which refers to the movement from an initial location to a secondary location, however for future research an A-to-B-to-A path type (Schembri et al., 2005), could be used to elicit longer narratives and multiple path changes. The interaction of the referents elicited locative units as well as manner of movement units (as in Schembri et al., 2005).

3.3.4 Sociolinguistic interview

Following the game, the interviewer asked the children in a sociolinguistic interview to describe the following in NZSL: themselves, their family, and their experience of bilingualism at home and at school. This included the number of Deaf and signing members in their family, who they interact with in NZSL, when they were first exposed to NZSL, their past and present linguistic practices in different environments within and outside their family, language rules and appropriateness (Lillo-Martin et al., 2014), their degree of involvement with the Deaf and hearing communities, and their knowledge of the term "Codas" (see Appendix E). In doing so, this research aimed to reveal the children's developing language investments and family language policies, which may signal the covert or overt prestige of a language (Milroy, 2002), and social, or cultural motivations for language use (Bourdieu, 1998).

Frequently the interlocutors asked me for clarification about the interview schedule. Lucas communicated more (note, in spoken English) to me compared to the other children (e.g. to tell me how the interlocutor was not playing the game properly). While there were few instances when the children communicated with me, the presence of a hearing 'overhearer' (cf. audience design, which refers to the idea that language use is influenced by the speaker's (or signer's) audience, Bell, 1984) in the room may have influenced the language use. This is explored further in subsequent chapters. The employment of a Deaf 'field' facilitator to conduct the recording on the day would have helped with both of these issues.

Additional questions for the parents were emailed after the language meet ups (Appendix A), to determine general biographical information including the parents' language history and typical use, generations of Deafness, their perceptions of their children's abilities in each language, and the language(s) used with their child at home (Grosjean, 2008; Quadros et al.,

2015). Jasper's mother was sent a video with these questions, making it easier for her to respond in her preferred language.

3.4 Ethical considerations

Ethical approval was received from Victoria University's Human Ethics Committee (Appendix G) for this project. Due to anonymity issues, parents were asked to consent on behalf of their child, alongside the interviewers' discretion with information divulged in the interview (Appendix H). In the interview outline, the interviewers were asked to check in with the child to see if they were comfortable throughout the language session. In further studies, I will ensure that Deaf signing participants have the option to consent in NZSL to ensure that all information is communicated in their primary or preferred language, in order to reduce the possibility for miscommunication (Harris, Holmes, & Mertens, 2009, p. 121). While consent forms were in English, I ensured there was sufficient time to discuss face-to-face in NZSL before the interviews took place. Parents were asked in advance of the interviews if they had any suggestions for preferred pairings. The participants, parents, and other involved members of the Deaf community (including the Deaf Society for use of their facilities) received a small koha[16] in appreciation of their time, and I self-funded the city trips.

I took into consideration the potential current and future confidentiality concerns that the participants from a small Deaf community might have had. As sign language is a visual language including facial non-manual features in NZSL, confidentiality cannot be fully granted with presentation of data showing participants' faces. However, all of the names in this study are pseudonyms. I requested the families' consent for use of images and videos. One family requested for their child's face to be partially covered in this thesis, and therefore black bars are superimposed on photos of this child. Confidentiality was approached with sensitivity and was discussed with families to ensure they were informed and comfortable with the choices they made.

[16] 'Koha' is a Māori word meaning *gift*, "especially one maintaining social relationships and has connotations of reciprocity" (http://maoridictionary.co.nz/search?&keywords=koha)

3.5 Analysis

3.5.1 Transcription, coding and glossing

I used qualitative methods for analysing the children's perceptions of bilingualism in the sociolinguistic interview responses, and for analysing the bimodal bilingual linguistic structures elicited in the game and interview (cf. Bishop et al., 2006). In particular, I draw on some principles of Interactional Sociolinguistics, involving sociolinguistic approaches to language contact in multilingual speech communities, as well as linguistic methods of phonological, morphosyntactic and semantic analyses. Interactional Sociolinguistics "involve[s] a micro-analytic investigation of interaction sequences, which is typically reflected in a more fine-grained and detailed transcription system than is found in other forms of discourse analysis" (Stubbe et al., 2003, p. 353). This study draws only on some principles of an Interactional Sociolinguistics approach for analysis; while I do not analyse sequential turns of talk, the analysis of isolated sequences is strengthened by the participants' own perspectives on their languages (Gumperz, 1982; Gumperz, 2005). Analysis of a constellation of features which arise in interaction forms a reliable research method, is suggested to be key in analyzing mixed utterances (Petroj, to appear, p. 12), and is particularly suitable for a small sample of rich data. Unlike Conversation Analysis[17], which also involves analysis of microlevel interactional sequences, an Interactional Sociolinguistic approach investigates language use as being influenced by social and cultural characteristics of the speakers using the language, and examines how language can affect the social and cultural relationships of language users (Stubbe et al., 2003).

The structures I aimed to analyse were: 1) instances of audible (*mouthing*, *whispering*, *full-voice*) volume, 2) visual volume (i.e. exaggerated mouth shapes), 3) the ratio of lexical items produced on each linguistic channel during code-blending, 4) influence of NZSL or English features on oral and manual channels, including marked ("unusual and stands out in some way because it is not typical usage" (Napier, 2006, p. 51)) use (or absence) of inflectional features from one language that are not permissible in the other language, and 5) semantic congruence of lexical items on both channels and the grammatical category of each code switch/blend.[18]

[17] For a full discussion of Conversation Analysis refer to Stubbe et al. (2003).

[18] Use http://nzsl.vuw.ac.nz for access to the frozen established signs used by the children. For depicting signs, see Appendix C for handshape types.

The coding system for counting signed lexical items is the same as that used in Napier (2006, p. 52); notably signs, hyphenated glosses, fingerspellings, and repeated signs produced with one mouthing for emphasis were each counted as one lexical item. The audible volume distinctions (whispered, voiceless, and fully-voiced) were fairly easy to make, however, the recordings were listened to carefully throughout the project to ensure accuracy. Coding for visual volume involved determining whether mouth openings and closures were marked or unmarked. Grammaticality of the speech was determined by a rudimentary analysis based on adult intuition, as in Petroj et al. (2014)—in other words, I asked myself, "would this be ungrammatical in English if uttered in isolation, without the manual channel?". The grammaticality of the manual channel was determined based on structural patterns already observed in NZSL (see Chapter 2, Section 2.2.1, Table 2.1)).

3.5.2 Annotation

ELAN (Eudico Linguistic Annotator), a free multimedia annotation program, was used for transcribing and glossing the data, as it allows for simultaneous tiers of information to annotate multiple production channels (manual, non-manual, and oral) (Crasborn & Sloetjes, 2008). Tiers included: Left Hand (LH), Right Hand (RH), non-manual features (NMFs), as well as oral channel types (Table 3.1). The sign language was glossed with capital letters, and the spoken language was annotated in lower case (Bishop et al., 2006) (see Appendix C for more transcription conventions). A *free translation* tier was used to provide an overall translation of all language output. An additional tier was used for any other relevant information (Chen Pichler, Hochgesang, Lillo-Martin, & Quadros, 2010).

Tier Name	Description
Mouthing *(m)*	The English word is inserted in this tier, representing in orthography the partial or full articulation
Whispering *(w)*	
Full voice *(f)*	
Mouth gesture *(&=)*	A phonetic or orthographic approximation is inserted in these tiers
Sound effect *(&=)*	
Nonce mouth action *(&=)*	

Table 3.1: Tier description for annotation of oral channel types.

Data were glossed with input from the Deaf Studies Research Unit at Victoria University of Wellington, for intercoder reliability. In addition to difficulties in some of the transcription due to being a non-native signer, child language is sometimes found to be difficult to understand even by native adult users of that language (Kelly, 2015). Therefore, after the data were transcribed, I sent families the recordings with transcriptions for them to check and amend (cf. 'team transcription' [Kelly, 2015]). Liddell (2003) notes that "perhaps the most challenging sign language verbs for notational systems are *depicting signs* (Liddell 2003). In this thesis, depicting signs are notated with a CL- (standing for *classifier*), followed by the handshape type (see Appendix D for handshape types), and then an English translation of the sign (for example, CL-H:dog-jumps-over). In presenting the coding within this thesis, signs (left hand (LH) and right hand (RH)) are transcribed in a line above the speech (*w(hispered), f(ull voice), m(outhed*). Lexical items are underlined to show temporal alignment of the oral channel in relation to the manual channel (Emmorey et al., 2008). However, it is acknowledged that "no transcription can ever be a neutral or complete rendition of a spoken [or signed] text" (Stubbe et al., 2003). A translation of both channels is provided underneath. An example of this is presented immediately below (Example 3.1).

Example 3.1

LH	SEESAW		
RH	SEESAW	FALL-down	DOWN
	w(it need to	*f-f-f-fall*	*down)*

'the seesaw needs to fall down'

3.5.3 Analysis of code-blends and volume

In order to determine when, how, and why bimodal bilinguals produce the oral channel with the manual channel, I analysed variation in the use of linguistic channels. Several labels below in Table 3.2 combine those in Petroj, Guererra and Davidson (2014) who focus only on full-voice and whispered phonation types, and Palmer (2015) who focuses on code-blends and language-mode switches between code-blends and *sign only* or *speech only*. In addition to Petroj et al's (2016) labels, *mouthing* was included; Petroj et al. (2014) do not consider voiceless mouthing as code-blends (see Chapter 2, Section 2.3.1).

Signed	Fully-voiced	Whispered	Mouthed
Manual channel only (no speech)	*Fully-voiced oral channel only (no signs)*	*Whispered oral channel only (no signs)*	*Mouthed oral channel only (no signs)*
	Fully-voiced code-blend (both linguistic channels)	*Whispered code-blend (both linguistic channels)*	*Mouthed code-blend (both linguistic channels)*
	Fully-voiced language-mode switch	*Whispered language-mode switch*	*Mouthed language-mode switch*

Table 3.2: Language synthesis and volume variation

Utterances in which only the manual channel was used for the entire utterance were classified as *manual channel only*. Palmer (2015) refers to such utterances as "ASL only" (Palmer, 2015); however NZSL-only is not used in this thesis as it is unclear whether or not it refers to language or modality. This label is therefore potentially problematic, as it would suggest other linguistic features are not at play, which might not be accurate in cases of transfer. *Oral channel only* variants occurred when the oral channel was used, without sign. *Code-blended* utterances occurred when speech and signs were used across the major clausal constituents (S, V and O, if present) "with the relation between the verb and the arguments expressed in both the English and the ASL" (Palmer, 2015, p. 34). Utterances involving a language-mode switch require at least one of the major clausal constituents to not be produced in one language (defined in Chapter 1, Section 1.3).

Utterances were determined by syntactic and/or prosodic boundaries: "any sequence of speech, signs, and/or gestures that is preceded and followed by silence, a change in an intonation pattern, or a conversational turn" (Palmer, 2015; Petitto et al. 2001; Van den Bogaerde and Baker, 2008).

3.6 Positionality

When conducting sign language research, it is important to acknowledge my positionality, and the different lenses through which I viewed the research process. In my case, I am a hearing

non-native late learner of NZSL, I have taken courses in Deaf studies, and Linguistics of Signed Languages, and I have developed connections within the Deaf community. As Sankoff, Meyerhoff, & Nagy (2008) note, “there is one basic practical limitation to analysis of variation across codes and in situations of contact which must also be considered: it requires researchers themselves to have competency in multiple languages” (p. 6). Using NZSL with the parents (and sometimes the participating children) in face-to-face communication was paramount in order to respect the cultural norms of communication of the New Zealand Deaf community (Harris et al., 2009, p. 121; Singleton, Jones, & Hanumantha, 2014, p. 61). As I am a non-native learner of NZSL, expressing and understanding complex ideas in NZSL took longer than it would have done in my native language, however I took measures to compensate for this by making sure communication was as clear as possible, and I sought for confirmation of my transcription.

Furthermore, the research was conducted with respect to the social and historical situation in the D/deaf world and the diversity and fluidity of D/deaf identities, in particular regarding decisions around cochlear implantation (Harris, Holmes & Mertens, 2009). In addition, the perspective underpinning this project was that Deaf people are a linguistic and cultural minority, rather than a disability group (Napier & Leeson, 2016, p. 51). As a hearing late signer, I viewed the research process through a bicultural lens, which meant I had the ability to cross between hearing and Deaf worlds, offering both an 'outsider-looking-in' perspective as well as a perspective as an extended member of the shared signing community (Napier & Leeson, 2016). My hearing ability afforded me the ability to analyse both oral and visual modes of language.

Moreover, I was conscious of the power relations that can form in research involving a researcher from the majority hearing population and participants from the minority D/deaf population (Young & Temple, 2014). Therefore, I drew on "empowering" research models by working closely with community interests by acknowledging previous literature on community based interests (e.g. McKee & Manning, 2015) as well as collaborating closely with specific families to work with and for them, giving the participants and their parents a voice during collection and transcription (Singleton et al., 2014, p. 62). The decision for Deaf parents to be the interviewers reflected how their expertise in NZSL and Deaf experience were fundamental parts of this project. An additional lens with which I viewed the research project was as a French teacher in primary schools—I easily connect with children, and therefore I am well suited for collecting data from children.

3.7 Chapter summary

This chapter covered the research design and methodology, which inform the data collected and the forthcoming analysis of the language-based session consisting of a spatial language elicitation activity and a sociolinguistic interview. Due to the varied family dynamics within the small New Zealand Deaf community, sociolinguistic variables such as age, number of Deaf family members, sex and number of participants recruited could be seen as a limitation. Nevertheless, their varied linguistic experiences afford a rich and 'real world' description of Codas' use of linguistic features and the language transmission and development of children with Deaf parents. The current data should not necessarily be viewed as being representative of the Coda population, rather as a piece of valuable research of the individual participants' experiences with language. The sample allows for in-depth analyses and detailed descriptions of each child's language use, which are outlined in the following chapters.

Chapter 4: Auditory-visual volume variation in the oral channel of code-blends

The oral channel's prominence in sign language production is not always reflected in sign language research. Research which does concern the oral channel primarily focuses on Deaf signers' use of voiceless mouthings and mouth gestures (Johnston et al., 2016). Importantly, auditory and visual volumes of the oral channel deserve more attention, given the bimodal language that arises due to contact between a diverse range of Deaf and hearing language users, and in families of Deaf parents and hearing children (van den Bogaerde & Baker, 2008). While the connection between volume and the grammatical status of the oral and manual channels in bimodal bilingual production is an emerging area of research in America and Italy (Petroj, Guerrera, & Davidson, 2014; Branchini & Donati, 2016), this study invites insight from NZSL-English hearing bilinguals. It is for these reasons that my Interactional Sociolinguistic approach (see Chapter 3) is centered on the auditory-visual volumes and grammatical status of the oral channel. This chapter presents findings directly targeting the following research questions (cf. Petroj et al., 2014):

1) How do bimodal bilingual children modulate auditory-visual volume in the oral channel in sign-target language sessions with a Deaf interlocutor?
2) What are the linguistic implications of different volumes: do different volumes correspond with the grammar of the spoken or the sign language?

Section 4.1 commences this chapter with a preliminary description of oral channel variation across and within the language sessions of six bimodal bilingual children (4-9 years of age), including the phonation types (*whispered, mouthed,* or *fully voiced*), visual volume types (exaggerated or unmarked mouth shapes), and use of features of deaf speech. The grammaticality of the oral and manual channels is examined in Section 4.2, in order to determine if there is a link between audible volume and an NZSL-aligned or English-aligned morphosyntactic pattern. Section 4.3 investigates bidirectional language transfer across linguistic channels; particularly how spatial information is grammatically encoded in both oral and manual channels. The following analysis contributes to our limited understanding of the different types of bimodal bilingual auditory-visual volumes, and provides a holistic account of code transfer (of English and NZSL) across modalities. Throughout this chapter, language

development as well as the interlocutors' use of language and hearing assistive devices are considered as factors influencing bimodal bilingual oral channel variation (explored further in Chapter 6).

4.1 Whispering, mouthing, voicing

As is described in Chapter 2, Petroj et al.'s (2014) seminal study of bimodal bilingual whispering examines the grammaticality of the oral channel of ASL-English bilingual Codas and DDCI (with longitudinal data from age 2 to 7 years) to determine the role that whispering (as opposed to full-voice) plays in communication with a Deaf interlocutor. In ASL-dominant contexts and as children grow older, whispered utterances were continued to be produced with ASL-influenced grammar, while fully-voiced utterances were increasingly produced with English-based grammar. Petroj et al. (2014) conclude that speech is produced simultaneously with signs because the alternative—that is, expressing only one language and suppressing the other—is cognitively more costly. Whispering is argued to be a way of maintaining an ASL grammar, in a reduced volume appropriate for communication with a Deaf interlocutor (Petroj et al., 2014).

In the current study, the oral channel is used in a variety of ways across participants and within each participants' sign-target language session. Oral channel types include *full-voice, whispering, mouthing (voiceless), mouth gestures (voiceless),* and *sound effects (fully-voiced or whispered)*. Table 4.1 below outlines the instances of these oral channel types for each word produced by each participant during the game section of the language session (excluding the interview section). Mouth gestures and sound effects are discussed in detail in Chapter 5; this chapter focuses on the remaining oral channel types.

Participant (pseudonym)	Age (years)	ORAL CHANNEL TYPE					Interlocutor (pseudonym), audible volume, and hearing assistive device (HA)
		Fully voiced words	Whispered words	Mouthed words	Mouth gestures	Sound effects or nonce sounds	
Codas							
Lucas	Four	154	3	4		5	**Dougal** Very quiet Deaf voice (HA)
Dominic	Five	8 (one utterance when speaking to me)	70	5	2	3	**Tamsin** Very quiet Deaf voice and mouthing (HA)
Stephen	Six		81				**Penelope** Whispered Deaf voice
Catie	Seven	9 (one utterance when speaking to me)	78	9		(4 unidentified mouthings)	**Dannielle** Fairly loud Deaf voice
Jasper	Nine		29	45			**Jasmine** Mouthing, some quiet voice
DDCI							
Nina	Six		9	15	4[1]		**Penelope** Whispered Deaf voice
TOTAL		175	271	75	2	3	

Table 4.1: Instances of different oral channel types in the game section of the language session

Table 4.2 outlines the total number of signed and spoken/mouthed lexical items produced, as well as instances of *manual channel only* (no oral channel) and *oral channel only* (no manual channel) productions. These ratios demonstrate how frequently participants code-blend versus how frequently they produce language with only one linguistic channel. When the number of spoken words exceeds the total number of signs, it reflects how: (1) some spoken words were produced in isolation (*oral channel only*), and (2) there were many instances of multiple spoken words matched with one sign (*continuous (multi-word) code-blends* (Emmorey, Borinstein, et al., 2008)). An equal ratio of signs to spoken words reflects how most code-blends are one-to-

one matches of signs and words (Jasper). When the number of signs is more than the number of spoken words, it reflects how few words are produced with signed utterances (Nina).

Participant	Total number of signed lexical items	Total number of spoken/mouthed English lexical items	*Manual channel only*: Total number and percentage of signs produced without the oral channel	*Oral channel only*: Total number and percentage of spoken or mouthed words produced without the manual channel
Codas				
Lucas	88	161 (73 more words than signs)	6 (6.8%)	31 (19.25%)
Dominic	59	83 (24 more words than signs)	6 (10%)	8 (9.64%)
Stephen	62	81 (19 more words than signs)	2 (3.2%)	0 (0%)
Catie	69	96 (27 more words than signs)	5 (7.2%)	9 (9.37%)
Jasper	72	74 (two more words and signs)	0 (0%)	0 (0%)
DDCI				
Nina	62	24 (40 more *signs* than *words*)	27 (43.5%)	0 (0%)

Table 4.2: Instances of signs, spoken words, manual channel only and oral channel only

Of the six bimodal bilinguals, the general pattern is that three produce their signed motion event narratives concurrently with whispers (Catie, Stephen and Dominic), one with full-voice (Lucas), and two with mouthings (Jasper and Nina) (Table 4.1). Each volume is discussed in turn below.

4.1.1 Whispering

Catie, Stephen, and Dominic predominantly produce *whispered continuous code-blends* throughout their language sessions, as in Example 4.1 and 4.2 (see Appendix B for transcription conventions).

Example 4.1: Dominic

LH		SEESAW[17][ ]+
RH	ME +	SEESAW[ ]+
	w(I made	*a sssseesaw) [pause while interlocutor signs] m(-aw)*
	'I made a seesaw'	

Example 4.2: Stephen

LH	DOG	BEHIND	CL-B:two-blocks
RH	DOG	BEHIND	CL-B:two-blocks
	w(dog	*behind*	*blue)*
	'put the dog behind the blue'		

In the game, the whisperers produce a similar amount of whispers, and similar ratio of signs and English words (respectively, they produce 27, 19 and 24 more words than signs [Table 4.2]). Extra words include multiple lexical items in the oral channel produced with depicting signs (see Chapter 5), and English grammatical features, such as function words, which are (sometimes) expressed by the oral channel (Section 4.2). Some of Nina's and Jasper's whispers were initially coded as mouthed variants as they were whispered extremely quietly. However, after reviewing the data, and listening more closely, more whispers were found. Importantly, Nina and Jasper appear to whisper as an unintended outcome of air escaping during mouthed articulations, and their whispers are more recognisable when they increase the visual volume (Section 4.1.4) of the oral channel for emphasis. The other Codas' whispers are more deliberate (and therefore more audible and intelligible during coding). Stephen and Catie whisper slightly quieter than Dominic; Dominic exerts more effort in his whispered articulation. This lowered volume reflects these children's awareness of the redundancy of volume for their Deaf interlocutor (see Chapter 6). However, whispered volume is occasionally modulated, for example, when Dominic was asked by his interlocutor to repeat his brother's name, he whispers the name louder (with signs). This may be in part due to Dominic's awareness of his

interlocutor's hearing aid, or as a result of increasing visual cues for emphasis. Note, there is little to no evidence of "whispering" in sign (characterised by a reduction of space occupied by the gestures, and minimal facial expressions). Whispered signing (or the manual channel at all) was not analysed in (Petroj et al., 2014). Thus, the whispered speech does not reflect the manual channel's 'visual volume'.

4.1.2 Fully voiced

Lucas, the youngest participant, is the only participant who fully voices the oral channel while signing, and has the most uneven sign to word ratio, producing 73 more spoken words than signs (n=88) (Table 4.2). His voice modulates from a soft talking voice to a loud volume, and sometimes reaches a shouting volume. The latter occurs mainly in *oral channel only* utterances, (in addition to what appears to be emphatic co-speech gesture), due to (playful) frustration with his Deaf interlocutor, Donald, who pretends to misunderstand instructions, by placing the toys in the incorrect manner, in a ruse to elicit more language from Lucas. Lucas also projects his voice with increased volume for emphasis, perhaps as amplitude is regarded as a cue for clear communication amongst hearing interlocutors (cf. Dohen & Loevenbruck, 2009). Lucas whispers once when he is planning what to say (*so you um*; see Example 4.3). However, note that Lucas also sometimes speaks to himself in full-voice (e.g. *where's that doggie—oh there it is*).

Example 4.3: Lucas

LH				GREEN
RH	g(*hand-to-chin-thinking-gesture*)	FIRST	PUT	GREEN CL-bC:put-green-block-horizontally
	w(so you um) *[pause]*	*f(first*	*you put*	*a green block in a line)*
	'so you um- first you put a green block in a line'			

Dominic and Catie produce one fully-voiced utterance each (with intact English grammar), when communicating with me (a hearing addressee) without sign. For example, immediately before the game, Dominic asks me a fully-voiced question – *do we get to make something now?,* to which I also reply in full-voice without signing. Otherwise, Catie and Dominic's utterances are simultaneously whispered and signed. This adjustment of volume indicates that Dominic and Catie whisper to accommodate to the change to a Deaf addressee (cf. Petroj et al., 2014). Lucas's use of *full-voice continuous code-blends* is likely because he is often in an English-dominant mode at home as his mother is a Deaf non-native signer who uses a hearing

aid, and his father is hearing and learnt NZSL as an adult (Appendix A). Note, Lucas is aware of his interlocutor's hearing aid, which may also play a role in the use of full-voice (these factors are discussed further in Chapter 6).

4.1.3 Mouthings

Nina, the only DDCI, and Jasper, the oldest Coda, predominantly mouth the oral channel (Examples 4.4 and 4.5). Again, a lowered volume demonstrates accommodation to the audiological status of their interlocutor. Jasper and Nina both produce mainly code-blends of one sign matched with one word, yet their productions indicate different interactions between their languages. More specifically, the two differ in that 27 of Nina's 62 signs are produced without mouthings (producing utterances with language-mode switches between a blend and sign only), whereas Jasper mouths or whispers one word concurrent with every single sign in *continuous code-blend* utterances (apart from a few instances when two words are produced with one sign) (Table 4.2). These patterns reflect how for Jasper, English generally dictates the sign stream (for exceptions see section 4.2) and for Nina, NZSL dictates the sign stream. This is unlike the whisperers and Lucas (full-voice) who have a continuous stream of whispered speech with a separate stream of signs, and fewer one-to-one sign and speech code-blends.

Example 4.4: Nina

LH	DOG	BLUE	2hCL-gC:two-blocks-together	2hCL-B: two-blocks-together	2hCL-gC:two-blocks-together
RH	DOG IX-loc	BLUE	2hCL-gC:two-blocks-together	2hCL-B: two-blocks-together	2hCL-gC:two-blocks-together
	m(dog			*together)*	

'the dog is behind the two blue blocks which are together'

Example 4.5: Jasper

LH		DOG		BEHIND	fs-T		BLUE	WOOD
RH	LITTLE	DOG	BEHIND	BEHIND	fs-T	TWO	BLUE	WOOD
	w(little	*dog*	*behind*	*behind*	*the*	*two*	*bl-blue*	*wood)*

'the little dog is behind the two blue blocks'

Lucas rarely mouths—once he mouths when counting the blocks by mouthing, pointing and looking at the blocks (*one, two, three, four*; Example 4.6). This is not directed at the addressee; rather, he is counting to himself in a silent self-dialogue (cf. inner speech or signed soliloquy [Zimmermann & Brugger, 2013]), as afterwards he signs FOUR—this time while looking at his addressee.

Example 4.6: Lucas

RH	IX-one	IX-two	IX-three	IX-four	FOUR
	m(one	*two*	*three*	*four)*	*f(four)*
	'one, two, three, four – four blocks'				

On close inspection, Catie and Dominic mouth (almost indiscernibly) while their interlocutor holds the floor. This too could be self-directed dialogue and is produced with a high degree of concentration as they focus on the production of their interlocutor. It indicates they are intently focusing on their addressee's lip patterns or translating the interlocutor's signing into English mouthings for easier comprehension. Other times, it seems Catie and Dominic are mouthing as a backchanneling cue, to confirm the interlocutor's interpretation, such as in Examples 4.1 and 4.7.

Example 4.7: Catie

RH	SEESAW
	w(made a seesaw) [pause while interlocutor signs] m(seesaw)
	'I made a seesaw'

It is worthwhile considering the ages of the participants in relation to their voices. The youngest (aged 4) uses full-voice with a few instances of mouthed and whispered words, the middle three (aged 5, 6, 7) predominantly whisper, and the eldest (9 years) predominantly mouths although he uses some very quiet whispers. Nina, the sole DDCI, is aged 6, and she mainly mouths, and occasionally very quietly whispers. Although the sample size is small, the above findings could highlight a developmental trend, whereby bimodal bilingual children gradually turn down the volume of their voices, upon developing sensitivity to the functions of volume with addressees who have differing audiological statuses (in other words, learning that it is not necessary [and perhaps inappropriate] to use full-voice with a Deaf addressee). However, interlocutors' use of hearing aids and Deaf voice is taken into consideration (in Chapter 6).

4.1.4 Auditory-visual volume

Deaf people are known to mouth sporadically ('on and off'), often using a mouthing in a phrase to increase the 'visual volume' of the accompanying sign (McKee, 2007). However, all of the

participants in this study (bar Nina) incessantly use the oral channel, in *continuous code-blends*, and instead at times they reinforce visual cues of the oral channel for emphasis. Exaggerated mouth shapes involve more marked mouth openings and closures. These reinforced mouth shapes appear to increase the 'visual volume' as a prosodic cue for emphasis or stress, compensating for lack of acoustic cues, or for clear communication. From the photos in Image 4.1-4.6, one would think they were speaking loudly, but aside from Lucas, they are using a reduced audible volume.

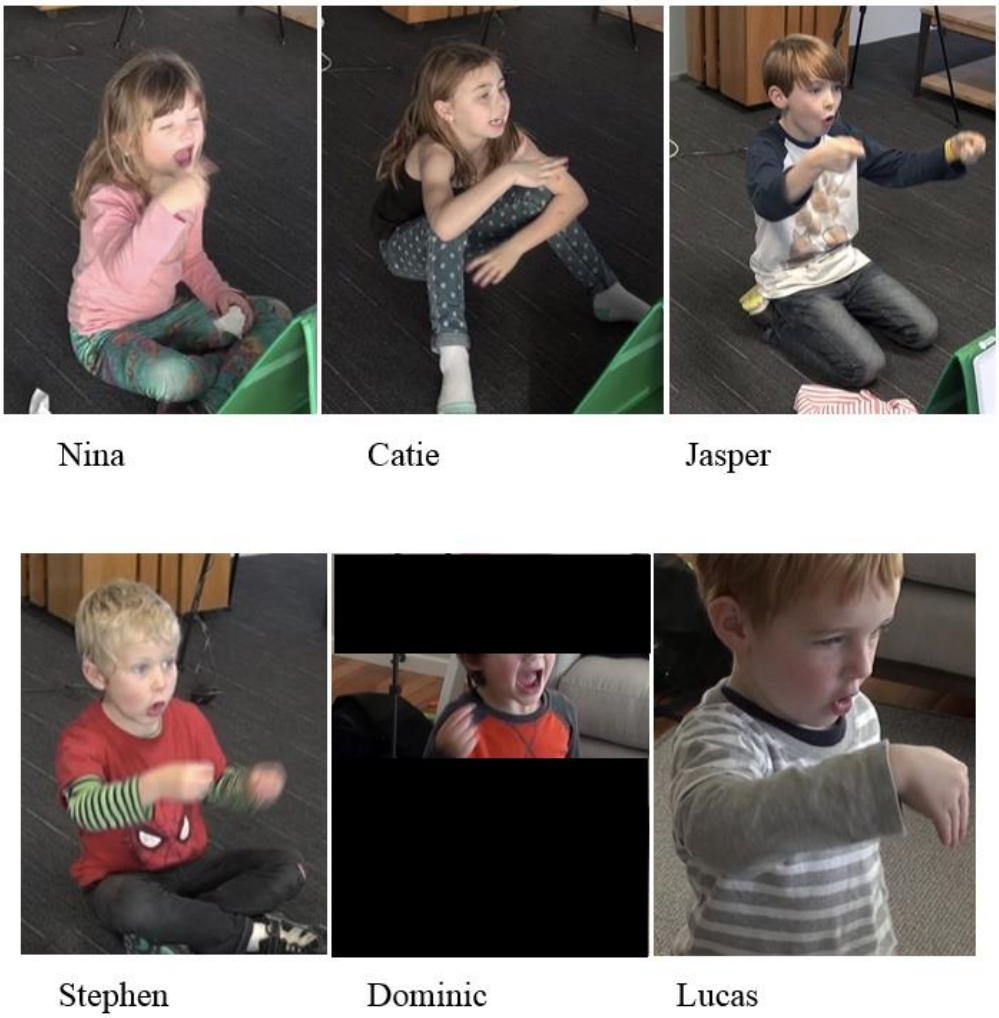

Image 4.1 – 4.6: Exaggerated mouth shapes

Exaggerated mouth shapes appear akin to stage whispering or whispering to someone from a distance—distinct from whispering a secret into someone's ear. A key difference between secretive whispering between hearing interlocutors and whispers blended with signs for a Deaf interlocutor is that secretive whispering needs to be received by the hearing interlocutor (but

not by overhearers), whereas the acoustic cues of bimodal bilingual whispering do not need to be perceived by the Deaf interlocutor (however they possibly function for hearing overhearers, see Chapter 6). Intriguingly, Lucas (Image 4.6) uses less exaggerated mouth shapes overall, which is likely because he has maintained acoustic cues during full-voice, such as increased amplitude, for stress.

As is modelled in Figure 4.1, while Lucas has louder audible volume than the others, he uses 'quieter'/unmarked visual volume. Additionally, while Catie, Stephen and Dominic have louder auditory volume (whisperings) than Jasper and Nina (voiceless mouthings), the whisperers use slightly 'quieter' visual volume than Jasper and Nina. Narrowing in on the whisperers, Catie appears to use slightly less exaggerated mouthings than Stephen and Dominic. Dominic's whispers are visually and audibly louder than Stephen's. Notably, Jasper and Lucas are polar opposites with regards to visual and auditory volume, reflecting an inverse relationship between visual and audible volumes. On closer inspection, the whisperers' individual visual and auditory volumes align, with Dominic producing the most audio-visually loud whispers, and Catie producing the quietest audio-visual whispers.[19] Furthermore, in the interview section, the participants use exaggerated mouthings to a lesser extent, which may indicate the instructional game required more cues for clarification than a conversation about language use.

	Visual volume	
Exaggerated	Jasper–Nina–Dominic–Stephen–Catie–Lucas	**Neutral/unmarked**
	Audible volume	
Full-voice	Lucas–Dominic–Stephen–Catie–Nina–Jasper	**Voiceless or ∅**

Figure 4.1: Auditory volume and visual volume continua

4.1.5 Deaf voice

Although the interlocutors were not the focus of this study, like Nina, the interlocutors language-mode switch between blends and sign only (consistent with McKee, 2007). They also

[19] Participants also increase the 'visual volume' of the *manual* channel for emphasis. However, it seems the linguistic channels' visual volumes do not always align (i.e. manual visual volume may be 'quieter' than the oral channel).

occasionally use marked visual cues for clarification. For instance, Penelope signs and whispers in Deaf voice that she will ask him some *questions* (simultaneously with QUESTION[20]). Note, when Stephen does not understand, Penelope repeats the sign and projects her voice louder. Stephen still did not understand even with increased visual cues (see Chapter 6 for discussion).

The interlocutors and children were also alike in displaying considerable sound elision, or "temporal reduction" (Bank et al., 2015) (a feature of Deaf voice whereby "strong assimilation processes [lead] to a loss of syllables, and nonlinguistic vocal gestures" [Bishop, Hicks, Bertone, & Sala, 2006, p. 82]; see Chapter 2). Catie's production is characterized by syllable or sound deletion (e.g. *slii* instead of *slide*); likewise, Dominic occasionally trails off at the end of words (e.g. *gr* for *green*). Even Lucas occasionally elides fully-voiced sounds (e.g. *ething wen* for *everything went*). The same occurs for Nina—for instance, she mouths just the beginning of the bilabial [b] instead of fully producing the word for *blue*. Some partial mouthings of Catie, Stephen, and Nina, while initially coded as mouthings, appear as something in-between a mouthing and a mouth gesture (e.g. bah and pah), as they are no longer serving as a semantically loaded mouthing (these could be termed "NZSL mouthing", as Napier (2006) refers to similar mouthings as "Auslan mouthing"). None of the bimodal bilinguals have other Deaf voice characteristics of nasalization or distorted prosody. Sound and syllable reduction may occur because an NZSL syntactic structure is (at least partially) driving the oral channel (cf. Petroj et al., 2014).

4.2 Grammaticality of the oral channel

This section investigates the grammaticality of the oral channel, taking into consideration any connection to volume, and the manual channel's grammaticality. In order to do this, examples from both the game and interview sections are drawn on, in order to crosscheck grammaticality in narrative and conversational registers.

Typologically opposing features of NZSL and English are apparent when looking at the oral channel of these bimodal bilinguals. In particular, features which do not typically occur in NZSL are sometimes absent/elided; for instance, determiners, subjects (cf. McKee, et al., 2011; McKee, 2015), auxiliary verbs, and copula verbs exist in English but are not typically permitted

[20] http://nzsl.vuw.ac.nz/signs/6010

(or used in the same way) in NZSL (cf. Chapter 2, Section 2.2). As English too permits dropping the second person pronoun (subject deletion) in imperatives, such as "∅ [you] put the green block there", this was taken into consideration. The central question asked during this section is: which language provides the morphosyntactic frame? Transfer is found to occur, in which both channels exhibit either an NZSL morphosyntactic pattern or an English morphosyntactic pattern. Very occasionally there is no transfer, in which English and NZSL are simultaneously expressed on oral and manual channels in ways permissible in English and NZSL respectively (cf. (Branchini & Donati, 2016)). In addition, both channels occasionally reflect a shared morphosyntactic structure, in which "lexical material from both languages is mixed in a structure that is shared between the two languages" (van den Bogaerde & Baker, 2009, p. 153). Findings are represented in the descriptions of each audible volume type with examples presented in tables.

4.2.1 Full-voice: Lucas

For the majority of Lucas's motion event narrative, the oral channel has grammatically intact (full-voice) English[21] (as in Example 4.8).

Example 4.8:

LH				GREEN (cont.)
RH	g(*hand-to-chin-thinking-gesture*)	FIRST	PUT	GREEN (cont.)
	w(so you um) *[pause]*	*f(first*	*you put*	*a green* (cont.)
	'so you um- first you put a green (cont.)			

LH			
RH	CL-bC:put-green-block-horizontally	THEN	YELLOW ONE
	w(block in a line	*and then*	*the yellow one)*
	'put green block in a horizontal line, and then the yellow one'		

This mirrors findings by Petroj et al. (2014) who also found that full-voice productions largely align with English grammar. Furthermore, his higher ratio of spoken words to signs than the other participants and *oral channel only* utterances reflect how his language production is English-dominant (see Chapter 6).

[21] The 'grammatically intact English version' column is the same as the free translation tier in my coding.

The manual channel is also influenced by the oral channel. In Example 4.8, English also spills over into the sign stream when Lucas signs ONE, and says *one*. ‘One’ has a different meaning in both languages—the English word, ‘one’, can be used as a pronoun and numeral, while the sign ONE is only realised as a numeral. Thus, the NZSL sign ONE is reanalysed as a pronoun (a word category derived from English).

However, despite a clear connection between full-voice and English grammaticality in the game, in the questions posed to Lucas immediately after the game, and in the interview section, more instances of utterances which align with NZSL were found in both the speech and sign signals (despite fully-voicing [Table 4.3]). In such instances, the oral channel’s grammar mirrors the manual channel. Also, this perhaps reflects how a conversational register leads to an increase in NZSL-led morphosyntax, and an instructional game may lead to use of English grammar as a default strategy for clear communication. However, as Lucas is the youngest participant, it may be the case that atypical English structures are connected to his stage in English development, rather than NZSL-influence; for instance, *Mummy teached me* (Example 4.13) is expected English grammar for a four year old, in that he may be overregularising, by over-applying the rule that regular verbs are inflected with a suffix, *–ed*, for tense (Warren, 2012).

Example no.	Manual channel	NZSL-aligned utterance in oral channel	Grammatically intact English version	Features consistent with NZSL structures
4.9	YOU HEAVY STAND ON IX BREAK	You goin to be heavy to stand on it psssh break	You ***are*** too heavy to stand on it ***so*** it ***will*** break	No conjunction; no auxiliary verbs
4.10	FALL	Fall down	***They*** fell down	Null subject; no inflectional affix on verb for tense
4.11	DAD fs-R NEG BECAUSE THEY HEARING SAME ME HEARING	Daddy and Ross don't because they hearing same as me, I'm hearing	Daddy and Ross don't (sign to me) because they ***are*** hearing same as me, I'm hearing	No copula
4.12	ME GO WALK NEG FAR	I go walking it's not so far	I ***walk because*** it's not so far	NZSL syntax; no conjunction
4.13	MUM TEACH ME	Mummy teached me	Mummy ***taught*** me (NZSL)	Verb inflection not consistent with NZSL—likely overregularisation, typical of a four-year-old

Table 4.3: Lucas' NZSL-aligned fully voiced utterances

4.2.2 Whispering: Catie, Stephen, Dominic

There were strong similarities regarding grammaticality of the oral channel across participants who whispered (see some examples of this in Tables 4.4–4.6). Whispered productions in *both* the motion event narrative and interview were typically NZSL-aligned, with morphologically degraded grammar matching an NZSL signed string (see features consistent with NZSL structures in Tables 4.4–4.6). The oral channel would be deemed ungrammatical English if it were produced in isolation, yet corroborating Petroj et al.'s (2014) finding, such utterances exhibit NZSL-influence. Note that in Example 4.14, only the noun, SEESAW, is produced in the manual channel, while in the oral channel, the whispered verb, *made*, and determiner, *a*, in addition to the noun, *seesaw*, are produced, but crucially the first-person subject, *I*, is null. Thus, the oral channel may retain some English morphosyntactic features, exhibiting different levels of influence across a single utterance. Example 4.15 in Table Six, Stephen elides a copula, conjunction and extra information (mirroring the manual channel). Dominic retains more English features than the other two whisperers in the game section, showing less NZSL-influence (Table 4.3). He is situated between the other whisperers and Lucas who uses full-voice in terms of grammaticality. As Dominic is the youngest of the whisperers, it may be the case that, as (Petroj et al., 2014) found, with age, whispered utterances become more influenced by the sign grammar.

Example no.	**Manual channel**	**NZSL-aligned utterance in oral channel**	**Grammatically intact English version**	**Features consistent with NZSL structures**
4.14	SEESAW	Made a seesaw seesaw	***I*** made a seesaw	Null subject
4.15	THEN BIG YELLOW 2hCL-flat:bC-long-block NO SAME CL-flat bC	The big yellow on top not the same that way	The big yellow block ***is*** on top, not the same way ***as the other block***. That way	No copula, locative information encoded manually
4.16	ALL PEOPLE DOG CL-B:seesaw-tips-and-slides	All the people the dog slide	All the people ***and*** the dog slide ***off*** the seesaw	No conjunction; no preposition
4.17	DOG CL-B:seesaw-tips-and-slides	Dog slide	***The*** dog slide***s*** (***off the seesaw***)	No determiner; no -s inflectional particle; no preposition
4.18	WHEN ME ONE	When I one	When I ***was*** one	No copula
4.19	DRIVE BECAUSE FAR HOME	Drive because it's far home	***We*** drive because it's far ***from*** home	Null subject; no preposition

Table 4.4: Catie's NZSL-aligned whispered utterances

Example no.	**Manual channel**	**NZSL-aligned utterance in the oral channel**	**"Corrected" grammatically intact English version**	**Features consistent with NZSL structures**
4.20	SEESAW palm-up	Seesaw um	***It's a*** seesaw	Null subject; no copula; no indefinite article
4.21	IX-rt GIRL IX-lt	The boy on that side the girl –	The boy ***is*** on that side ***and*** the girl ***is on that side***	No copula, no conjunction; locative information encoded manually
4.22	CL-O:dog-jump-over	Dog jump over the blue and then smash like girl over	***The*** dog jump*s* over the blue blocks and then smash***es*** like ***the*** girl over	No definite articles; no verb inflectional suffix -*s*
4.23	NO CL-O:knock-over GIRL OVER	No knock the girl over	No ***it*** knock***s*** the girl over	Null subject; no verb inflectional suffix -*s*
4.24	THEN BALANCE	Oh wait and balance	Oh wait and ***it*** balance***s***	Null subject; no verb inflectional suffix -*s*

Table 4.5: Stephen's NZSL-aligned whispered utterances

Example no.	**Manual channel**	**NZSL-aligned utterance in oral channel**	**Grammatically intact English version**	**Features consistent with NZSL structures**
4.25	AND DOG OVER WALL	And a doggy behind the wall	And a doggy ***is*** behind the wall	No copula
4.26	SEESAW FALL-down DOWN	It need to fall down	It need***s*** to fall down	No verb inflectional suffix *-s*
4.27	IX HEARING	They hearing	They ***are*** hearing	No copula
4.28	WALK WHEN ME EARLY CAR WHEN ME LATE	Walk when I'm early car when I'm late	***I*** walk when I'm early ***and*** take the car/drive when I'm late	Null subject; no conjunction
4.29	WHY JAMES LAUGH	Why is James (pseudonym) laugh	Why is James laugh***ing***	No verb inflectional suffix *-ing*

Table 4.6: Dominic's NZSL-aligned whispered utterances

4.2.3 Mouthing: Jasper

Unlike the whisperers, Jasper (who predominantly mouths) produces more grammatically intact English in both the manual and oral channels (Example 4.30), particularly in the game section.

Example 4.30

LH							WOOD
RH	Fs-T(the)	BOY	fs-A(and)	GIRL	ON	YELLOW	WOOD
	m(the	*boy*	*and*	*the girl*	*on*	*the yellow*	*wood)*

'put the boy and girl on the yellow wooden blocks'

It is likely that the manual channel is influenced by English syntax. This is particularly evident through the use of fingerspelling (a feature of contact signing [Johnston & Schembri, 2007]), for instance determiners (fs-T(the), and conjunctions (fs-A(and)), which account for the mouthings *the* and *and*. Fingerspelling and frozen signs are also employed in place of depicting signs, disrupting the nonconcatenative morphological spatial transitions of NZSL to become more like English. However, at the beginning of each instruction, Jasper deletes second person pronouns and instructional verbs in both linguistic channels, as this information is mostly expressed by the depicting sign—yet this is arguably permissible in an instructional context in English. However, frequently in the interview section, when the manual channel is less influenced by English, the oral channel is influenced by NZSL-aligned grammar (Table 4.7). For instance, Dominic matches the reduplicated verb TEACH++ by producing three whispered words, *teach teach teach*, and also uses subject-final word order which are features consistent with NZSL grammar (Example 4.34).

Note that Jasper, aged 9, falls outside the age range that Petroj et al. (2014) focused on (1-7 years). While Jasper uses more voiceless mouthings than the other Codas, indicating his sensitivity to the functional redundancy of using voice when communicating with a fully Deaf addressee, his marked English influence in the manual channel (more so than the others), raises the question whether language influence increases with age, or is a consequence of language practices in Jasper's family, or simply because his two languages and modalities afford him the option of employing them in unique ways (discussed in Chapter 6).

Example no.	Manual channel	NZSL-aligned utterance in oral channel	Grammatically correct English version	Features consistent with NZSL structures
4.31	LITTLE GREEN WOOD IN CL-flatgC:put-in-the-middle	Little green wood in middle	***The*** little green wood ***is*** in the middle	No determiner; no copula
4.32	IX-loc 2hCL-B:two-blocks-stand-up TWO BLUE WOOD 2hCL-B:two-blocks-stand-up	Those up- two blue wood up	Those ***two blocks are*** up***right***	No copula; number and noun expressed in manual channel; NZSL-aligned preposition
4.33	ME TEACH++	Me teach teach teach	***I taught them all***	Objective pronoun (me) used not subjective pronoun (I); NZSL verb inflection
4.34	THREE ME	Three me	***I was*** three	Clause-final subject pronoun; no copula; NZSL word order
4.35	IX PROUD fs-O(of) ME	They proud of me	They ***were*** proud of me	No copula
4.36	SIGN SCHOOL TALK BACK WORD AFTER SCHOOL fs-p TALK BACK HOME SIGN	Sign school talk back word after school program talk back home sign	In the after school program ***I*** talk, and back home ***I*** sign	Null subject; NZSL word order

Table 4.7: Jasper's NZSL-aligned mouthed/whispered utterances

4.2.4 Mouthing: Nina

Nina differs from the other participants, not only because she is hearing through CI, but also because her infrequent use of the oral channel is marked. Nina occasionally language-mode switches between code-blends and *sign only* (especially in utterances with a high frequency of depicting signs). Nina's simultaneous use of the oral channel is morphologically reduced, paralleling the whisperers. All of the instances where more than one word is mouthed in an utterance are presented in Table 4.8, showing some features consistent with NZSL grammatical structures.

Given Nina's parents' report that she has a spoken language preference, her infrequent use of oral channel should not be attributed to lack of fluency in English, given her hearing parent reported she has a spoken language preference. It may be that Nina has acquired a skill for code separation in a signed setting. Indeed, her NZSL appears to be dominant throughout the language session and across linguistic channels, and the sporadic use of mouthings are more native-like. Therefore, although Nina and Jasper use a similar volume, they are dissimilar regarding the extent of their mouthings. Throughout the language session, she uses progressively more mouthings, possibly attributed to a non-linguistic effect as she had just woken up at the beginning of the session and was unwell. The addition of more mouthings may show increased bimodal production 'effort' as she warms up.

Example no.	Sign	NZSL-aligned utterance in oral channel	Grammatically correct English version	Features consistent with NZSL structures
4.37	YELLOW 2hCL-bC: horizontal-block ON	*yellow xx on*	***the*** yellow ***block is*** on ***top***	No copula; no determiner; null subject; locative information encoded manually
4.38	2hCL-gC:two-blocks-together FACE SEESAW	facing the seesaw	***Two blocks are*** facing the seesaw	Nominal manually encoded; null subject; no copula
4.39	IX CL-bent 2:dog-jumps-over-fence IX:on-top-of-the-seesaw	*dog jump*	***The*** dog jumps ***over the fence from there to there (the seesaw)***	No determiner; no verb inflectional suffix *-s*; locative information encoded manually
4.40	DOG IX BLUE CL-gC:two-blocks-together TOGETHER CL-gC:two-blocks-together	*Dog together*	***The*** dog ***is behind the two blue blocks which are*** together	No determiner; no copula; locative information encoded manually

Table 4.8: Nina's NZSL-aligned mouthed/whispered utterances

4.3 Bidirectional transfer

While NZSL may influence the oral channel, English can certainly influence the manual channel. As mentioned in Chapter 2, there exists a striking typological difference between English and NZSL regarding the encoding of spatial information. While English generally encodes spatial information separately in a verb (manner) and prepositional phrase (path) (*satellite-framed*), NZSL can encode spatial information together in *depicting signs* (*verb-framed*). This section focuses on the bimodal bilingual children's descriptions of the motion event, involving a toy dog which jumps over a fence onto a seesaw, subsequently pushing off the toy people sitting on the seesaw. These descriptions were produced for their interlocutor who had not seen the motion event, and who was instructed to conduct the motion event with the toys. Participants encoded spatial information in various ways in the manual channel. Some used NZSL depicting signs, others used English-influenced structures (prepositions), and some used both English-influenced and NZSL structures[22]. A description of the types of linguistic features employed by the children as they describe a motion event are outlined below. Of note is that even if the sign channel follows an English-like structure, the oral channel may be produced with morphologically atypical English, and instead reflect NZSL morphosyntax—showing evidence of bidirectional transfer (cf. Pavlenko & Jarvis, 2002) across modalities simultaneously.

Note, the Deaf interlocutors used depicting verbs in their description of the motion event, and generally did not use lexical prepositions (see Table 4.9). These sometimes, but not always, reflected a similar construction used by the child that they were paired with.

Interlocutor	**Signs depicting location and motion**
Tamsin	THROUGH CL-3:people-fall
Donald	CL-bent 2:dog-jumps; CL-B:seesaw-tips
Penelope with Nina	CL-bent 2:dog-jumps; 2hCL-B:seesaw-tips
Penelope with Stephen	CL-bent 2:dog-jumps; 2hCL-1:seesaw-tips; Cl-2:people-fall
Dannielle	CL-B:seesaw-tips
Jasmine	CL-X: dog-jumps; CL-2:people-fall

Table 4.9: Interlocutors' use of verbs depicting motion

[22] A prepositional sign (borrowed from English) is available in NZSL to express path, although depicting signs are more likely used in native sign production.

4.3.1 NZSL-influenced manual channel (NZSL-influenced oral channel)

Catie and Nina's motion descriptions are NZSL-dominant across linguistic channels. Nina produces a depicting sign to express 'dog-jump-over-fence', accompanied by *jump* (whispered) (Example 4.41). Note, *jump* is uninflected for person (i.e. the suffix *–s* is elided) but is used in a way that aligns better with NZSL verb form and therefore appears NZSL-aligned. Nina does not describe the rest of the motion event—instead, she physically picks up the toy dog and shows her interlocutor (even though this went against the rules of the game [Appendix E]).

Example 4.41

LH	CL-bent 2:dog-jumps-over-fence
	w(dog jump)
	'the dog jumps over the fence'

Catie skips the description of the dog jumping over the fence, and instead describes the outcome; that the people and the dog slide off the seesaw (Example 4.42). The manual channel aligns with NZSL grammar as path is encoded in the movement of the depicting sign. The oral channel (whispered) also appears NZSL-influenced as the preposition *off* is not produced and the conjunction (*and*) is 'missing', aligning with NZSL grammar which often sequences ideas rather than using a connective sign (McKee, 2015).

Example 4.42

RH	ALL	PEOPLE	DOG	CL-B:seesaw-tips-slides
	w(all	*the people*	*the dog*	*slide)*
	'all the people and the dog slide off the seesaw'			

4.3.2 English-influenced manual channel (NZSL-influenced oral channel)

Jasper's description differs from Catie's and Nina's in that spatial information is encoded with an English satellite-framed structure in both linguistic channels. Note, in example 4.43, fingerspelling the article 'a' and preposition 'off' show English transfer in the signed channel. In the oral channel, the verb *push* is not inflected for person, and thus both channels show simultaneous bidirectional transfer.

Example 4.43

RH	Fs-T(the)	DOG	JUMP	OVER	TWO	BLUE	AND	PUSH	fs-A(a)	BOY	OFF
	m(the	*dog*	*jumps*	*over*	*two*	*blue*	*and*	*push*	*a*	*boy*	*off)*

'the dog jumps over two blue blocks and pushes a boy off'

4.3.3 NZSL and English-influenced manual channel

Dominic, Stephen and Lucas all produce both NZSL and English structures for encoding spatial information in the manual channel—usually in that order within or across utterances. Lucas uses grammatically intact English in his fully-voiced productions. Conversely, Dominic and Stephen produce NZSL influenced whispers, indicating bidirectional transfer.

Firstly, Lucas uses a depicting verb (CL-H:jumps over the fence SEESAW) to express that the dog jumps over the fence and onto the seesaw (Example 4.44). Donald then asks "what did the dog do?" (WHAT DOG DO), to which Lucas replies with English-influenced prepositional structures, OVER FENCE ON SEESAW (Example 4.45) (note, although a preposition, OVER is oriented in line with the fence on Donald's side of the barrier). As depicting verbs (gestural in nature) encode more rich and detailed information than a prepositional phrase, using a preposition might be for the purpose of highlighting the path or location. English-like grammar may function for clear communication in the eyes of the children, who are increasingly dominant in English with age. This is similar to the explicit expression of DOG (4.44); the actor noun phrase is often expressed before a depicting sign to "emphasise or clarify the actor" (Johnston & Schembri, 2007). Note the oral channel is fully voiced, and has intact English grammaticality. The same pattern occurs in Example 4.46 and 4.47.

Example 4.44:

RH	THEN	DOG	CL-H:dog-jumps-over-fence	SEESAW
	f(and then	*the dog*	*brrrrbrrrschhhhh)*	

'and then the dog jumps over the fence and onto the seesaw'

Example 4.45:

RH	OVER	FENCE	ON	SEESAW-2
	f(over	*the fence*	*and then onto*	*the seesaw)*

'over the fence and then onto the seesaw'

Example 4.46:

RH	CL-B:seesaw-tips-slides-off
	f(everything went pschhh)

'everything fell off'

Example 4.47:

RH	THEN	CL-B:seesaw-tips-slides-off	OFF
	f(then	*it slides*	*off)*

'then everything slides off'

A similar pattern is found in Stephen's manual channel. In Example 4.48, Stephen also produces a satellite-framed description in the manual channel, in which path is encoded in a preposition. In Example 4.49, he produces a depicting sign, CL-O:smash-over, followed by an English-influenced satellite, OVER, in the sign. Note, the oral channel is whispered and English is morphologically reduced (matching NZSL grammar) in both examples (uninflected verbs *jump* and *smash* and elided determiner). Also, the oral channel in both utterances have a preposition *over*. Therefore, influence across channels is variable. Thus, the oral channel shows NZSL influence and the manual channel shows English influence of different features—in other words, simultaneous bidirectional transfer.

Example 4.48:

RH	CL-O: dog-jump-over	BLUE
	w(dog jump over	*the blue)*

'the dog jumps over the blue blocks'

Example 4.49:

RH	CL-O:dog-smash-over	BLUE	GIRL	OVER
	w(then smash like	*blue*	*girl*	*over)*

'then the dog smashes the blue girl over'

Likewise, Dominic produces two different utterances with the same meaning, in which the signs and words are coordinated differently. In 4.50, a depicting verb is produced with the path encoded in the verb, and in 4.51 a verb JUMP-over is produced (the sign's direction of movement is modified to express 'over') and a separate preposition OVER is produced, which also encodes path. In the Example 4.50, in the oral channel, Dominic uses a quietly whispered nonce sound effect with the depicting sign (arguably NZSL-influence), and in 4.51 he produces a whispered verb.

Example 4.51 and 4.52 both show how a depicting verb and a prepositional phrase may be used in one utterance in the manual channel. The additional preposition is lexically redundant as 'over' and 'down' are already expressed in the depicting verb, however it appears to clarify or emphasise the path. Examples with English prepositions are elaborations produced for an inquisitive interlocutor, who had asked for clarification. In the oral channel in Example 4.51, the verb *go* is uninflected and in Example 4.52 the verb *need* is uninflected, showing influence from NZSL grammar. Thus, linguistic features of either language can be expressed to varying degrees in both linguistic channels—evidence of simultaneous bidirectional transfer.

Example 4.50:

RH	CL-flat bC:dog-runs-and-jumps-over-fence	AND	ON SEESAW
	w(and the dog went oof oof oof	*and went*	*on the seesaw)*

'the dog jumped over the fence and on to the seesaw'

Example 4.51:

RH	AND	JUMP-over	OVER	WALL	AND	GO	ON SEESAW
	w(and it jumps	*over*	*the*	*wall*	*and*	*go*	*on the seesaw)*

'the dog jumps over the wall and onto the seesaw'

Example 4.52:

LH	SEESAW		
RH	SEESAW	FALL-down	DOWN
	w(it need to	*f-f-f-fall*	*down)*
	'the seesaw needs to fall down'		

In sum, all three children often first produce a depicting sign, and then in an iteration (elaboration) they use English structures to encode path. Taking into consideration the instructional nature of their descriptions, this pattern may indicate that English-aligned structures are perceived by the children as functioning for clarity as their English is more dominant than NZSL. In other words, while the depicting verb offers a rich, and detailed description of the location and motion event, an English (satellite-framed) structure may provide clarification with more overt information expressed as a satellite.

4.4 Chapter summary

All participants produce the oral channel with varying volumes; three whispered, two mouthed (although they too sometimes whispered very quietly), and one used full-voice. Visual volume increases through reinforced mouth shapes for emphasis and clarification, particularly when audible volume is decreased. Phonological reduction of words, characteristic of deaf speech are also found in bimodal bilingual production.

Additionally, in the game section, the whisperers were all similar in that they produced continuous code-blends, and a similar ratio of signs to words—although English features (lexical items and syllables) are frequently morphologically reduced, matching NZSL grammar. Conversely, Lucas, who used full-voice, produced many more words than signs, with English morphosyntax frequently remaining intact. Jasper produced an even ratio of signs to words, showing the most alignment between channels, and more transfer from English to the manual channel out of the participants, although at times, he also has NZSL-influenced oral channel. Nina differs in that she produces fewer words in the oral channel, however when the oral channel was produced, it was typically NZSL-influenced.

For four participants transfer from English to NZSL occurred during descriptions of location and motion, whereby English grammatical features influence the encoding of path. Use of

depicting verbs and English-influenced prepositions in a single utterance results in a double layer of semantic information. The oral channel does not necessarily only align with English, and the manual channel does not necessarily only align with NZSL; the production of NZSL and English features is not fixed or bound to modalities, rather there is flexibility (an interplay) of codes across modalities. Overall, participants may alternate between the grammar system of either language between utterances or co-produce them simultaneously.

To get an even better picture of what the oral channel achieves in communication with a Deaf interlocutor, the semantic content needs to be addressed; in the next chapter complementary information expressed in the oral channel (including mouth gestures and sound effects) is argued to have a gestural role in signed communication.

Chapter 5: Variation in the coordination of meaning in code-blended descriptions of location and motion

This chapter investigates the ways in which bimodal bilingual children (aged 4-9) package meaning into simultaneous blends of sign and speech in a sign-target session), to provide insight into the role of the oral channel. This is a particularly interesting question regarding descriptions of location and motion, considering depicting signs do not correspond with discrete lexical items in English. Previous research on native or near-native signers has found that depicting signs are the least likely grammatical class to be produced with a mouthing, and instead are often produced with mouth gestures (Johnston et al., 2016). Considering the bimodal bilingual children's use of phonation and the varying extent of transfer (described in Chapter 4), how does the oral channel function for meaning creation? Building on the previous chapter, this chapter presents findings from a preliminary analysis of the effect of simultaneous production on the oral and manual channels. This analysis follows on from the works of Emmorey, Borinstein, Thompson, & Gollan (2008) and Johnston, Van Roekel, & Schembri (2015) which compare code-blends to co-speech gesture vis-à-vis "synchronous vocal–manual timing and semantic equivalence" (Emmorey et al., 2008, p. 43), and examine the possible universality of mouth actions across language users (Johnston et al., 2016). Neither study addresses audible volume used by bimodal bilingual children.

Using a case study structure (cf. Duff, 2012), Section 5.1 focuses on each participants' coordination of semantic information expressed across channels, from the game section of the language sessions. A case study structure affords in-depth analysis of individual language use; moving participant by participant, each case builds a picture of the combinatory options of modality and language used for expressing an instructional narrative, describing motion and location. Focusing on location and motion specifically allows for in-depth examination of how the participants coordinate the rich information in depicting signs, with the oral channel. Thus, the questions asked in the first section of this chapter are:

1) How do bimodal bilingual use the oral channel in motion and location descriptions to express meaning?

2) How are the participants' two languages and modalities temporally coordinated when producing motion descriptions?
3) Do the oral and manual channels produce semantically congruent or incongruent information within a code-blend?

The second section of this chapter presents a description of children's attitudes towards their use of NZSL and English, which emerged in the sociolinguistic interview.

5.1 A case study of the coordination of meaning in code-blends

5.1.1 Dominic

Most of Dominic's utterances are *whispered (multi-word) continuous code-blends* (as in Example 5.1). Only six of the 59 signs that Dominic produces are not code-blended with a whispered word (Table 4.1, Chapter 4). Immediately evident is the tight synchronisation of the oral and manual channels, in which onsets of the signed and spoken words align (cf. Emmorey et al. [2008]). Synchrony of the two channels is preferred to the extent that words are stretched to become temporally aligned with the sign. In 5.1, Dominic extends the sound, [s], in the word *seesaw* so that the duration of the word matches the articulation of the sign SEESAW which is produced with a longer duration than usual (+). As this is the first use of SEESAW, and because it is not a fully established sign (absent from the NZSL online dictionary),[23] the oral channel specifies the sign in context. Modifying the duration of both channels serves to amplify the sign, to ensure that the interlocutor understood (note, the visual volume of the oral channel was reinforced by this lengthening).

Example 5.1:

LH		SEESAW[_]+
RH	ME +	SEESAW[_]+
	w(I made	*a sssseesaw) [pause while interlocutor signs] m(-aw)*
	'I made a seesaw'	

Likewise, in Example 5.2, *fall* spreads to temporally match the sign, FALL, binding prosodically to form a single unit (Boyes Braem, 1999). In this example, the signed lexical

[23] Another example of this is in the interview section (not the location and motion narrative extract), where his goes beyond emphasis and rather for word play Dominic extends the sign BROTHER by repeating the movement several times, and elongates the vowels in "brother" to become temporally aligned with the sign.

item FALL is at the tip of his fingers[24], and whispering *fall* ([f] is drawn out, and the visual volume increases) appears to help access the form FALL. Thus, even when there is an apparent delay in the production of the sign, oral and manual channels are temporally aligned.

Example 5.2:

LH	SEESAW		
RH	SEESAW	FALL-down	DOWN
	w(it need to	*f-f-f-fall*	*down)*
	'the seesaw needs to fall down'		

The majority of Dominic's code-blends are semantically equivalent. However, a few signs are coupled with lexically incongruent spoken words. Also, because Dominic produces continuous code-blends, sometimes extra information is expressed in the oral channel. In Example 5.2, Dominic signs SEESAW and *it need to* concurrently. In this case, the oral channel provides semantically distinct information from the single concurrent sign. One possible explanation for this is that SEESAW has already been established with the whispered word *seesaw* earlier in the narrative. Therefore, a new layer of meaning is added in the iteration instead of reproducing its semantically equivalent English representation. In Example 5.1, four spoken words (*I made a seesaw*) are produced with two signs (ME+ SEESAW). Note that ME is repeated (+), presumably to rhythmically match the spoken word *made* and *a* so that the following sign, SEESAW, and whispered word *seesaw* can be temporally aligned at their onsets. Spoken determiners (if produced) are sometimes produced in transitions between blends, immediately before the noun code-blend (as in the article *a* in Example 5.1), or are tagged onto the previous code-blend (*a* in Example 5.3).

Example 5.3:

LH		WALL	[+]
RH	AND AND	WALL	[+]
	w(and and a	*wall*	*oo-pursed lips)*
	'and build a wall'		

[24] "Tip-of-the-tongue (TOT) states are word retrieval failures characterized by a feeling of imminent recall" (Borodkin & Faust, 2013, p. 914).

Dominic's depicting signs are accompanied by mouth gestures or nonce sound effects, meaning he switches from a blend of sign and word, to a multichannel sign. For instance, in Example 5.4, two depicting verbs are accompanied by a single whispered mouth gesture, &=[B] (bilabial trill), in which the cheeks are firstly puffed and [B] is produced with a prolonged exhalation of air (cf. Braem, 1999; Johnston & Schembri, 2007). The mouth gesture is spread over two verbs (persisting beyond the first sign), which serially depict the seesaw (CL-B), and the people (CL-O) as falling. Additionally, the widened eye-aperture and raised eyebrows enact the surprise of the toy people. The interlocutor later produces a similar depicting verb (CL-3:the-people-and-dog-slide-off), with a similar mouth gesture. The mouth gesture, while minimal in semantic information, draws attention to the manner of the depicting verb. However, this mouth action is not entirely devoid of semantic information, (Johnston et al. (2016) also recognises the meaningful nature of these mouth actions), and rather could be enacting the uncontrolled manner of the objects falling down the slope of the seesaw.

Example 5.4:

LH			2hCL-bC:seesaw-tips 2hCL-O:people-slide-off
RH	AND	PEOPLE	2hCL-bC:seesaw-tips 2hCL-O:people-slide-off
	w(and	*the people)*	*&=[B]-prog)*

'and the people fall off the seesaw which slides'

With another depicting verb (Example 5.5), Dominic produces a quietly whispered nonce sound in which the syllable *oof* is repeated three times, while the handshape (depicting a dog) moves towards the seesaw. The origin of this nonce sound is debatable. It is possibly an enaction or imitation of the sound of the dog walking, or the sound of a dog barking, introducing complementary semantic information about the referent into the utterance. This is somewhat curious given the Deaf status of the interlocutor, for whom the onomatopoeic representation of a dog's bark is arguably less meaningful (but would have been exposed to the word 'woof'). Another interpretation is that *oof* is an echo mouth gesture, in which the [f] is produced at the offset of the downward movement of the sign, thus mirroring the manual movement (cf. Woll, 2001). Regardless of its opacity, this sound is idiosyncratic and potentially unique to someone who has access to both a signed and spoken language (a Coda-ism), and appears to rhythmically fill the gap (cf. Petroj [to appear]) in the spoken string while the depicting verb is produced, maintaining movement of both sign and speech. By firstly

whispering quotative phrase, “the dog went”, and then providing additional semantic information about manner in the depicting verb, the oral channel directs the interlocutor’s attention to the semantically-dense depicting sign.

Example 5.5:

LH	DOG	
RH		CL-flat bC:dog-runs
	w(and the dog went)	*m(&=imit:oof oof oof)/ xxxx(nonce sound)*
	‘and the dog ran’	

5.1.2 Stephen

Like Dominic, Stephen mainly produces *whispered continuous code-blended* utterances, in which sign and whispers are concurrently produced. Intriguingly, unlike the other participants, even fillers for hesitation are code-blended (and are frequently used in his narrative), showing his preference to have both channels “on” across a range of lexical items. For instance, in Example 5.6, spoken fillers *um* and *like* are accompanied by a generic palm-up discourse marker, as commonly found in NZSL discourse (McKee & Wallingford, 2011). Other times spoken word fillers are not accompanied by a gesture, and are instead produced with the preceding code-blend—in which the code-blend stretches to accommodate multiple spoken words. A similar stretching pattern is found in Example 5.6 where Stephen produces *you put* and *the blue* slowly, and the signs PUT and BLUE, which are simultaneously produced, accommodated by also being modified in length. Note, while the lexical item PUT (which is not modified in form) is lexically redundant as ‘put’ is expressed by the depicting sign, it serves to emphasise the instruction.

Example 5.6:

LH					BLUE		2hCL-Bflat:put-two-blocks-to-the-right
RH	THEN	PUT	palm-up	BLUE	BLOCK	2hCL-Bflat:put-two-blocks-to-the-right	
	w(and then	*you puuut*	*like*	*the bluuue*	*block*	*there)*	
	‘and then you put like the blue block to the right over there’						

Unlike Dominic, Stephen simultaneously produces most depicting signs with spoken word approximations (e.g. *knocks* in Example 5.10). Otherwise, he produces separate but semantically related information (cf. Emmorey et al. [2008]) with depicting signs. For instance,

he blends a depicting sign with a discourse marker (*like that* [Example 5.7], *on like* [Example 5.9]), with orientation information (*on top*, *on that side*), or locative information (*onto there* [Example 5.8], and *there*). In doing so, the whispers comment or describe the hands, while the physical location, orientation and spatial relation is visually expressed by the depicting sign. This complementary information arguably serves a similar role to mouth gestures (used by Dominic), as they both direct attention (a type of gesturing) to the critical information contained in the manual channel, forming a composite utterance.

Example 5.7:

LH		2hCL-O:put-people-on-either-side-of-the-seesaw
RH	2hCL-O:put-people-on-either-side-of-the-seesaw	
	w(like that)	
	'put the people on either side of the seesaw like this'	

Example 5.8:

LH	BIG	2hCL-bC:put-block-on-top-of-small-block
RH	BIG	2hCL-bC:put-block-on-top-of-small-block
	w(big	*block onto there)*
	'put the big block on top of the small block'	

Example 5.9:

LH	2hCL-bC:put-two-blocks-standing-up-together						
RH	2hCL-bC:put-two-blocks-standing-up-together	FOUR	BLOCK	AWAY	FROM	palm-up	
	w(on like g(hand to chin thinking gesture)	*four*	*blocks*		*away*	*from*	*like)*
	'put the two blocks stand up four blocks away from-'						

Example 5.10:

LH				
RH	NO	CL-O:knock-over-girl	GIRL	CL-2:girl-falls
	w(no	*knocks*	*girl*	*over)*
	'no it knocks the girl over'			

In example 5.11, the oral channel expresses a modifier, *blue*—information that is not expressed by the concurrent depicting sign "2hCl-B:two-blocks". Although rare (cf. Emmorey et al., 2008), producing different but complementary information on two channels is uniquely possible for bimodal bilinguals, since both codes can be activated simultaneously. The two channels coordinate and collage different information about the same object, "adding meaning which is formally unstated or understated in the wording" (Johnston et al., 2016, p. 33), similar to co-speech gesture.

Example 5.11:

LH	DOG	BEHIND	2hCL-B:two-square-blocks
RH	DOG	BEHIND	2hCL-B:two-square-blocks
	w(dog	*behind*	*blue)*

'put the dog behind the blue blocks'

5.1.3 Catie

Catie too mainly produces *whispered continuous code-blended* utterances. Like Dominic and Stephen, the channels are frequently temporally aligned. In 5.12, the [p] in *put* is drawn out while she slowly articulates the sign PUT, seemingly as she plans what to say next. As in Example 5.2, the oral channel is stretched to temporally align with the manual channel (also potentially helping produce the signed lexical item). Furthermore, in 5.12, the whispered word, *yellow*, is stretched progressively over the depicting sign, bunching both the frozen sign, YELLOW, and depicting sign, CL-flatbC:long-block, to form a prosodic unit. Yellow is a modifier, expressing information (colour) that is not expressed internal to a depicting sign (Bank et al., 2015), creating a more vivid image for the Deaf interlocutor who has to distinguish between differently coloured blocks. In addition, this whisper is particularly visually amplified. Likewise, in 5.13, *wooden* modifies the sign depicting a block (which cannot iconically express the meaning "wooden").

Example 5.12:

LH			PEOPLE	ON		2hCL-flat bC:PEOPLE-ON-SEESAW
RH	THEN	PUT	PEOPLE	ON	YELLOW	2hCL-flat bC:PEOPLE-ON-SEESAW
	w(and then	*p-p-put*	*the people*	*on*	*yellow-prog)*	

'and then put the people on the yellow block'

Example 5.13:

LH 2hCL-flatbC:long-block

RH USE 2hCL-flatbC:long-block

w(use the wooden)

'use the long wooden block'

Catie, like the other Codas, produces continuous code-blends. In 5.14, the SEESAW handshape is temporarily held still while the oral channel articulates *made a*, and then the 'seesaw' movement of the sign SEESAW commences, in alignment with the whispered word *seesaw*. The use of words, such as *made*, which are not expressed by the hands, perhaps indicate an expectation that the interlocutor can perceive this information (see Chapter 6 for more discussion).

Example 5.14:

RH SEESAW

w(made a seesaw) m(seesaw)

'I made a seesaw'

Like Stephen, Catie's depicting signs are often accompanied by locative or orientation information, or by discourse markers, in the oral channel; respectively, *over there*, *that way* (5.16), and *like that* (5.15) comment on salient information of depicting signs. Other examples where the oral channel provides complementary information to a depicting sign include: *on top*, *together*. In 5.16, *that way* is mouthed, unlike the majority of Catie's whispered oral channel. The volume is further reduced perhaps because it does not provide new information; the new orientation of the block which Catie is referring to, is implied in NO SAME-*not the same*. The information in the oral channel which is co-expressed with a depicting sign is frequently partially articulated, so whether or not the mouth pattern is received by the interlocutor is debatable. At the very least it is functioning for the child to maintain the oral rhythm, cohesively with the manual channel—perhaps not dissimilar to mouth gestures and nonce mouthings by Dominic and Lucas (see Chapter 6 for more details).

Example 5.15:

LH 2hCL-flat bC:put-two-blocks-standing-up-next-to-each-other

RH 2hCL-flat bC:put-two-blocks-standing-up-next-to-each-other

w(like that)

'the two blocks stand up next to each other like that'

Example 5.16:

LH 2hCL-flat bC:put-block-on-top-horizontally

RH NO SAME 2hCL-flat bC:put-block-on-top-horizontally

w(not the same) *m(that way)*

'not the same as before – that way'

5.1.4 Lucas

Unlike the others, Lucas frequently switches between only speaking (in full-voice) utterances, and *fully-voiced continuous code-blends* utterances. Like the others, he also stretches words to match the rate at which the sign is produced. In Example 5.17, the vowels in *first you put* are lengthened (and therefore visually amplified) to match Lucas's slow signing, seemingly while he plans what to say next.

Example 5.17:

RH FIRST YOU PUT

f(fiiiirst you puuuuut)

'first you put- '

Like Catie and Stephen, depicting signs are often coupled with locative information (*there there* [5.22]), or orientation information (*a line* [5.18]). Also, depicting verbs are produced with sound effects (Examples 5.19, 5.20, 5.21) (similar to Dominic). The sound effect in 5.20 is produced over a serial verb sequence, and therefore prosodically binds both signs to form one unified utterance. Lucas' sound effects/vocalisations (fully-voiced), such as *duuuschhh*, which is concurrently produced with CL-B:seesaw-tips-and-slides (5.20), playfully embellish the depicting sign. However, unlike Dominic's nonce mouthing, *oof oof oof*, which may be unique to bimodal bilingual production (Emmorey et al., 2008), Lucas' sound effects appear to reflect

the playful vocal resources that all children and adults employ (or *iconic vocal gestures* [Emmorey et al., 2008]). However, they are produced in the same position as adverbial mouth gestures that may be utilised by native Deaf adult signers with verbs, which suggests Lucas attempting to produce this feature of NZSL.

Example 5.18:

LH				IX-loc CL-1:a-vertical-line	
RH		PUT GREEN BLOCK			
	f(not like that	*put the green block*		*a line*	*nooo)*

'not like that – put the green block in a line – nooo'

Example 5.19:

LH			DOG	
RH	YES	THEN	DOG	CL-H:dog-jumps-over-fence
	f(yeah yes	*and then*	*the dog)*	*&=brrrschhh (sound-effect)*

'yes and then the dog jumps over the fence'

Example 5.20:

LH				
RH	FENCE	THEN	CL-flatbC:dog-runs CL-2:dog-runs	CL-B: 'seesaw-tips-and-slides'
	f(put it in a fence	*and then)*	*&[B]sound effect*	*&=duuuschhh(sound-effect)*

'make the blocks a fence and then the dog runs and the seesaw tips and slides'

Example 5.21:

RH	CL-B: 'seesaw-tips'
	f(everything went) &=pssschhh (sound-effect)

'everything slides off'

Example 5.22:

RH	CL- flat O:the-boy-goes-behind
	f(there there)

'the boy goes behind that'

5.1.5 Jasper

Jasper produces *mouthed* and *whispered continuous code-blended* utterances. Jasper's oral and manual channels are also temporally linked and work in tandem. In 5.23, when the sign BLUE is produced as a false start with the incorrect orientation, [b] is drawn out. The sign is promptly self-repaired (cf. Warren, 2012)—simultaneously articulated with the rest of the mouthing for *blue*. Again, it seems that when the sign stream is lagging, the oral channel is put on hold until production has resumed.

Example 5.23:

LH													
RH	fs-T	DOG	JUMP	OVER	TWO	BLUE(incorrect)	BLUE	fs-W	fs-A	fs-A	PUSH	fs-A	BOY	OFF
	m(the	*dog*	*jumps*	*over*	*two*	*b-*	*blue*	*wood*	*and*		*pushes*	*a*	*boy*	*off)*

'the dog jumps over the two blue blocks and pushes the boy off'

Jasper's signs depicting location or the handling of a block or toy are matched with mouthings (as in Example 5.24). As for Stephen, Catie and Lucas, signs depicting shape and size and location are produced with the oral channel commenting on the location or orientation of the object (e.g. *in the middle, on top, together, up*). Intriguingly, unlike the other participants who use *block* to describe the wooden blocks, Jasper mouths *wood* and produces a nonce sign WOOD (it is possible this form was adopted from his parents, as well as the mouthing *wood* from parents who might not use the word 'block'). As is explained in Chapter 4, Jasper uses frozen signs in place of depicting verbs of motion. The oral channel produces semantically equivalent forms to match these (e.g. *pushes*, in Example 5.23).

Example 5.24:

LH	LONG		WOOD	2hCL-IrishT:put-block-on-top
RH	LONG	YELLOW	WOOD	2hCL-IrishT:put-block-on-top
	m(long	*yellow*	*wood*	*on top)*

'put the long yellow block on top'

5.1.6 Nina

Nina's language production in the game section differs dramatically from the other children, as she uses the oral channel to a much lesser extent (refer to Chapter 4, Table 4.2). Nina's mouthings typically accompany frozen signs and depicting signs are not produced with the oral channel, as in (5.25) and (5.26).

Example 5.25:

LH	DOG	BLUE	2hCL-gC:two-blocks-together	2hCL-B: two-blocks-together	2hCL-gC:two-blocks-together
RH	DOG IX-loc	BLUE	2hCL-gC:two-blocks-together	2hCL-B: two-blocks-together	2hCL-gC:two-blocks-together
	m(dog			*together)*	

'the dog is behind the two blue blocks which are together'

Example 5.26:

LH	2hCL-gC:put-two-blocks-together			2hCL-gC:put-two-blocks-together
RH	2hCL-gC:put-two-blocks-together	FACE	SEESAW	2hCL-gC:put-two-blocks-together
		m(facing	*seesaw)*	

'the two blue blocks are together facing the seesaw'

Although Nina mainly produces depicting signs without mouthings, the offset of a mouthing preceding a depicting sign tends to be slightly stretched to overlap with the onset of such signs, prosodically binding them (Example 5.27). Additionally, the motion verb is produced with a spoken word approximation; in Example 5.28, Nina mouths *jump* with the depicting sign, and the initial consonant is stretched to temporally align with the sign (thereby increasing the visual volume). It appears the oral channel is used here to clarify what the dog is doing because the question which prompted Nina's response was "what did the dog do?". Nina also produces micro movements of the mouth, unrecognisable in form or semantic meaning, but seemingly serving a rhythmic filler role (cf. Petroj, to appear).

Example 5.27:

LH GREEN

RH GREEN CL-gC:put-block-horiztonally-on-ground

w(green-prog)

'put the green block horizontally on the ground'

Example 5.28:

RH IX-loc CL-bent 2:dog-jumps-over-fence IX-loc(on-top-of-the-seesaw)

m(dog j-j-jump)

'the dog jumps over the fence from there to there (the seesaw)'

Note that while non-manual features, other than the oral channel, are not analysed in detail in this thesis, they are employed by all participants. For instance, eye-gaze shifts between the addressee and hands when producing depicting signs—in doing so, directing the addressee's attention to the depicting sign. Thus, other non-manual features (not just the oral channel) can also bind signs and words in prosodic units.

5.1.7 Common trends

Temporal alignment for rhythmic and prosodic functions

As is evidenced above, children in this study make use of both modalities and languages to varying degrees yet demonstrate a likely role of the oral channel—to bind meaning in synchronized blends (akin to co-speech gesture, McNeill, 1992). *Multi-word continuous* code-blends (one sign matched with multiple words) are preferred by the five Codas, so that signs are often accompanied by their semantic equivalent, alongside extra information not specified by a sign. Signed and spoken lexical representations are generally time-aligned, matched at their onsets, with extra words mouthed at the offsets or in the transitions between blends.

Discourse markers and filled pauses used for planning a code-blended utterance are primarily produced in the oral channel, possibly because English serves to guide the manual production for these children. Such simultaneity appears economical—less semantically critical information is produced by the oral channel—the least accessible channel for the Deaf interlocutor. An exception to this is Stephen, whose spoken word fillers are frequently accompanied by signed palm-up fillers. The temporal alignment of channels during self-repairs

when the child stops and recasts an utterance, or when a sign/word is at the tip of their fingers/tongues, suggests that the oral channel aids the production of NZSL lexical items (cf. co-speech gesture). Furthermore, there were instances of one word or mouth gesture spreading over multiple signs to bind them as a prosodic unit (as in Boyes Braem, 2001; Bank, Crasborn, & van Hout, 2015).

Gestural role of oral channel—specification or extension of the sign

The bimodal children in this study prefer to not leave the oral channel unexpressed and instead maintain a steady production of both the oral and manual channels, even when using depicting signs or gestures which do not have exact semantic equivalents in English (evidenced through mouth gestures, and complementary words). Nina, the sole DDCI, is the exception who patterns more with native signers by producing depicting verbs without mouthing words. Further, almost every sign is matched with a mouthing of a semantically corresponding English word, corroborating Emmorey et al. (2008) and Petitto et al. (2001). However, as is described for each participant above, and plotted in Table 5.1, signs depicting motion and location are expressed with semantically distinct or complementary information in the oral channel. This is likely due to the fact that depicting signs, which are visually iconic descriptions, do not have exact lexical equivalents in English (Emmorey et al., 2008). Certainly, for these bimodal bilinguals, expressing meaning in the oral channel emphasises the meaning expressed in the manual channel, gesturally augmenting an element of the sign. When the oral channel is used, it "perform[s] a role not unlike that often attributed to co-speech gesture: adding meaning which is formally un-stated or under-stated in the wording" (Johnston, Van Roekel, & Schembri, 2016, p. 33).

Information in the oral channel	Dominic	Lucas	Nina	Stephen	Jasper	Catie
Manner/handling - Discourse marker (e.g. like that)				2		2
Locating – Locative information (e.g. there)		1	1	4	2	3
Orientation information (e.g. that way)		1			2	2
Sound effects or mouth gesture	3	3				
English equivalent (e.g. slide)		1	1	3		
Extra relevant information (e.g. modifier)			1 (*green*)	2 (*yellow*, *wooden*)		1 (*blue*)
Additional clause	1 (Example 4.26)					
Nonce mouth pattern						1
No mouth action		4	14			

Table 5.1: Instances of information expressed in the oral channel with depicting signs

Both channels are arguably necessary for providing the complete story, particularly when the oral channel comments on the orientation or location of the object described in the depicting sign. However, this is not to say the same information cannot be expressed in *sign only* utterances; it simply means that these bimodal bilinguals exploit both oral and manual channels. In this sense, the oral channel is not redundant, as it provides emphasis or complementary information for the sign. This function is akin to eye-gaze (also observed to be used by all participants) which is often directed "toward a classifier construction for a number of reasons, for example, for emphasis, to draw the addressee's attention to a spatial location, or perhaps to linguistically mark object or locative information" (Emmorey, Thompson, & Colvin, 2008, p. 243).

Also, there are a few cases when some of the depicting signs are repeated (often spatially modified in their iteration), mouthing is dropped, most probably because the mouthing serves to specify a sign, which is achieved in the initial articulation. Instead, an alternative mouth

gesture may be used to embellish the manual component of the message, or additional information may be expressed (cf. Example 5.2).

5.2 Children's attitudes towards their use of NZSL and English

This final section summarises children's attitudes towards bilingualism, which emerged in the sociolinguistic interview. The sociolinguistic questions (see Appendix E) aimed to gauge the children's attitudes towards using and switching between English and NZSL. Quotes in this section are English translations of information the children expressed bimodally as they responded to a Deaf interviewer.

Regarding domains of use, all participants confidently identified when and where they use NZSL and English. For them, Deaf people and home are associated with NZSL, whereas hearing people, school and other public domains such as the "shops" (Nina) are associated with speaking English. Additionally, for Nina, the sole DDCI, switching between languages also involves switching between signing and speaking according to when she and her Deaf brother have their cochlear implants turned on or off. Lucas reports he does not sign with three sets of people who are hearing – father and brother, teachers, and friends – "I don't sign […] to Daddy and Ross because they are hearing same as me I'm hearing". Catie acknowledges how "you sign, and then if a hearing person doesn't hear you can speak". Likewise, Dominic says he signs with his mother and less with his father. When asked to clarify he says: "because he has a hearing aid – like you", showing his sensitivity to differing audiological statuses. He has likely associated a spoken language code with hearing aids, as his father uses spoken language with him (with or without sign) and his mother uses signed language with him (Appendix A). Dominic reports he does not sign when he talks to his brother or friends or "because they are hearing".

Most of the participants positively reflect on their role in teaching signs to hearing people. Dominic's teachers know some signs such as how to say "good morning" and his name sign, Jasper's teachers are taking NZSL classes so they can practice with him, and Nina and Jasper are teaching school friends. Stephen noted that he speaks and signs with his hearing baby sister, so that she can learn both languages.

Furthermore, the secrecy that NZSL affords the children with hearing peers who know some signs was noted as an advantage. In answer to the question "what's cool about signing and talking?", Jasper says his friends cannot hear him, because they do not know the words, unless he teaches them secret words (i.e. signs). On the contrary, Stephen says that "the cool thing about speaking is that other people know what you are saying", reflecting an awareness of the utility of spoken language for communicating with people beyond family. Stephen also reflects: "the cool thing about signing is that you use your hands to talk". Additionally, the eldest and youngest bimodal bilinguals were the only participants who knew what the term CODA meant. While the youngest knew his mother had told him, and seemed proud to have insider knowledge that he was a Coda, he could not remember exactly what CODA stands for. While the others were not aware of the term, CODA, they are aware of Deaf history and culture, and that signing and speaking have held different statuses. For example, Stephen reflects how "a long time ago signing was not allowed".

Most of the participants reported that they like knowing sign and speech, and experienced it without problems (although some responded fairly minimally to "do you like knowing how to sign and speak? What's cool about knowing both?", especially Lucas, the youngest, who simply said "because I do"). Nina reports how "I feel good with both". Jasper explains how he has no problem switching from signing and speaking; "I sign, and then at school I talk, then back—words—then at after school program I talk, then back at home I sign". Intriguingly, although the oral channel is clearly a part of their signed production, none of the participants noted that they mix languages (although language mixing was not specifically enquired about); thus it seems they do not have the metalinguistic awareness of their interconnected use of sign and speech. This perhaps reflects how oral channel use and signing are a combined language production type (code-blending) in their linguistic repertoires. However, Stephen does give an account of how his father playfully said 'McGoggles' and signed GOGGLES[25] instead of 'McDonalds', playing on the similar sounds of the spoken word. Thus, Stephen can see the creative combined possibilities of combined sign and voice. Unlike the others, Dominic says that he liked "just talking" and "I don't like signing because it makes me tired". When asked what is it like to switch between sign and speech, Dominic says:

[25] http://nzsl.vuw.ac.nz/signs/4190

Example 5.29:

LH				SIGN						NOW
RH	LIKE	WHEN	I	SIGN	I	FEEL	STRANGE	LIKE	I	FEEL	NOW
	w(it's like	*when*	*I*	*sign*	*I*	*feel*	*strange*	*like*	*I*	*feel*	*now)*

'it's like, when I sign, I feel strange, like how I feel now'

When asked if he feels strange when he speaks, he hesitates and shakes his head. It is possible 'like how I feel now' refers to how he is made the object of attention when signing, or that signing is possibly more constraining than speaking. Catie's response likewise reflects her awareness of the uniqueness of her bilingual experience; when asked "what it is like to switch between sign and speech?", Catie says that it is WEIRD. Catie was asked why and she shrugged. These responses may reflect their curiosity about their unique language use, that their unconscious use of it is peculiar to them, and perhaps that that the physical act of switching modes is taxing for them. It is likely they are contrasting their experience with their peers who do not come from Deaf families, and therefore are attuned to their experience as a linguistic minority. More detailed perspectives on the development of metalinguistic awareness may emerge in future research with older bimodal bilinguals (cf. Bishop et al., 2006; Hoffmeister, 2007)

5.3 Chapter summary

Examining different uses of the oral channel and coordination with the manual channel has shed light on some of the functions of code-blending—for prosodic emphasis/clarification and providing complementary information to the sign. Overall, oral channel variation in oral-manual blends among the six participating children demonstrates the combinatorial outcomes which dual languages and modalities afford bimodal bilinguals (Lillo-Martin et al., 2014).

Regardless of volume, the oral and manual channels are temporally aligned, and sign and speech are coordinated. While semantic equivalence is more frequent than incongruent code-blends across all participants, oral elements produced with depicting verbs are a notable exception, frequently providing complementary or modifying information. Thus, the oral channel may play a similar role to co-speech gestures used by hearing speakers—to emphasise parts of the message (Warren, 2012). It is uncertain whether or not their vocal sound effects are

like those used by children generally when describing a motion event, or reflect ‘voicing’ of an NZSL mouth gesture. Use of sound effects and other nonce mouth patterns problematize the notion that mouth gestures are integral to the sign language(s); in any case, they are a necessary addition to research on the universality of mouth actions across all language users (Johnston et al., 2016). The children show awareness of their two languages and domains of use, as well as varying perspectives on the advantages and constraints of their use of NZSL and English. In Chapter 6, their “third identity” (Bishop et al., 2006) as Codas, and their experiences in the overlap between two cultures and languages are addressed as factors influencing their use of the oral channel.

Chapter 6: Discussion—Synthesis of signs and speech

The bimodal bilingual children of this study make use of the oral channel, with variation in audible and visual volumes, morphosyntactic form, semantic contribution, and temporal coordination with the manual channel. This chapter will explore cognitive, socio-cultural and linguistic reasons for this variation. While at first glance the use of the oral channel during signed interaction with a Deaf interlocutor could be considered redundant, this would be taking a cursory approach—in fact, the data reveals many dimensions of oral channel use. As Chapter 4 highlighted, there is: 1) an inverse relationship between the visual and audible volumes of the oral channel; 2) an association between reduced volume and a greater presence of NZSL-aligned grammatical features in the oral channel, and an association between full-voice and intact English grammatical features; and 3) evidence of transfer of English into the manual channel during the encoding of spatial information. Indeed, Chapter 5 highlighted how the oral channel (including complementary information, mouth gestures, and sound effects) can contribute to the creation of meaning, during descriptions of location and motion. Overall, bimodal bilinguals use their mouths while signing in much the same way that non-signers use co-speech gesture while speaking—to contribute to the message being expressed. Additionally, the children's attitudes towards their use of NZSL and English were described in Chapter 5, highlighting their sensitivity to the uniqueness of their heritage language and movement between overlapping Deaf and hearing worlds and associated languages.

In order to highlight the roles of synthesis of sign and speech, this chapter is organised thematically, addressing research questions as they arise (refer to Chapter 1, Section 1.2). Firstly, this discussion assesses the relevance of notions of language synthesis and suppression with regard to the association between a lowered audible volume and increased transfer of NZSL into the oral channel. Secondly, bimodal bilingual language production is considered in a heritage language framework, in order to uncover the roles of the oral channel types (full-voice, whispers, mouthings, mouth gestures, sound effects, vocalisations, micro mouth movements) with regard to broader socio-cultural and individual family contexts. Language development, and interlocutor and interactional sensitivities are also considered. The final section compares the use of oral and manual channels across signed and spoken language users. In doing so, this chapter addresses the central research question of the role of the oral channel

in blended language use, assembling a web of pivotal language internal (child-specific) and external (linguistic environmental) factors for the use of the oral channel in language synthesis (cf. Palmer, 2015; Kanto, Laakso, & Huttunen, 2016). This begins to account for the plethora of variation present in the blended language use of the participating bimodal bilingual children. Approaching the findings holistically is crucial (albeit a challenge) for capturing the complexity of bimodal linguistic production situated in the wider language contact context of Deaf and hearing communities and families.

6.1 The cognitive role of synthesis

6.1.1 Language Synthesis and Suppression

The language production of all bimodal bilinguals in this study consists of various types of synthesis of NZSL and English, including code-blending, language-mode switching, and transfer. The participants draw on both languages to produce a myriad of syntactic frames, morphological features, and lexical items, and employ two linguistic channels to execute these. These patterns support the Language Synthesis Model for bilingual language production which accounts for synthesis across different levels of production (Lillo-Martin et al., 2012; see Figure 6.1). The idea that both languages are active, even if not explicitly expressed, is supported across research in unimodal and bimodal bilingualism (Kroll & de Groot, 2005; cf. Chapter 2).

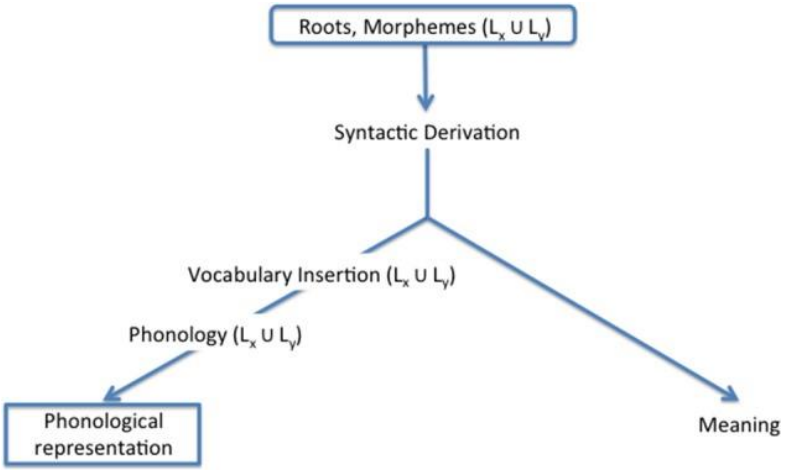

*Figure 6.1: The Language Synthesis Model (*Lillo-Martin et al., 2014, p. 2*)*

Although the language data for this project come from a sign-target language session, the children's use of synthesis reflects how a bilingual's two languages (in this study, NZSL and English) are active even in contexts which require only one language to be perceived (Kroll &

de Groot, 2005; Emmorey et al., 2008; Chen Pichler, et al., 2014). Notably, bimodal bilinguals can express their two languages simultaneously with the hands and their mouth during code-blending (Lillo-Martin et al., 2014).

As both languages are active under the above model, cognitive resources are required when inhibiting one language while producing the other in isolation (Green, 1998). Indeed, the current study's findings support previous research which has found that bimodal bilinguals prefer code-blending (*simultaneous* production of two lexical representations) to code-switching from sign only to speech only (*sequential* production) (Petitto et al., 2001; Emmorey et al., 2008).[26] The preference to code-blend rather than code-switch amongst bimodal bilinguals is likely due to the cognitive cost involved in lexical suppression of the non-target language (Emmorey et al., 2008); producing both languages simultaneously reduces the cost involved in suppression (Petroj et al., 2014). Hence, it is argued that unimodal speech-speech (e.g. English-Māori) bilinguals code-switch, as opposed to code-blend, simply because they are restricted by physiological constraints. In other words, speech-speech bilinguals only have one vocal tract to produce one spoken language at a time, whereas sign-speech bilinguals have two channels to produce their spoken and signed languages simultaneously (Petroj et al., 2014)[27]. Thus, while unimodal bilinguals must learn how to suppress one language, and hone this skill as they grow older (Petroj et al., 2014), bimodal bilinguals can capitalise on their non-competing articulators and alleviate the cognitive cost in switching. However, as Petroj et al. (2014) note: "suppression is not just restricted to overt phonological production (whether it is spoken or signed) but also grammatical structures" (p. 10), and therefore partial suppression is possible.

6.1.2 Partial suppression with a reduced audible volume

Addressing the first research question, while the bimodal bilinguals in this study produce English lexical items with oral articulators, all participants suppress English grammatical structures to varying degrees. Notably, different volumes (whispers, voiceless mouthings or full-voice) align with English and NZSL grammar to different extents. Thus, examining whispered and fully-voiced volumes of the oral channel independently, instead of coalescing

[26] However, language-mode switches from code-blends and one linguistic channel are also found to occur in the current study (cf. Palmer, 2015).
[27] Although, typological features of the non-target language can indeed surface in co-speech gesture (cf. Brown & Gullberg, 2008).

phonation types into a single *speech* category, provides insight into suppression across different levels of production. Aligning with Petroj et al. (2014), findings of this study show that when participants whisper, English grammatical structures are suppressed, and the oral channel instead reflects grammatical structures of the signed language. Thus, bimodal bilingual whispering (associated with partial suppression) appears to be a cross-linguistic phenomenon in sign-target sessions. Although the current study does not have data from speech-target sessions to compare against, Petroj et al. (2014) found that whispering occurred more in sign-target sessions than speech-target sessions. In this study, typically when NZSL influences the oral channel, the English grammar is degraded; subjects, objects, determiners, conjunctions, and copula verbs are elided, and atypical verb inflections for tense and person are produced. While these features are atypical of English grammar, they are consistent with NZSL native grammar. Likewise, bimodal bilinguals (aged 3;00-5;04) in Koulidobrova (2014) were found to omit subjects in both languages, more so in ASL-target sessions than in English-target sessions. They suggest this is pattern occurs more as they develop an awareness that using ASL-like structures is 'more appropriate' in ASL-target sessions. Thus, it appears bimodal bilingual children likely are developing the "ability to judge which sociolinguistic conditions are appropriate for language synthesis, and which are not" (Lillo-Martin et al., 2012, p. 313).

The current study's findings also directly mirrors Coda-talk found in other studies, such as absent copulas, prepositions and conjunctions (which align with ASL grammar) in the written emails of adult ASL-English bilinguals (Bishop & Hicks, 2005), and in Coda-talk in discourse among adult Italian Codas (Bishop et al., 2006). Conversely, one participant in this study uses full-voice (Lucas) and mainly produces utterances with intact English grammar in the oral channel (aligning with fully-voiced utterances in children of a similar age in Petroj et al. (2014)). It is possible that many fully-voiced productions follow intact English grammaticality, because ungrammatical English may sound strange to the child.[28] Lucas' English is also less inhibited with language mode switches to *oral channel only*, and this may reflect of the role of English in his family practices (see Section 6.2).

However, across all participants, morphological reduction did not always occur across an entire utterance (i.e. roots and morphemes from both languages can be drawn on in a single utterance).

[28] See Palmer (2015) who coalesced all phonation types and found children tended not to produce noncanonical syntax with phonation in ASL-English code-blended utterances.

For instance, some English features aligned with NZSL grammar, while others remained intact, varying between and within participants' language sessions. Likewise, Petroj et al. (2014) found more ASL grammar features in the whispers of their participants than in fully voiced articulations, but "the rate of match to English grammar is still generally high for whispering (never less than 50%), but we expect this is due to overlap in the grammars between ASL and English: both are SVO languages" (p. 9). Similarly, utterances of participants in the current study reflect the different word order possibilities for NZSL (not just SVO). Other features are more clearly NZSL-aligned—such as null subject, and 'missing' copulas, determiners and conjunctions—as the grammatical information of these features are expressed in other ways in NZSL (McKee, 2015).

Furthermore, unlike Petroj et al. (2014), two participants (Nina and Jasper) in this study switched between whispering and *mouthing*. Like the whisperers, Nina's voiceless mouthings also morphologically align with NZSL, yet she employs a more native-like *synthesis tendency* (cf. Palmer, 2015), where the oral channel is switched 'on and off'. Nina's parents reported that she has a preference for spoken English over NZSL. Her greater code separation perhaps reflects how she is more attuned to the audiological status of her interlocutor, as she herself can switch between audiological statuses (due to using a CI). Jasper's voiceless mouthings sometimes have NZSL-influence, and other times he produces intact English grammar—which corresponds with the strong influence English has on his manual channel (e.g. fingerspelling English function words, and minimal use of depicting signs)—a synthesis pattern perhaps acquired by his mother who has a non-native signing style (Appendix A). In fact, across all participants, morphologically reduced English structures seem to match the signed stream by following the grammar of the manual channel (an aspect predicted, but not researched by Petroj et al. (2014)). Hence, even some fully-voiced utterances were morphologically reduced if the manual channel reflected an NZSL structure (cf. Kanto, Laakso, & Huttunen, 2016). Whispering according to NZSL syntax in the oral channel serves to maintain NZSL grammar across channels.

An additional finding was that the presence of English features in manual production is common across bimodal bilinguals. Adult bimodal bilinguals in Pizer et al. (2013) "described their signing as 'English sign language' or 'Englishy'" (p. 78). For the NZSL-English bilinguals in this study, influence of English in the manual channel was particularly striking in motion event descriptions, where some participants encode path elements concatenatively in

prepositions (a satellite-framed feature borrowed from English) rather than (or in addition to) encoding path in a depicting verb (a verb-framed structure of NZSL). This parallels Palmer (2015), who found English reinforces morphosyntactic options in the sign language. While producing both a depicting sign and an English-aligned prepositional structure in an utterance, or across utterances is lexically redundant, both are likely employed for clarification and emphasis of changes in location. It is also potentially more economic for the bimodal bilinguals to use English-influenced prepositions. Bilinguals of typologically opposing languages thus have various options for expressing a narrative about a motion event.

Furthermore, sometimes simultaneous bidirectional transfer of these *different* types of transfer across channels occurs, in which the oral channel morphologically aligns with NZSL grammar (e.g. zero copula, determiners, and null subjects) reflecting the manual channel grammar, while the manual channel simultaneously exhibited English structures for encoding spatial information (e.g. use of a preposition as opposed to, or in addition to, a depicting verb) reflecting the oral channel grammar. There is some evidence which would suggest the morphosyntactic form of the oral channel differs across conversational and narrative registers, as all participants produce more NZSL-aligned utterances in the interview than in the game, perhaps because the game required clarifying instructions. Intact English grammatical structures in both channels are possibly drawn on as a resource for clarification.

Therefore, there is a large amount of transfer of languages across modalities during the code-blends of the participants in this study, and variation of this is expected due to both languages being active. While it could be argued that participants' language use is a hybrid of the two languages or an integrated system, findings from experimental studies suggest bilinguals' two languages are separate systems (Kroll & de Groot, 2005). However, lack of code separation due to interaction of codes during bidirectional transfer can make determining a base language a challenge. This study's findings support the position that variation occurs due to both languages being active throughout the production process; bimodal bilinguals draw on the linguistic resources that are available to them, and move along a continuum of speech and signs (cf. *language mode*, Grosjean, 2001). These are influenced by non-linguistic factors spelled out in Section 6.2. Importantly, although somewhat variable, English grammatical structures and/or oral articulators are used by the bimodal bilingual participants even during a sign-target session, indicating spoken language's salience in their repertoires, and their ability to draw on

linguistic features from both languages, simply because they are available for them (Lucas & Valli, 1992).

This section established that code-blending serves a role for the child in alleviating the cognitive cost that is involved in completely suppressing a language, and that partial suppression of English grammatical features in the oral channel is associated with a reduced volume and is associated with the NZSL structure in the manual channel (addressing the first research question). The next step is to consider more deeply the socio-cultural factors influencing the plenitude of variation in the oral channel (addressing the third research question).

6.2 Socio-cultural roles of the oral channel

6.2.1 Community norms for oral channel use

As the children in this study are growing up in a minority (NZSL)-majority (English) language contact context, their simultaneous use of the oral channel with their heritage sign language is shaped in part by the majority hearing community. Further, their parents' use of language is influenced by the majority language; as is the case for most people in minority linguistic communities, Deaf people are functionally bilingual and often "acquire written language as their L2 and exhibit a wide range of ability to produce intelligible speech and to comprehend speech through lip reading" (Emmorey, Giezen, & Gollan, 2016, p. 1). Deaf signers' use of the oral channel is also in part a flow-on effect of the enforced oralist education tradition, and/or due to their own habitual navigation of communication with hearing family members, and/or amongst the hearing non-signing majority. This sociolinguistic context enables use of the oral channel within a Deaf community, whereby Deaf people may choose to extract features from the spoken language, and use them in their signed communication. Yet, use of the oral channel varies in Deaf signers' sign language production. Producing sign language without obvious mouthings or voice is viewed as a feature of proficient signing in ASL (Lucas & Valli, 1992). In Aotearoa/New Zealand, Deaf signers use a range of vocalisation and/or unvoiced mouthing when signing (McKee, 2015). In this study, use of volume varied across adult Deaf interlocutors, ranging from fully-voiced Deaf voice to voiceless mouthing. By using voice or mouthings they were likely in part accommodating to the children's hearing status, but voice and prominent mouthing is also observed to occur with other NZSL signers (McKee, 2015). Features of these voices undoubtedly are a part of "a legacy that Deaf parents pass on to their

children" (Bishop & Hicks, 2005, p. 221).

6.2.2 Family language practices and attitudes

Arguably, English plays a more prevalent role for hearing bimodal bilingual children of Deaf parents than for the Deaf parents. In this study, children confidently separate Deaf and hearing domains, which they associate with English and NZSL. English is used in increasing domains as hearing bimodal bilingual children grow older, especially as they gain more exposure to English through formal education at school, through hearing peers and siblings, and through other contexts outside of the home and/or Deaf community. Indeed, as Dominic's parents report, English is used more upon entering the schooling system, and therefore the children are becoming increasingly dominant in English as NZSL is largely restricted to the home with their family and community domains. This is similar to other bilingual and multilingual households—paralleling the case for immigrant heritage speakers (Seals, 2013; Fogle & King, 2013). Both Codas' and DDCI's overlapping cultural experiences in Deaf and hearing worlds appears to be a driving factor influencing code-blends and transfer.

Although the language use of interlocutors (parents of the children) was a periphery focus of this study, bimodal bilingual use of the oral channel is likely linked to communication strategies of their parents (Deaf or hearing) (cf. Palmer, 2015). Deaf parents of bimodal bilinguals have been found to likewise use a "third system" (Romaine, 1995) or "contact signing" (Lucas & Valli, 1992)—use of signed and spoken language (albeit to varying degrees)—a language variety which bimodal bilingual children mirror in their own language production (Petitto et al., 2001; van den Bogaerde 2003). Deaf parents have been found to use their voices when talking to their hearing children (van den Bogaerde & Baker, 2008), and thus bimodal bilinguals may acquire Deaf voice in the same way that other children acquire accents from their parents (Hoffmeister, 2007). Deaf voices[29] have mixed reviews from their children; while some children may reflect on it as embarrassing outside of the family, it is also often regarded by bimodal bilinguals as a positive part of family life, especially remembered warmly later in life (Hoffmeister, 2007). As an adult ASL-English bilingual Codas in Bishop & Hicks (2005) expresses, "'Deaf voice for me is my true voice. I feel I'm more understood […] when I talk in my native tongue, which is Deaf voice'" (p. 202).

[29] Deaf voice is characterized as "a pervasive nasalization, a distortion of the prosody towards the extremes of highs and lows, and strong assimilation processes leading to a loss of syllables" (Branchini & Donati, 2016).

Thus, while the children's use of voice is not functional for a fully Deaf addressee, Deaf voice is a part of hearing children's experience growing up. For instance, Deaf parents' voices may lead to misinterpretations of a word; for instance, Walton (2006) shared her experience of talking to hearing peers and using the word 'carburger'; "[m]y father would sign, simultaneously using his voice, 'Do you want hamburger for tea?' I knew the sign for 'hamburger', and knew what it meant, but his voicing sounded like 'carburger' to me. Naturally, I thought that 'carburger' was the English equivalent for what people knew as McDonalds" (p. 170). Likewise in the current study, Stephen reports how his father signs and speaks *McGoggles*, playing on the spoken word 'McDonalds'. Deaf voices of the parents of hearing children therefore may result in novel forms—which are an essential part of these children's experiences. Therefore, although the children in this study did not exhibit Deaf voice (but did produce some parallel features of deaf speech), their use of the oral channel when signing might still be a way of indexing sociocultural identification with Deafness or learned behaviour. Deaf/Codas and hearing cultural identification may be entangled in use of both oral and manual channels.

Furthermore, van den Bogaerde and Baker (2008) found that it is the language that parents accept from their children that influences child language production, perhaps more so than parental language input. All of the participants' parents noted that they use both English and NZSL (a *bilingual strategy* [van den Bogaerde & Baker, 2008]) with their children (apart from Stephen's parents who report that they both only use sign [Appendix A]). It is possible the children's parents accept from them a bimodal production style, and that use of voice is expected/accepted from them as hearing individuals.

Communicating with full-voice is arguably even more helpful for children who have one hearing and/or non-native signing parent(s) as opposed to two Deaf parents, or native signing parents. Except for Lucas, all have two Deaf parents, or one Deaf parent and one Coda native-signing parent, and while Lucas uses full-voice, the others whisper or use voiceless mouthings. For children of a hearing parent and Deaf parent, use of phonation is likely a linguistic practice, whereby the oral channel is maintained so it can be accessed by overhearers or other interlocutors. For example, it is possible that Lucas is acutely aware of my presence in the room as an 'overhearer' (Bell, 1984), and knows I am hearing. However, this is likely a result, not the principle cause of phonation—Petroj et al. (2014) found participants whispered as young

as two years old, who had not yet played an interpreter role, and also whispers occurred more often with Deaf interlocutors than with hearing signers, with whom they instead used full-voice. Furthermore, as is reported by the children, they take NZSL into English domains, conflicting with the ideology which emerged in their responses—that English is to be used with hearing people (cf. Pizer et al. [2013]). Teaching non-signing hearing peers is a site of language contact, whereby Codas are likely employing language synthesis to teach their heritage language to their peers.

Positive 'child-as-teacher' attitudes are a product and a predictor of positive value sets towards their heritage language and most of the participants in this study report they do not encounter issues when navigating hearing and Deaf 'spaces' and switching between both languages (Jasper), or say that they "feel good with both" (Nina). However, some participants are attuned to the uniqueness of their bilingual experience. Dominic and Catie describe using both languages as a "weird" or "strange" experience. As Bishop and Hicks (2005) report, "sometimes misunderstood in public schools or stigmatized for having parents who are not hearing, Codas may experience ambivalent feelings about where they belong and what their relationship is to both the Deaf and hearing communities. This uncertainty is addressed in the development of a separate identity called Codas" (p. 221). Furthermore, the lower status of a minority language may influence attitudes, and use of a language (Bishop & Hicks, 2005). While only Jasper knew what CODA stood for (although Lucas was aware of it), the negotiation of their Coda identity appears in all of the participants' use of both languages and modalities—namely, visual and audible volumes of the oral channel are employed in ways that are meaningful for them and their Deaf interlocutors.

6.2.3 Auditory-visual volume variation as accommodation to interlocutor and interactional setting

The findings of this study suggest awareness of the cultural and interactional functions of visual and audible volumes are honed throughout childhood. There appears to be a developmental trend whereby volume is decreased over time: the older Codas whisper or use voiceless mouthings, while the youngest Coda uses full-voice. Perhaps, as the children learn of the oral channel's functional redundancy (e.g. for those who cannot hear), it fades from their register. Note, as many Deaf people in NZ do vocalise to varying degrees, it is perhaps not sociolinguistically redundant for NZSL-English bilingual children. For ASL-English bilinguals, Petroj et al. (2014) note, whispering "permits the bimodal bilingual's spoken

language to manifest while remaining at an appropriate volume level for sign language conversation ("voice off")" (p. 11). Petroj et al.'s (2016) longitudinal study does not show a developmental trend regarding a decrease in whispering over time. Therefore, longitudinal studies would be need to be conducted in Aotearoa/New Zealand, for instance to see if Lucas indeed decreases his use of full-voice in a year or two. Furthermore, as Petroj et al. (2014) note, "whispering is a strategy employed by a large majority (and possibly all) balanced bimodal bilingual children" (p. 12)—the operative word being *balanced*. It seems equally likely that due to Lucas's family context in which his father is hearing and mother is Deaf (and uses a hearing aid), he may continue this pattern of full-voice and signing.

In addition to Lucas' family context, his use of full-voice and intact English grammatical structures may demonstrate sensitivity to his interlocutor's use of a hearing aid (which Lucas is aware of because he often plays at his interlocutor's house (with their son, Dominic)). This matches what we know about children accommodating to interlocutors (Seals, 2013). However, participants' accommodation to interlocutors' use of language and hearing aids is variable and inconsistent across participants. For instance, unlike Lucas, Dominic reduces volume to a whisper despite his interlocutor's use of a hearing aid, showing sensitivity to the audiological status of his interlocutor. The Deaf interlocutors' use of the oral channel are not reported in Petroj et al. (2014), and their participants' interlocutors did not use hearing aids (Petroj, personal communication, February 28th, 2017).

While a reduced volume can be accredited to sensitivity to the audiological status of an interlocutor or family practices, increased visual volume appears to be utilised for the sake of the interlocutor who is understood to be bilingual to some extent, given their own use of the oral channel. Such visual cues have been found to contribute to prosodic focus in studies on spoken language: "[a]lthough prosodic focus typically involves acoustic parameters, several works have suggested that articulatory – and more specifically visible lip and jaw motion – as well as other facial modifications are also involved" (Dohen & Loevenbruck, 2009, p. 416). Even for those who whispered, elided English morphemes (consistent with NZSL grammatical features) often leads to articulation of only the most visually salient aspects of the spoken word. Exaggerated visual cues appear to compensate for lost acoustic cues (e.g. amplitude and stress). Conversely, Lucas' fully-voiced utterances maintain acoustic cues as a means for clear communication, such as amplitude (however, the extent to which his voice is understood by his interlocutor with a hearing aid is not addressed in this study). Interestingly, one bimodal

bilingual participant of Pizer et al. (2013) noted that bimodal bilinguals may choose not to sign at all, and instead increase the visual volume of their oral channel:

> My brother is very much opposed ... he's, he's opposed to anything that will put him out. So it is just easier for him to rely on (over-enunciating) *talking to my parents like this*, than to have to come up with the sign.... It's almost like he can't be bothered. (p. 85)

This reflects how exaggerated enunciation is not always well received by those who prioritise sign language as a means of communication with Deaf people (cf. an ASL language learning website which explains how "exaggerated mouth movements have been regarded by some as rude, and even more difficult to lip read than non-exaggerated mouth movement" (Start ASL, 2017)).

Thus, visual volume appears to be produced with the intention of mitigating ambiguity or for emphasis. However, the extent to which the oral channel's visual cues aid the interlocutor remains a question for future research. While the mouth can be used to disambiguate a sign, increased audible and visual volume might not be helpful (especially if the sign is not known; see chapter 4.1.4). Thus, the oral channel is perhaps not the best means for clarification if it is not intelligible for the child.

While whispering is interpreted by Petroj et al. (2014) as an economic option in which whisperers expend less effort, the articulatory effort involved in producing visual volume (associated with a lowered volume) (not researched by Petroj et al. (2014)), appears to be fairly physically taxing based on the level of exertion it requires. This may account for Dominic's perception that he gets tired when signing. It may be physically demanding to produce enunciated mouth shapes. This could also account for why Nina, who had just woken up, produced less mouthings/whispers at the beginning of the language session—more mouthings/whispers may show increased bimodal production 'effort'. Other reasons that might make code-blending a taxing articulatory overload experience is that the rate of language production is also delayed due to synchronization of English and ASL lexical onsets (Emmorey et al., 2012). In spite of the physical cost, children continue to use code-blending for emphasis.

Overall, discussion thus far suggests that the oral channel can be used in a number of ways

(regarding volume and grammaticality) for a combination of reasons, including: the cognitive cost of suppression, sensitivity to the habitual bimodal practices used within the family, their interlocutor's audiological status, and for clarification. The next section brings together research on oral and manual channels in spoken and signed language research, and I argue both channels are used as meaning-making resources across hearing and Deaf languages users (addressing the second research question).

6.3 Code-blending and co-speech gesture compared

Human language is multimodal by nature; all combinations of hearing, Deaf, monolingual and multilingual language users can draw on the hands and mouth (not exclusively) to express meaning. Namely, co-speech gestures are also meaningful manual productions, produced concurrently with spoken words or phrases and are regarded as integral to speech (McNeill 1992; Goldin-Meadow 2003; Kendon 2004). Thus, the notion of "gesture and spoken language as different sides of an underlying process reveals a new dimension of the mind" (McNeill, 1992, p. 1) can equally apply to bimodal bilingualism.

6.3.1 Semantic equivalence: Clarity and pragmatic considerations

The findings of this study mirror previous research which has found that although there is a preference for simultaneous production of lexical representations, bimodal bilinguals tend to disfavour the selection of two semantically different lexical items or propositions (Emmorey et al., 2008). Alongside being cognitively costly to suppress the oral channel, it is suggested to be costly to produce semantically distinct propositions (Chen Pichler et al., 2014; Palmer, 2015). However, in this study, while sign and speech convey semantically equivalent information for most grammatical categories (*congruent blends*), sometimes the oral channel contributes a different component of the message that is incongruent to the manual channel (*complementary blends*) (cf. van den Bogaerde & Baker (2009) and Bishop et al. (2006)). This separate but related information expressed through all oral channel types (whispered, mouthed, mouth gestures, vocalisations) appears to help build the children's signed instructional narratives, by providing clarifying complementary information to the message being conveyed in the manual channel.

Thus, while previous studies have found depicting signs are produced without the oral channel due to the absence of a single English lexical match, many participants in this study use the

oral channel to express a salient aspect of the depicting sign (i.e. handling, locative, orientation information), superimposing semantically incongruent but complementary information on the sign (Chapter 5, Table 5.1). Occasionally, the mouthing 'grafts' an extension of the meaning of a sign, or specifies a generic sign (McKee, 2007), such as by expressing colour (which cannot be specified in a sign depicting shape and size). Co-speech gesture perhaps plays a similar role for hearing speakers, which has been found to help direct the addressee's attention and emphasise parts of the message (Warren, 2012). Thus, children can capitalise on both languages' ways of encoding spatial information as resources in meaning-making (cf. code-mixing for pragmatic reasons, Kanto et al. (2016)). In the words of Johnston et al. (2016) "mouth actions as a whole perform a role not unlike that often attributed to co-speech gesture: adding meaning which is formally un-stated or under-stated in the wording (i.e., the linguistic coding)" (p. 33). Throughout the game, the children were concentrating intently on the task at hand trying to communicate a fairly complex motion event to the interlocutor. The oral channel is likely serving as an extra helping "hand" in processing the motion event so that the child then can describe it efficiently, in turn aiding the interlocutor, a similar role to co-speech gesture. The use of the oral channel appears to function for the purpose of disambiguation and emphasis and communicating efficient instructions, particularly when asked to repeat instructions.

Moreover, the temporal alignment of simultaneous production of signs and words parallels the synchrony found in production of co-speech gestures and spoken words (Emmorey et al., 2008). Code-blending may also serve cognitive advantages in a complex, instructional narrative. Emmorey, Petrich, & Gollan (2012) found, "in production, code-blending did not slow lexical retrieval for ASL and actually facilitated access to low-frequency signs" (p. 208). Similarly, in the current study, the acute temporal alignment of sign and speech, particularly noticeable in cases of self-repairs, whereby both channels slow down together to produce the lexical item in tandem, aids the child in producing a complex narrative. Furthermore, this study's findings corroborate previous research with adult Deaf signers which has found the oral channel maintains alignment with the duration and rhythm of the manual sign, including when the sign has been modified (cf. Fontana, 2008; Crasborn, van der Kooij, Waters, Woll, & Mesch, 2008; Bank et al., 2013). Aligning with Boyes Braem (1999), "[s]ilent mouthings of spoken language words or word parts are often stretched over several manual signs, thereby marking the manual signs as constituents of one prosodic word" (p. 202). In other studies, stretched forms too appear to have "more of a co-speech function than a linguistic one"

(Bishop, Hicks, Bertone, & Sala, 2006, p. 104). Thus, the oral channel possibly functions cohesively, to blend meaning into the sign. Other mouth movements may serve a purpose as rhythmic fillers (Petroj, to appear). Micro mouthings, including mouth openings, which occurred at the onset of a depicting sign, appear to be emphatic, and ensure that the mouth moves to maintain the rhythm of a blended utterance.

6.3.2 Accounting for Coda-isms

Codas in this study frequently use the oral channel as a resource, stitching it meaningfully to the manual channel. Use of vocalisations in this study inform discussion around the universality of mouthings and mouth gestures. A widely held assumption is that mouth gestures are not derived from spoken languages (Boyes Braem, 2001). However, the extent to which mouth gestures are conventionalised parts of sign languages has recently been questioned, and one interpretation is that the use of mouth gestures is a linguistic resource of all humans (Johnston et al., 2016). Although nonce sound effects have not been discussed as much as voiceless mouth gestures (Johnston et al., 2016), in a review of Boyes Braem (2001), Pizzuto E (2003) briefly notes that use of sound in mouth gestures need to be addressed, regardless of whether or not it can be accessed by Deaf interlocutors. Vocalisations can improve our understanding of these forms and their universality or specificity to the visual-gestural modality.

Some vocalisations in this study appear to be specific to bimodal bilinguals (in other words, Coda-isms (cf. Bishop & Hicks, 2005)), such as *oof oof oof* produced by Dominic. This is akin to vocalisations produced by hearing bimodal bilingual adults (cf. *eh eh eh* used for durational meaning in Emmorey et al., (2008)). Conversely, Lucas' sound effects are similar to those used by children (and adults) of all language backgrounds when words fail them or for playful expression and imitation of action and sounds. However, use of nonce vocalisations with depicting signs, which are typically used with a mouth gesture reflect the child's linguistic awareness of rules for usage. The resulting mouth movement resembling a mouth gesture may be meaningful for the Deaf interlocutor. It must also be considered that the child is hearing their own voice, even if the Deaf interlocutor is not, and therefore the children may be using sound as a creative linguistic resource for themselves. Additionally, in the interview, children noted how they revel in the secrecy that the visual-manual modality affords them amongst hearing non-signing peers (those they do not teach). The reverse is also possible, where they might creatively use vocal gestures (i.e. not voiceless mouth gestures) privately for themselves. It thus seems mouth gestures and nonce vocalisations form part of a continuum of mouth

actions, which can be employed in meaningful ways by a range of language users. As such, "there is a deep synergy between language in spoken and signed modalities: both use oral and manual gestures" (Johnston et al., 2016, p. 4).

Thus, bimodal bilingual bicultural identity can be addressed by looking at the use of both oral and manual channels—importantly, use of spoken English repertoire does not preclude the possibility for expression of a Coda identity or NZSL knowledge. Like Māori Deaf signers who have been found to use the oral channel to express their cultural identity through mouthing Māori words simultaneously with NZSL signs (McKee, 2007), bimodal bilingual children can make use of the oral channel in ways which reflect their knowledge of hearing and Deaf worlds in the form of whispering, full-voice, mouthing, sound effects, and mouth gestures, and with structures that may reflect a NZSL grammatical pattern.

6.4 Chapter summary

Bimodal bilinguals' multiple production, in which the volume in the oral channel is modulated in accordance with grammaticality (i.e. whispered speech matches NZSL grammar, and full-voice matches English grammar), points to their ability to employ their sociolinguistic knowledge of both languages across two modalities to communicate. The oral channel serves to alleviate a cognitive cost of completely suppressing English. Furthermore, for whispered productions specifically, utterances of English lexical items correspond with NZSL structures, indicating partial suppression to maintain a NZSL mode. However, various combinations of codes across channels are found to occur—indicating activation of both languages. The oral channel is likely meaningful for their Deaf interlocutors, particularly given many Deaf people communicate with voice or mouthings even in their typical language use (McKee, 2015). The findings of this study support previous research on bimodal bilingualism that found that parents use and accept a 'third system', or language synthesis from their child (van den Bogaerde & Baker, 2008), which, alongside parents' audiological statuses, and native or non-native signing statuses and styles appear to influence the child's language.

Additionally, visual volume increases when audible volume decreases, seemingly to compensate for reduced acoustic cues for prominence—a fairly untouched area of research. Akin to co-speech gesture, the oral channel may temporally align with the manual channel to maintain rhythm. The mouth functions to supplement the manual channel, which provides the

main means of communication. Thus, bimodal bilinguals strike a balance between their NZSL and English modes, for themselves and their interlocutor, and a combination of their two codes may arise within each utterance. It appears there are costs and rewards of language synthesis, but ultimately, bimodal bilingual children can exploit the visual or audible volumes of the oral channel, serving to emphasise or clarify, particularly in the context of an instructional game. Importantly, the use of the oral channel does not necessarily entail a switch into an English dominant mode. Whispered NZSL-influence and emphatic separate but related mouthings or mouth gestures serve to scaffold a NZSL-dominant mode, but reduce pressure to suppress English lexical items (Petroj et al., 2014), and play a gestural role akin to co-speech gesture (Emmorey et al., 2008; Johnston et al., 2016).

Chapter 7: Conclusion

This thesis has concentrated on the use of the oral channel as a part of the bilingual experience of six children, who are growing up with Deaf parents. The oral channel is a prevalent (although often secondary) aspect of signed communication, ubiquitous amongst most, if not all, minority sign language communities which are nestled in majority spoken language communities. The current study draws on language used by NZSL-English bimodal bilingual children (ages four to nine), and contributes to ongoing discussions about language synthesis and the role(s) of the oral channel in signed communication.

The questions asked in this thesis are:

1) What auditory-visual volumes of the oral channel do bimodal bilingual children use in a sign-target language session, and do different audible volumes correspond with the grammar of the spoken or the signed language?
2) How is meaning expressed across oral and manual channels in location and motion narratives produced by bimodal bilinguals in a sign-target language session?
3) How do sociolinguistic factors, including bimodal bilingual children's attitudes towards their use of NZSL and English, influence the use of language synthesis?

7.1 Contribution of study

In answering the above questions, this study provides insight into how bimodal bilingual children exploit both modalities and languages in a variety of unique ways, due to their ability to hear and their knowledge of their heritage sign language. Chapter 4 detailed the varied audible volumes (whispers, voiceless mouthings, full-voice) used by bimodal bilingual children in sign-target sessions, and demonstrated a connection between volume and grammatical integrity of the oral channel. Corroborating preliminary work of Petroj et al. (2014), whispered and voiceless productions generally align with NZSL morphological patterns, maintaining an NZSL-dominant mode across linguistic channels, in a volume appropriate for communication with a Deaf interlocutor. Conversely, one participant communicated with fully-voiced grammatically intact English prevailing in the oral channel, likely due to family language practices, as his mother is a non-native Deaf signer, and his father is a hearing non-native signer (while the others have native or near-native signing parents). All

children draw on both languages and modalities, but the extent to which varies across participants and within individual language sessions. Additionally, bidirectional transfer is found to occur in some participants' language sessions, whereby English-like structures for encoding path surface in the manual channel (sometimes in addition to NZSL depicting verbs), alongside NZSL-aligned grammar in the oral channel. Furthermore, there is evidence that suggests there exists an inverse relationship between visual and auditory volumes; reinforced visual cues compensate for lost acoustic cues for stress during whispered and voiceless productions, whereas visual cues generally remain unmarked during fully-voiced productions as other acoustic cues for stress remain intact.

Chapter 5 addressed how while most signs were produced with lexical equivalents, the oral channel sometimes expressed complementary meaning to depicting verbs produced in the manual channel—likely due to the fact depicting signs do not have exact semantic equivalent lexical items in English. In doing so, the oral channel provides specification of a sign, gesturally referring to salient information expressed by the manual channel—a function not too dissimilar to co-speech gesture in spoken language communication. Dual languages and modalities leant themselves well to an instructional task, as bimodal bilinguals can capitalise on their articulators for the creation of meaningful utterances—both for themselves and for an interlocutor who has limited auditory access. Overall, the oral channel is not always redundant in signed communication, as when it is reduced in volume it may contribute to communication in a NZSL-mode, and complementary information may aid the creation and clarification of meaningful utterances.

This use of the oral channel is influenced by a web of interrelated factors, captured in Chapter 6. Factors influencing use of the oral channel encompass bilingual cognitive constraints, family context, and the interactional setting. Firstly, use of the oral channel while signing confirms that suppression of the oral channel is more cognitively costly compared to multiple production (of both signs and spoken words), and thus whispering aids the child's signed production. Secondly, a developing "third identity" as bimodal bilinguals, family practices and parents' audiological statuses and language backgrounds, such as parents' use of Deaf voice, appear to effect the children's use of the oral channel. Thirdly, in the interactional context of describing motion event, the oral channel was found to be drawn on in creative ways to emphasize and embellish information in the sign, by modulating auditory and visual volumes, stretching mouthings over two signs, and by expressing complementary information to the semantic

information in the manual channel, for the benefit of the interlocutor. Thus, the oral channel has many functions in the blended language use of bimodal bilingual children in the context of a sign-target session. Cognitive, cultural, and interactional factors influencing the variation of the oral channel in signed interaction are manifold and interconnected.

7.2 Research implications

This study offers insight from NZSL-English bilinguals to assist ongoing research of ASL-English bilinguals (e.g. Emmorey et al., 2008; Petroj et al., 2014; Palmer, 2015) and LIS-Italian bilinguals (Branchini & Donati, 2016), with the aim of building a cross-linguistic picture of language synthesis in different signed languages. This thesis supports the idea that language synthesis entails a myriad of linguistic outcomes which occur when two languages and modalities are active at each stage of production, including code-blending, transfer and language-mode switching. This study confirms that the use of the oral channel while signing is a natural combination (Petitto et al., 2001; Bishop et al., 2006; Emmorey et al., 2008).

This thesis also helps fill a gap in the research on the volume of the oral channel in bimodal bilingual language production. Crucially, this study is one of very few which investigates whispering as an independent phonation type in bimodal bilingual production. Functionally different from secretive whispering between hearing speakers, bimodal bilingual whispering entails partial suppression of English structures. As most of the interlocutors (the parents) use Deaf voice, use of phonation appears to be in part a learned behaviour, and are perhaps indexing a Deaf or Coda identity in using voice and NZSL-aligned morphosyntax. Furthermore, more than half of the participants reduce the volume of the oral channel to a whisper, and two others mouth, suggesting these participants are aware that full-voice is functionally redundant for the ears of a fully Deaf addressee. However, consideration of Deaf people's use of hearing assistive devices and parents' language use and backgrounds are important when addressing the use of full-voice production (i.e. Lucas).

Another underresearched feature of the oral channel, visual volume, was also addressed in this study, and suggests it should be considered in future investigations of volume variation. These findings highlighted how although the audible volume might be redundant for the ears of Deaf interlocutors, the oral channel can still function for emphasis and clarification for the eyes of their Deaf interlocutors. However, the efficacy of reinforced visual cues appears to be variable,

and intelligibility and the oral channel as a source of clarification in parent-child dyads is an area of study that needs further exploration.

This study also sheds light on the modality divide in language production, and highlights how it is more complex than initially thought, warranting further attention. In the same way that users of a spoken language are not restricted to the oral-auditory modality (co-speech gesture is integral to language itself), signers too are not restricted to the visual-manual modality. Both code-blending and co-speech gesture involve tightly bound coordination—an orchestration of linguistic features in two modalities. The importance of discerning modality from language becomes apparent when analysing transfer, as certain grammatical structures of either language can be expressed by either oral or manual articulators. Languages are active at each stage in production, which results in combinatorial linguistic outcomes, particularly noticeable due to their dual linguistic channels and typologically distinct features of NZSL and English, which pose an interesting site for investigation for transfer-prone bilinguals (Gabryś, 2012).

Overall, it appears that auditory-visual volume has been largely overlooked in the field of bimodal bilingual research. However, future research should continue to be conducted in this area, to ascertain claims made in this preliminary study of NZSL-English bilinguals, and in previous theories of language production, which primarily focus on spoken languages.

7.3 Practical implications

Understanding the use of the oral channel has potential ramifications for how we transmit language (both informally in family, and formally in schools). As has been found in previous studies, language mixing naturally occurs in the instruction of Deaf education (Swanwick, 2016), and is used in parents' communication with their children (van den Bogaerde & Baker, 2009). The findings of visual and audible volume are important for teachers of NZSL, who may benefit from the knowledge that whispering can maintain an NZSL mode with NZSL-aligned structures. Since multilingual competence is widespread, it is important to understand the different roles—semantic, cognitive, and gestural—a second language provides during communication and learning.

Furthermore, relevant to the community's priorities, at the moment, mainstreaming and cochlear implants are seen as threats to the language by 72 percent of respondents to a Deaf

community survey (McKee & Manning, 2015). Therefore, analysing the language use of DDCI helps address this contentious point of view. Due to the increasing number of bimodal bilingual Deaf children who use cochlear implants, sign linguists predict more dual and flexible use of modes and languages. The only DDCI, Nina, in this study produced the most NZSL-like utterances and lowest use of the oral channel, showing control of NZSL, and her hearing parent reported Nina has a spoken language preference, indicating her ability to move between codes according to interlocutor. As Swanwick (2016) reflects, "understanding the individual language profiles and skills within and across sign and spoken language must precede decisions about language policy" (p. 18). This particularly rings true for parents of deaf children who are faced with the option of cochlear implantation. Nina's language production shows how enabling access to both a signed and spoken language can afford multiple linguistic resources. All of the participants' use of both languages shows how use of both languages is a part of their experience as children with Deaf signing parents. Importantly, instances of transfer should not be assessed as if they were predictions of the children's English and NZSL competence; otherwise, their utterances would be "misinterpreted as deviant or disordered and thereby possibly lead to a diagnosis of language impairment" (Kanto et al., 2016, p. 3; Chen Pichler et al., 2014). Acceptance of bilingualism or multilingualism is even more crucial in Aotearoa/New Zealand which, despite its rich Māori heritage, is often monolingual in nature.

Protecting and promoting childhood bilingualism is particularly important when one of the languages is a minority endangered language (Kelly, 2015). These bimodal bilingual children may only be a small subset of the Deaf community, but as they are transmitters and heritage users of NZSL, it is important to focus on this group to see how their language use is developing and how their linguistic identities are forming. This may have ramifications for the future vitality of NZSL, as the participants of this study are likely going to continue teaching their heritage language to younger siblings, peers, partners, and colleagues, and some may go on to become interpreters, or may pass on their sign language to their own children, so that their Deaf parents can communicate with their grandchildren in NZSL.

7.4 Limitations

While all participants were positioned an equal distance from the camera, and the video camera was sensitive enough to capture the whispers of the participants, other factors such as a noisy main road and families in the adjacent room meant there was often a lot of background noise.

As a suggestion for future research, because the use of a lapel microphone could be off-putting for some of the children, or could trigger greater use of spoken language if they are sensitive to the function of a microphone, alternative methods such as using a 'hidden spy pen' could benefit future data collection of whispers. In the same way that there has been a push to document gesture in spoken language research (Seyfeddinipur, 2011), it is evident that quality sound recordings should be ensured in sign language research. Adequate audio-visual recording is indispensable for understanding language as a composite of linguistic channels in spoken and signed language research.

This research project investigates a limited data set of six participants. I analysed the data with care when commenting on potentially idiosyncratic language use, language development and naturally arising language transfer. More data are needed to be sure that the volume and language produced by the participants in this study are reflections of their daily use of language. However, even the small sample from this study has yielded exploratory space for how dual modalities and languages manifest in varied ways in interaction, by focusing in-depth on the micro-detail of individual language behaviour. Additionally, it is acknowledged that language data collection itself may be a site of contact in sign language research, particularly if the researcher is a hearing person. Overall, further research on NZSL-English bilinguals needs to be conducted to continue the comparison across bimodal bilinguals of different signed and spoken languages.

7.5 Future research

While the parents of the bimodal bilinguals report that they use both English and NZSL and different styles of language with their children, further research in the New Zealand context is needed to determine the types of synthesis used during both hearing and Deaf parents' communication with their bimodal bilingual child (van den Bogaerde & Baker, 2009; Petroj et al., 2014), and when their child is present as an 'overhearer'. In addition, future comparisons would be useful between language used between hearing bimodal bilingual addressees (such as between sibilings) to see the extent their language use differs when considering the audiological or familial status of the interlocutor (Petroj et al., 2014). Another avenue of future inquiry is whether or not voice is something that the (hearing, hearing-assisted, and fully Deaf) parents are aware and accept of their children, and how effective and intelligible the oral channel produced by children is for Deaf interlocutors. More naturalistic settings would benefit

this analysis, for instance filming children while they are interacting with their family members at home with their own toys and games (cf. *The Bimodal Bilingualism Project*, Quadros et al. (2015)).

When examining the linguistic production of children, questions around language development and acquisition naturally arise, and thus this study would benefit from a longitudinal follow up. Researching adult or older bimodal bilingual children would help ascertain if the variation across participants suggests that either the children are at different developmental stages in acquiring the skills to successfully coordinate multiple production, or if they are simply exploiting the resources of each language which they deem appropriate in that specific context, due to familial practices of language use. It would be worthwhile tracking the language development of children who whisper to see if they produce more or less grammatically intact standard English in whispers later on. Nevertheless, this research provides a starting point for the exploration of bimodal bilingual language development in Aotearoa/NZ.

Although this study contributed to the discussion around the origin of mouth actions by looking at those produced by bimodal bilinguals, further analysis and comparison is needed of mouth actions across hearing and Deaf people on different points on the spectrum of audiological status and mono-bilingualism (as was suggested by Johnston et al. (2016)). In the language sessions of the current study's participants, one must consider whether or not the whispering is connected to the play/game context and how the oral channel might aid in delivering a complex narrative, such as inner speech or private dialogue. There have been reports that bilinguals are cognitively advantaged with regards to inner speech as they have two languages to draw on (Sawyer, 2016), and while Konnai (2012) noted that hearing non-signing children whisper during play, she do not go into depth about the reasons why. Thus, a future research suggestion is to continue to investigate the different functions of whispers and vocalisations across different language users.

7.6 Concluding remarks

This study has tapped into broader questions around the gestural nature and linguistic status of both the oral channel and depicting signs, and recognises their interconnectedness in bimodal bilingual production. Participants capitalise on their dual linguistic channels for themselves and the interlocutor, showcasing their knowledge of Deaf and hearing worlds, and signed and

spoken languages (yet not necessarily in the modality which one would initially expect). Thus, while there has been plenty of research conducted on child monolingualism and bilingualism (and the differences between the two), much less is known about bimodal bilingualism—that is, when children natively acquire both signed and spoken languages. Looking to the oral channel, including its volume (both audible and visual), language synthesis, and semantic form, during bimodal bilingual production is revealing with regards to cognition, family language practices, community norms, and the linguistic uniformity and uniqueness across spoken and signed languages. The remarkable linguistic experience of bimodal bilinguals is a much needed addition to wider research on bilingualism and the various ways languages reveal themselves in their linguistic practices.

This thesis concludes by connecting one participant's linguistic experience and production of language (Image 7.1). Stephen commented how "the cool thing about sign is that you use your hands to talk". The movement of the sign SPEAK from his mouth outward while whispering, reflects how while the hands may produce the primary linguistic means for communication, the oral channel is still silently, or maybe not so silently, in the background.

Image 7.1: Stephen

COOL SIGN USE HANDS SPEAK

w(the cool thing about sign is that you use your hands to talk)

Appendices

Appendix A: Follow up questionnaire for the participants' parents

1. Child's name
2. Are you and your partner Deaf?
3. How/when did you and your partner learn NZSL?
4. Are [child's name]'s grandparents Deaf?
5. Would you say that [child's name] is a bilingual, or is he dominant/more fluent in one language?
6. Do you mainly use NZSL or English with [child's name] at home, or do you use both?
7. Would you feel comfortable for me to use an image of [child's name] signing in my written thesis and/or conference presentations, or would you prefer that I blur [child's name]'s face so they are not recognisable?
8. When did your child receive her cochlear implants?
9. Why did you choose that time for her to get an implant?

1	2	3	4	5	6	7	8	9
Nina	Mother hearing CODA, Father "Deaf"	Mother, - as a child, as parents are deaf. Father - "in the playgrounds of van Asch"	yes from the maternal side	Nina and brother are bilingual, but Nina "definitely has a preference in spoken English"	"We use both"	Y	"All 3 children had CIs before the age of 1".	"It is well known that the early years 0-4 are key language learning time. The longer you wait the less effective the device will be and the work and effort required to develop spoken language is much harder. If the device is given early there is no therapy required children just learn naturally. Almost all deaf children who have a profound loss have CIs and therefore we wanted our children to have access to sound and speech as their other deaf peers do. We felt to be deaf now days has changed so much and there isn't a large signing community of children who are the same age as our children. The world would be too isolating for them without a community of sign language users".
Dominic	Mother deaf, Father deaf	Mother - parents, Father - Deaf sister	yes from the maternal side	"Dominic is a bilingual. He uses English more of course because of school and communicating with his little brother"	"I use NZSL fully with Dominic. Donald - sometimes NZSL, sometimes NZSL with spoken English"	N		
Lucas	Mother Deaf, Father hearing	Mother - as a teenager, initial SL was TC/Signed English. Father - learnt NZSL from L's Mother	No	"Lucas is a bilingual"	"NZSL most of the time"	Y		

Catie	Mother Deaf, Father hearing CODA	Both parents 1st language is NZSL	Yes both sides	Bilingual	"we use both"	Y		
Stephen	Mother Deaf, Father Deaf	Mother – since birth, father – 7 years old	Yes from maternal side, not paternal side	Bilingual	"we just use NZSL at home, Stanley have older brother they speak sometimes they sign to each other"			
Jasper	Mother Deaf, Father Deaf	Both Mother and Father have deaf siblings, and both attended a deaf school for at least part of their schooling. They also learnt NZSL through friends, socializing in the Deaf community and sports.	No	Bilingual – used to both parents styles of communicating	Jasper's mother sometimes uses voice and signing, and sometimes switches off her voice (depending on the environment) . Stephen's father is a strong signer and uses mainly signs.	Y		

Appendix B: Transcription conventions

Adapted from (Emmorey 2008; Chen Pichler, Hochgesang, Lillo-Martin, & Quadros, 2010; Napier, 2006; McKee, 2015) with additions specific to this thesis.

RH

This corresponds to the signs produced on right hand.

LH

This corresponds to the signs produced on left hand.

m(seesaw)

The words in the parentheses are mouthed.

w(seesaw)

The words in the parentheses are whispered.

f(seesaw)

The words in the parentheses are fully-voiced.

‘and the dog ran’

An English translation of code-blended utterances.

DOG

Words in capital letters represent English glosses (the nearest equivalent translation) for NZSL signs.

FALL-down

Multi-word glosses connected by hyphens are used when more than one English word is required to translate a single sign.

DOG BEHIND

<u>Dog</u> <u>behind</u>

Underlining indicates the speech that co-occurred with the signs.

DANCE+

Indicates that the sign is repeated to give emphasis, or for grammatical inflection.

CL-B:two-blocks

A depicting sign produced with a B handshape. The meaning of the sign follows.

2hCL-bC:seesaw-tips

A depicting sign produced with a bC handshape on both hands. The meaning of the sign follows.

xxx

Nonce sign or word.

g(clapping); *g(pouting-face)*

Gestures with a description.

Fs-S(seesaw); Fs-C-O-D-A

An initialised fingerspelling or a full fingerspelling.

MOTHER[_]

The sign is held for a short duration.

&=pssschhh

Sound effect or mouth gesture.

&=imit:oof oof oof

Imitation sound effect.

IX-loc

Spatial indexical pronominal signs.

IX-lf/rt

Indicates left and right signing space.

-prog

A progressive mouthing/whisper/full-voiced articulation.

ME/ SHE/ YOU

Used in place of PRO1, PRO2, PRO3 for easier reading.

[pause]

The signer pauses within or across an utterance for a short duration.

Appendix C: SEESAW variants

	Dominic	Stephen	Lucas	Nina	Chloe	Jasper
SEESAW-1	4					1
SEESAW-2			4	2	1	
SEESAW-3	1	2				
SEESAW-4						2
Cl:B					2	
2hCl-B	1					
2hCl-O	1	1				
2hcl-flat bC					1	
2hcl-flat gC				1		
CL-5			2	1		

SEESAW-1 Two Hands Together Horizontal Orientation Of Hands

SEESAW-2 One Hand – Variants Include Full Arm Pivot At Elbow Or At Wrist

SEESAW-3 Two Hands Separate Straight Orientation Of Hands

SEESAW-4 Fingerspelled Initialised

Appendix D: The major handshapes in Auslan

***(with glosses of minimal pairs). Many of these are also found in NZSL* (Johnston & Schembri, 2007)**

Appendix E: Interview schedule

Meet and greet: time to relax and get to know everyone

There will be a moment here for the families to:

- ask me any questions about the project.
- For me to collect signed copies of the consent forms, which I will bring with me. There will also be time for the interviewers to ask questions and for me to clarify. (In the photo you will see the green triangle whiteboard which will be the barrier/wall in the game– the interview script will be cellotaped to one side for you to follow as a guide)

- I will also chat with the kids for a bit to make them more comfortable before setting up. I'll show them how the camera works, so they are not so intimidated by it.
- I'll say something like: "Lucas's mum and Dominic's dad will tell you how to play the game, and I'll watch with this camera – can you see it over here – it's very fancy! You can pull a funny face at the camera if you want to? Can you see mum/dad through it? etc"

After this, I will then ease us all into the game setting - at this point I'll need everyone except for Tamsin, Dominic and myself to start to leave the room. I will sign/say "Ready to play a game? Let's have some fun! Can you boys help me set up the game? Can you see the bag of toys? Can you grab them? Dominic will go first. Say bye to everyone else! They'll be waiting for you in the kitchen."

After Dominic and Tamsin, it will be your turn with Lucas!

Part 1: Game **Donald, Lucas and Kaitlyn alone in room**

Kaitlyn to Lucas: Can you see this green board – we're going to build a wall so that you can hide behind it, and make a play area so Donald can't see what you're doing! This is your side, and that's Donald's side. (I will write on the whiteboard "Lucas's playground").

From here onwards you will be leading the session.
Donald to Lucas: Tell me, what have you got in that bag of toys?
Lucas will describe each object. Please don't prompt him unless he can't name an object at all! You can allow him to play with the toys a bit if he wants to (for about a minute)

The toys that will be in the bag

Note: There will be two rounds of the game: the first will be more and the next will be a little more complex (possibly eliciting a narrative).

Round one: Simple
Donald: Right now, you and Kaitlyn will make something with the toys behind this wall. I can't see them. It'll be your secret! Are you ready?
Kaitlyn shows Lucas how to make something simple. There will be two sets of toys – one set Kaitlyn will use, and the other set Lucas will use to copy her. Kaitlyn will be asking Lucas "can you copy what I have done? Now you do it." Kaitlyn's set will be handed to Donald once Kaitlyn has finished showing Lucas.

Donald: Now tell me what you've made! But don't touch the toys, just sign to me how to do it.
Lucas will tell you how to position the toys *without showing you with the toys*, and you will then repeat it with your set of blocks. Lucas can look over to watch you do it as he describes it.
Donald: Have I done it correctly? Is it the same as yours? Go back and check! Let me know if I need to change anything.

Round two: More complex

Donald: Kaitlyn will show you how to build something else now – which I still can't see! No peeping from me! Are you ready?

Lucas watches Kaitlyn build the model, then has a go at doing it himself.

Donald: Now tell me what you've made! But don't touch the toys, just sign to me how to do it.

Lucas will tell you how to position the toys *without showing you with the toys*, and you will then repeat it with your set of blocks. Lucas can look over to watch you do it as he describes it.

Donald: Have I done it correctly? Is it the same as yours? Go back and check! Let me know if I need to change something.

Donald: Silly dog! Can you make up a story about what happened? What do you think - what made the dog jump on the seesaw?

- (possible answers: because he wanted to play/ thought it would be funny/ wanted attention)

Donald: How did they feel when they fell off the seesaw?

- (possible answers: sore, angry, laugh, annoyed)

Donald: Thank you joining in Lucas!

Prompts: The aim is to elicit as much language as possible from the child. Gently encourage the child to explain further, and give more detail by asking follow up questions. Try not to just point to a toy/block to get more information – instead, ask:

- How can I do what you just did?
- So… tell me what you have just built?
- Tell me again?
- Without pointing to or picking up the blocks, how can I make what you made?
- Which block/toy?
- What are the people doing?
- What does the object look like?
- How close should these toys be?
- Is what I'm doing with the blocks the same as what you just did?

Part 2: Interview

Tamsin to Dominic: Now I want to ask you some things!
Note: Repeat and rephrase question if child doesn't understand. You can add comments or follow up questions as you go along to make it more natural.

Family

1. How old are you?
2. Who is in your family? (Mum, dad, any siblings?)
3. Who do you sign with in your family?
4. When don't you sign?
5. Who do you speak with in your family?
6. Who's the best at signing? Why?
7. Can any of your toys sign?
8. Do you have dreams? Do you sign in your dreams? Tell me about a time when you signed in your dreams?
9. Do you have a pet? Do they sign with you?
10. That's cool you can sign and speak! Do you like knowing how sign and speak? What's cool about knowing both sign and speech?
11. Do you sign with your friends? Which ones?

School

12. Where do you go to school/pre-school? / How would you get to your school from home?
13. Can any of your teachers sign with you? (If yes: What do they say to you in sign?)
14. Who are your friends at school? Do any of them sign?
15. When did you learn NZSL?/ Have you always signed and used English?
16. What's it like switching from using sign to speech when you go to school?

Identity

17. What does CODA/ Deaf mean?
18. Are you:

a. A "CODA"
b. "Deaf" (only ask if the child is in fact deaf)

Appendix F: Ethics approval

From: researchmaster-help@vuw.ac.nz <researchmaster-help@vuw.ac.nz>
Sent: Wednesday, June 1, 2016 4:11 PM
To: kaitlynvera.smith@gmail.com
Cc: Cas Wanden; Corinne Seals
Subject: Human ethics application approval. Automated Email, Do Not Reply

Dear Kaitlyn,

Thank you for your application for ethical approval (Children Of Deaf Adults as heritage signers: a linguistic analysis of the NZSL production of bimodal bilingual children, reference 0000022668), which has now been considered by the Standing Committee of the Human Ethics Committee.

Your application is approved as of today. You will receive an approval memo in the near future.

Best wishes with the research.

Susan Corbett
Human Ethics Committee

*****This is an automated email. Do not reply to this email address*******

Queries for the central Human Ethics Committee can be sent to ethicsadmin@vuw.ac.nz

References

Alatis, J. E. (Ed.). (1990). *Linguistics, language teaching and language acquisition: The interdependece of theory, practice and research*. Washington, DC: Georgetown University Press.

Ann, J. (2001). Bilingualism and language contact. In C. Lucas (Ed.), *The sociolinguistics of sign languages* (pp. 33–60). Cambridge: Cambridge University Press.

Bank, R., Crasborn, O., & van Hout, R. (2015). Alignment of two languages: The spreading of mouthings in Sign Language of the Netherlands. *International Journal of Bilingualism*, *19*, 40–55.

Bell, A. (1984). Language style as audience design. *Language in Society*, *13*, 145–204.

Bishop, M., & Hicks, S. (2005). Orange eyes: Bimodal bilingualism in hearing adults from deaf families. *Sign Language Studies*, *5*, 188–230.

Bishop, M., Hicks, S., Bertone, A., & Sala, R. (2006). Capitalizing on simultaneity. Features of bimodal bilingualism in hearing Italian native signers. In C. Lucas (Ed.), *Multilingualism and sign languages: from the Great Plains to Australia* (pp. 79–118). Washington, DC: Gallaudet University Press.

Borodkin, K., & Faust, M. (2013). Tip-of-the-tongue (TOT) states and cross-linguistic transfer. *Bilingualism: Language and Cognition*, *16*, 914–923.

Bourdieu, P. (1998). *Practical reason : on the theory of action*. Stanford, California: Stanford University Press.

Boyes Braem, P. (1999). Rhythmic temporal patterns in the signing of deaf early and late learners of Swiss German Sign Language. *Language and Speech*, *42*, 177–208.

Boyes Braem, P. (2001). Functions of the mouthings in the signing of deaf early and late learners of Swiss German Sign Language (DSGS). In P. Boyes-Braem & R. Sutton-Spence (Eds.), *The hands are the head of the mouth: the mouth as articulator in sign languages* (pp. 99–132). Hamburg: Signum.

Branchini, C., & Donati, C. (2016). Assessing lexicalism through bimodal eyes. *Glossa: A Journal of General Linguistics*, *1*, 1–30.

Brown, A., & Gullberg, M. (2008). Bidirectional crosslinguistic influence in L1-L2 encoding of manner in speech and gesture: A study of Japanese speakers of English. *Studies in Second Language Acquisition*, *30*, 225–251.

Brown, A., & Gullberg, M. (2011). Bidirectional cross-linguistic influence in event conceptualization? Expressions of path among Japanese learners of English. *Bilingualism: Language and Cognition*, *14*, 79–94.

Chen Pichler, D., Hochgesang, J. A., Lillo-Martin, D., & Quadros, R. M. de. (2010). Conventions for sign and speech transcription of child bimodal bilingual corpora in

ELAN. *LIA: Language, Interaction and Acquisition/Langage, Interaction et Acquisition*, *1*, 11–40.

Chen Pichler, D., Lee, J., & Lillo-Martin, D. (2014). Language development in ASL–English bimodal bilinguals. In D. Quinto-Pozos (Ed.), *Multilingual aspects of signed language communication and disorder* (pp. 235–260). Bristol, UK: Multilingual Matters.

Chen Pichler, D. C., Hochgesang, J. A., Lillo-Martin, D., Quadros, R. M. de, & Reynolds, W. (2016). Best practices for building a bimodal/bilingual child language corpus. *Sign Language Studies*, *16*, 361–388.

Ching, T. Y., Dillon, H., Day, J., Crowe, K., Close, L., Chisholm, K., & Hopkins, T. (2009). Early language outcomes of children with cochlear implants: Interim findings of the NAL study on longitudinal outcomes of children. *Cochlear Implants International*, *10*, 28–32.

Colletti, L., Mandalà, M., Zoccante, L., Shannon, R. V., & Colletti, V. (2011). Infants versus older children fitted with cochlear implants: Performance over 10 years. *International Journal of Pediatric Otorhinolaryngology*, *75*, 504–509.

Compton, S. (2014). American Sign Language as a Heritage Language. In T. G. Wiley, J. K. Peyton, D. Christian, S. C. K. Moore, & N. Liu (Eds.), *Handbook of Heritage, Community, and Native American Languages in the United States* (pp. 272–286). New York: Routledge.

Crasborn, O., & Sloetjes, H. (2008). Enhanced ELAN functionality for sign language corpora. *Proceedings of the 3rd Workshop on the Representation and Processing of Sign Languages: Construction and Exploitation of Sign Language Corpora*, 39–43.

Cruz, C., Kozak, V. L., Pizzio, A., Quadros, R. M. de, & Pichler, D. C. (2012). Phonological memory in bimodal bilingual children and children with cochlear implants. *Revista Virtual de Estudos da Linguagem*, *10*, 185–212.

Cruz, C. R., Kozak, L. V., Pizzio, A. L., Quadros, R. M. de, & Chen Pichler, D. (2014). Phonological Memory and Phonological Acquisition in Bimodal Bilingual Children. In W. Orman & M. J. Valleau (Eds.), *Proceedings of the 38th Annual Boston UniversityConference on Language Development* (pp. 103–115). Somerville, MA: Cascadilla Press.

Cummins, J. (1991). Interdependence of first- and second-language proficiency in bilingual children. In E. Bialystok (Ed.), *Language processing in bilingual children* (pp. 70–89). Cambridge: Cambridge University Press.

Davidson, K., Lillo-Martin, D., & Chen Pichler, D. (2014). Spoken English language development among native signing children with cochlear implants. *Journal of Deaf Studies and Deaf Education*, *19*, 238–250.

Dohen, M., & Loevenbruck, H. (2009). Interaction of audition and vision for the perception of prosodic contrastive focus. *Language and Speech*, *52*, 177–206.

Duff, P. A. (2012). Case Study. In C. A. Chapelle (Ed.), *The Encyclopedia of Applied Linguistics*. University Iowa State: Blackwell Publishing Ltd. doi:10.1002/9781405198431.wbeal0121

Eisenbeiss, S. (2010). Production methods in language acquisition research. In E. Blom & S. Unsworth (Eds.), *Experimental methods in language acquisition research* (pp. 11–34). Amsterdam, The Netherlands: John Benjamins Publishing Company.

Emmorey, K., Borinstein, H. B., & Thompson, R. (2005). Bimodal bilingualism: Code-blending between spoken English and American Sign Language. In J. Cohen, K. T. McAlister, K. Rolstad, & J. MacSwann (Eds.), *ISB4: Proceedings of the 4th International Symposium on Bilingualism* (pp. 663–673). Somerville, MA: Cascadilla Press.

Emmorey, K., Borinstein, H. B., Thompson, R., & Gollan, T. H. (2008). Bimodal bilingualism. *Bilingualism: Language and Cognition*, *11*, 43–61.

Emmorey, K., Giezen, M. R., & Gollan, T. H. (2016). Psycholinguistic, cognitive, and neural implications of bimodal bilingualism. *Bilingualism: Language and Cognition*, *19*, 223–242.

Emmorey, K., Petrich, J., & Gollan, T. H. (2012). Bilingual processing of ASL-English code-blends: The consequences of accessing two lexical representations simultaneously. *Journal of Memory and Language*, *67*, 199–210.

Emmorey, K., Thompson, R., & Colvin, R. (2008). Eye Gaze During Comprehension of American Sign Language by Native and Beginning Signers. *Journal of Deaf Studies and Deaf Education*, *14*, 237–243.

Ferrara, L. (2012). *The grammar of depiction : exploring gesture and language in Australian Sign Language (Auslan)* (Unpublished doctoral thesis). Macquarie University, North Ryde, N.S.W.

Fishman, J. A. (1966). *Language loyalty in the United States: the maintenance and perpetuation of non-English mother tongues by American ethnic and religious groups*. The Hague: Mouton.

Fogle, L., & King, K. (2013). Child agency and language policy in transnational families. *Issues in Applied Linguistics*, *19*, 1–25.

Fontana, S. (2008). Mouth actions as gesture in sign language. *Gesture*, *8*, 104–123.

Gabryś, D. (2012). *Cross-linguistic influences in multilingual language acquisition*. Berlin, Heidelberg: Springer.

Geers, A. E., Moog, J. S., Biedenstein, J., Brenner, C., & Hayes, H. (2009). Spoken Language Scores of Children Using Cochlear Implants Compared to Hearing Age-Mates at School Entry. *Journal of Deaf Studies and Deaf Education*, *14*, 371–385.

Geers, A. E., & Nicholas, J. G. (2013). Enduring Advantages of Early Cochlear Implantation for Spoken Language Development. *Journal of Speech, Language, and Hearing Research : JSLHR*, *56*, 643–655.

Gobl, C., & Ni Chasaide, A. (2003). The Role of Voice Quality in Communicating Emotion, Mood and Attitude. *Speech Communication*, *40*, 189–212.

Gordon, R. G., & Watson, L. R. (2015). Child-Directed Speech: Influence on Language Development. In *International Encyclopedia of the Social & Behavioral Sciences* (pp. 399–404). Oxford: Elsevier Ltd.

Green, D. (1998). Mental control of the bilingual lexico semantic system. *Bilingualism: Language and Cognition*, *1*, 67–104.

Grosjean, F. (1977). The Perception of Rate in Spoken and Sign Languages. *Perception & Psychophysics*, *22*, 408–413.

Gumperz, J. J. (1982). *Discourse strategies*. Cambridge: Cambridge University Press.

Gumperz, J. J. (2005). Interethnic communication. In S. F. Kiesling & C. B. Paulston (Eds.), *Intercultural discourse and communication: the essential readings* (pp. 33–44). Oxford: Blackwell Publishing Ltd.

Grosjean, F. (2008). *Studying Bilinguals*. Oxford: Oxford University Press.

Harris, M. (2011). Early communication in sign and speech. In M. Marschark & P. E. Spencer (Eds.), *The Oxford handbook of deaf studies, language, and education* (2nd ed, pp. 316–330). Oxford ; New York: Oxford University Press.

Harris, R., Holmes, H. M., & Mertens, D. M. (2009). Research Ethics in Sign Language Communities. *Sign Language Studies*, *9*, 104–131.

Hassanzadeh, S. (2012). Outcomes of cochlear implantation in deaf children of deaf parents: comparative study. *The Journal of Laryngology and Otology*, *126*, 989–994.

Hazrati, O., Ali, H., Hansen, J. H. L., & Tobey, E. (2015). Evaluation and analysis of whispered speech for cochlear implant users: Gender identification and intelligibility. *The Journal of the Acoustical Society of America*, *138*, 74.

Hodge, G., & Johnston, T. (2014). Points, Depictions, Gestures and Enactment: Partly Lexical and Non-Lexical Signs as Core Elements of Single Clause-Like Units in Auslan (Australian Sign Language). *Australian Journal of Linguistics*, *34*, 262–291.

Hoffmeister, R. (2007). Border Crossings by Hearing Children of Deaf Parents: The lost history of CODAS. In H.-D. L. Bauman (Ed.), *Open Your Eyes : Deaf Studies Talking* (pp. 189–215). Minneapolis, USA: University of Minnesota Press.

Hornberger, N. H., & Wang, S. C. (2008). Who are our heritage language learners? Identity and biliteracy in heritage language education in the United States. In D. M. Brinton, O. Kagan, & S. Bauckus (Eds.), *Heritage language education: a new field emerging* (pp. 3–35). New York: Routledge.

Humphries, T., Kushalnagar, P., Mathur, G., Napoli, D. J., Padden, C., Rathmann, C., & Smith, S. R. (2012). Language acquisition for deaf children: Reducing the harms of zero tolerance to the use of alternative approaches. *Harm Reduction Journal*, *9*, 9–16.

Jiménez, M. S., Pino, M. J., & Herruzo, J. (2009). A comparative study of speech development between deaf children with cochlear implants who have been educated with spoken or spoken and sign language. *International Journal of Pediatric Otorhinolaryngology*, *73*, 109–114.

Johnston, T., & Schembri, A. (2007). *Australian Sign Language (Auslan): An introduction to sign language linguistics*. Cambridge, UK: Cambridge University Press.

Johnston, T., Van Roekel, J., & Schembri, A. (2016). On the conventionalization of mouth actions in Australian Sign Language. *Language and Speech*, *59*, 3–42.

Kanto, L., Laakso, M.-L., & Huttunen, K. (2016). Use of code-mixing by young hearing children of Deaf parents. *Bilingualism: Language and Cognition*, *1*, 1–18.

Kelly, B. (2015). Linguistic diversity in first language acquisition research: Moving beyond the challenges. *First Language.*, *35*, 286.

Kelly, B. F., Forshaw, W., Nordlinger, R., & Wigglesworth, G. (2015). Linguistic diversity in first language acquisition research: Moving beyond the challenges. *First Language*, *35*, 286–304.

Konnai, R. M. (2012). *Whisper and phonation: Aerodynamic comparisons across adduction and loudness levels* (Unpublished doctoral thesis). Bowling Green State University, Ohio, USA.

Koulidobrova, E. (2014). Null arguments in bimodal bilingualism: Code-blending (and the lack of) effects in American Sign Language. *BUCLD 38: Proceedings of the 38th Annual Boston University Conference on Language Development*, *2*, 253–265.

Kroll, J. F., & de Groot, A. M. B. (2005). *Handbook of bilingualism: psycholinguistic approaches*. Oxford: Oxford University Press.

Liddell, S. K. (2003a). Depicting verbs. In *Grammar, Gesture and Meaning in American Sign Language*. Cambridge: Cambridge University Press.

Liddell, S. K. (2003b). *Grammar, Gesture, and Meaning in American Sign Language*. Cambridge: Cambridge University Press.

Lillo-Martin, D., Quadros, R. M., Chen Pichler, D., & Fieldsteel, Z. (2014). Language choice in bimodal bilingual development. *Frontiers in Psychology*, *5*, 1163.

Lillo-Martin, D., Koulidobrova, E., Quadros, R. M. de, & Chen Pichler, D. (2012). Bilingual language synthesis: evidence from WH-questions in bimodal bilinguals. In A. K. Biller, E. Y Chung, & A. E. Kimball (Eds.), *Proceedings of BUCLD 38* (pp. 302–314). Sommervilla, MA: Cascadilla Press.

Lo Bianco, J., & Peyton, J. K. (2013). Vitality of Heritage Languages in the United States: The Role of Capacity, Opportunity, and Desire. *Heritage Language Journal*, *10*, i–viii.

Lucas, C., & Valli, C. (1992). *Language contact in the American deaf community*. San Diego: Academic Press.

Mayberry, R., Lock, E., & Kazmi, H. (2002). Linguistic ability and early language exposure. *Nature*, *417*, 38–38.

McComsey, M. (2015). *Bilingual spaces: Approaches to linguistic relativity in bilingual Mexico* (Unpublished doctoral thesis). University of California, San Diego, USA.

McKee, D. (1996). Current issues in New Zealand Sign Language tutor education. *Topics in New Zealand Sign Language Studies: Occasional Publications. Victoria University of Wellington, English Language Institute, Deaf Studies Research Unit, 1*.

McKee, D., & Kennedy, G. (2000). Lexical comparison of signs from American, Australian, British, and New Zealand Sign Languages. In K. Emmorey & H. L. Lane (Eds.), *The Signs of Language Revisited: An Anthology To Honor Ursula Bellugi and Edward Klima* (pp. 49–76). London: Lawrence Erlbaum.

McKee, D., McKee, R., Pivac Alexander, S., Pivac, L., & Vale, M. (Eds.). (2011). The Online Dictionary of New Zealand Sign Language. Victoria University of Wellington: Deaf Studies Research Unit.

McKee, R. (2007). Hand to mouth: Findings on the role of mouthing in NZ Sign Language. Presented at the Keynote address, Australian Sign Language Interpreters Association National Conference, Macquarie University, Sydney.

McKee, R. (2015). *New Zealand Sign Language: A Reference Grammar*. Wellington: Bridget Williams Books.

McKee, R. L., & Manning, V. (2015). Evaluating effects of language recognition on language rights and the vitality of New Zealand Sign Language. *Sign Language Studies*, *15*, 473–497.

McKee, R., & McKee, D. (2007). *New Zealand Sign Language grammar: A guide for learners*. Wellington, New Zealand: School of Linguistics and Applied Language Studies, Victoria University of Wellington.

McKee, R., & McKee, D. (2011). Old signs, new signs, whose signs? Sociolinguistic variation in the NZSL lexicon. *Sign Language Studies*, *11*, 485–527.

McKee, R., Schembri, A., McKee, D., & Johnston, T. (2011). Variable "subject" presence in Australian Sign Language and New Zealand Sign Language. *Language Variation and Change*, *23*, 375–398.

Mckee, R., & Vale, M. (2014). The vitality of New Zealand Sign Language project. Report on a survey of the Deaf/NZSL community. *ResearchGate*.

McKee, R., & Wallingford, S. (2011). “So, well, whatever”: Discourse functions of palm-up in New Zealand Sign Language. *Sign Language & Linguistics*, *14*, 213–247.

McNeill, D. (1992). *Hand and mind: What gestures reveal about thought*. Chicago: University of Chicago Press.

Meyerhoff, M., Adachi, C., Nanbakhsh, G., & Strycharz, A. (2012). Sociolinguistic fieldwork. In N. Thieberger (Ed.), *The Oxford Handbook of Linguistic Fieldwork* (pp. 121–146). Oxford ; New York: Oxford University Press.

Milroy, J. (2002). Language ideologies and the consequences of standardization. *Journal of Sociolinguistics*, *5*, 530–55.

Mitchell, R. E., & Karchmer, M. A. (2004). When parents are deaf versus hard of hearing: Patterns of sign use and school placement of deaf and hard-of-hearing children. *Journal of Deaf Studies and Deaf Education*, *9*, 133–152.

Moorfield, J. C. (2017). Te Aka Online Māori Dictionary. Retrieved from

http://maoridictionary.co.nz

Napier, J. (2006). Comparing language contact phenomena between Auslan-English Interpreters and Deaf Australians: A preliminary study. In C. Lucas (Ed.), *Multilingualism and Sign Languages: From the Great Plains to Australia* (pp. 39–78). Washington, DC: Gallaudet University Press.

Napier, J. (2014, October 28). What’s in a name? [Blog]. Retrieved from https://lifeinlincs.wordpress.com/2014/10/28/whats-in-a-name/

Napier, J., & Leeson, L. (2016). *Sign language in action*. London: Palgrave.

Napier, J., McKee, R. L., & Goswell, D. (2010). *Sign language interpreting: theory and practice in Australia and New Zealand.* (2nd ed). Annandale, N.S.W.: Federation Press.

Palmer, J. L. (2015). *ASL word order development in bimodal bilingual children: Early syntax of hearing and cochlear-implanted Deaf children from signing families* (Unpublished doctoral thesis). Gallaudet University, Washington, USA.

Palmer, J. L. (2016). Bimodal bilingual heritage signers American Sign Language receptive skills. Presented at the The 12th International Conference on Theoretical Issues in Sign Language Research (TISLR12), Melbourne, Australia.

Paradis, J., Nicoladis, E., & Genesee, F. (2000). Early emergence of structural constraints on code-mixing: Evidence from French-English bilingual children. *Bilingualism: Language and Cognition*, *3*, 245–261.

Paradis, M. (2007). The neurofunctional components of the bilingual cognitive system. In I. Kecskes & L. Albertazzi, *Cognitive Aspects of Bilingualism* (pp. 3–28). Dordrecht: Springer.

Pavlenko, A., & Jarvis, S. (2002). Bidirectional transfer. *Applied Linguistics*, *23*, 190–214.

Petitto, L. A., Katerelos, M., Levy, B. G., Gauna, K., Tétreaultt, K., & Ferraro, V. (2001). Bilingual signed and spoken language acquisition from birth: Implications for the mechanisms underlying early bilingual language acquisition. *Journal of Child Language, 28*, 453–96.

Petroj, V. (to appear). Article distribution in English-ASL whispered code-blended speech. *Proceedings from (BUCLD 41): Boston University Child Language Development, Sommerville, MA: Cascadilla Press*, 1–14.

Petroj, V., Guerrera, K., & Davidson, K. (2014). ASL dominant code- blending in the whispering of bimodal bilingual children. In *Proceedings of the 36th Annual Boston University Conference on Language Development*. Sommerville, MA: Cascadilla Press.

Pivac, L. (2009). *The acquisition of New Zealand Sign Language as a second language for students in an interpreting programme: The learners' perspective* (Masters). Auckland University of Technology, Auckland, New Zealand.

Pizer, G., Walters, K., & Meier, R. P. (2013). "We communicated that way for a reason": Language practices and language ideologies among hearing adults whose parents are Deaf. *The Journal of Deaf Studies and Deaf Education, 18*, 75–92.

Pizzuto E. (2003). Review of "The hands are the head of the mouth - The mouth as articulator in Sign Languages" by Penny Boyes Braem and Rachel Sutton-Spence (eds.). *Sign Language Linguistics, 6*, 284–289.

Plaza-Pust, C. (2014). Language Development and Language Interaction in Sign Bilingual Language Acquisition. In M. Marschark, G. Tang, & H. Knoors (Eds.), *Bilingualism and bilingual deaf education* (pp. 23–53). New York, NY: Oxford University Press.

Quadros, R. M. de, Chen Pichler, D., Lillo-Martin, D., Cruz, C. R., Kozak, V. L., Palmer, J. L., … Reynolds, W. (2015). Methods in bimodal bilingualism research: Experimental studies. In E. Orfanidou, B. Woll, & G. Morgan (Eds.), *Research Methods in Sign Language Studies: A Practical Guide* (Vols. 1–250-280). John Wiley & Sons.

Quadros, R. M. de, Lillo-Martin, D., & Chen Pichler, D. (2012). Bi-national bi-modal bi-lingual corpora of child language. In H. Mello, M. Pettorino, & T. Raso, *Proceedings of the VIIth GSCP International Conference. Speech and Corpora* (pp. 87–92). Firenze: Firenze University Press.

Reffell, H., & McKee, R. L. (2009). Motives and outcomes of New Zealand sign language legislation: a comparative study between New Zealand and Finland. *Current Issues in Language Planning, 10*, 272–292.

Reynolds, W., Palmer, J. L., Chen Pichler, D., Quadros, R. M. de, Kozak, V. L., & Lillo-Martin, D. (2015). Heritage Signers: Bimodal bilingual children from Deaf families. Presented at the 12th Generative Approaches to Language Acquisition conference (GALA 12), The University of Nantes, Nantes (France).

Rinaldi, P., & Caselli, M. C. (2014a). Language development in a bimodal bilingual child with cochlear implant: A longitudinal study. *Bilingualism: Language and Cognition, 17*, 798–809.

Rinaldi, P., & Caselli, M. C. (2014b). Language development in a bimodal bilingual child with cochlear implant: A longitudinal study*. *Bilingualism: Language and Cognition*, *17*, 798–809.

Sankoff, G., Meyerhoff, M., & Nagy, N. (2008). *Social Lives in Language--sociolinguistics and Multilingual Speech Communities: Celebrating the Work of Gillian Sankoff*. John Benjamins Publishing.

Sawyer, J. (2016). In what language do you speak to yourself? A review of private speech and bilingualism. *Early Childhood Research Quarterly*, *36*, 489–505.

Schembri, A., Jones, C., & Burnham, D. (2005). Comparing Action Gestures and Classifier Verbs of Motion: Evidence From Australian Sign Language, Taiwan Sign Language, and Nonsigners. *The Journal of Deaf Studies and Deaf Education*, *10*, 272–290.

Schembri, A., Kearsy, C., Johnston, T., McKee, D., McKee, R., & Woll, B. (2010). Sociolinguistic variation in British, Australian and New Zealand Sign Languages. In D. Brentari (Ed.), *Sign languages* (pp. 476–498). Cambridge: Cambridge University Press.

Schembri, A., McKee, D., McKee, R., Pivac, S., Johnston, T., & Goswell, D. (2009). Phonological variation and change in Australian and New Zealand Sign Languages: The location variable. *Language Variation and Change*, *21*, 193–231.

Seals, C. (2013). Te Espero: Varying child bilingual abilities and the effects on dynamics in mexican immigrant families. *Issues in Applied Linguistics*, *19*, 119–142.

Seals, C. (2016). Pasifika heritage languages in New Zealand. In O. Kagan, M. Carreira, & C. Chik (Eds.), *A handbook on heritage language education: From innovation to program building.* New York: Routledge.

Seals, C. A., & Peyton, J. K. (2016). Heritage language education: valuing the languages, literacies, and cultural competencies of immigrant youth. *Current Issues in Language Planning*, 1–15.

Seyfeddinipur, M. (2011). Reasons for documenting gestures and suggestions for how to go about it. In N. Evans (Ed.), *The Oxford Handbook of Linguistic Fieldwork*. Oxford: Oxford University Press.

Singleton, J. L., Jones, G., & Hanumantha, S. (2014). Toward Ethical Research Practice With Deaf Participants. *Journal of Empirical Research on Human Research Ethics*, *9*, 59–66.

Slobin, D. I. (2004). The Many Ways to Search for a Frog: Linguistic Typology and the Expression of Motion Events. In S. Str & L. Verhoeven (Eds.), *Relating events in narrative, Volume 2: Typological and contextual perspectives* (pp. 219–257). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Solomon, A. (2014). *Far from the tree: Parents, children and the search for identity*. London: Vintage Books.

Start ASL (2017). Deaf Culture. Retrieved from https://www.startasl.com/deaf-culture_html

Statistics New Zealand. (2015). Census Totals by Topic: Language-Spoken Tables and QuickStats about Culture and Identity: Languages Spoken. Retrieved from http://www.stats.govt .nz/browse_for_stats/people_and_communities/Language.aspx

Stubbe, M., Lane, C., Hilder, J., Vine, E., Vine, B., Marra, M., … Weatherall, A. (2003). Multiple discourse analyses of a workplace interaction. *Discourse Studies: An Interdisciplinary Journal for the Study of Text and Talk*, *5*, 351–88.

Supalla, T. (1982). *Structure and acquisition of verbs of motion and location in American Sign Language* (Unpublished doctoral thesis). University of California, San Diego, USA.

Sutton-Spence, R. (2000). The influence of English on British Sign Language. *International Journal of Bilingualism*, *3*, 362–94.

Swanwick, R. (2016). Deaf children's bimodal bilingualism and education. *Language Teaching*, *49*, 1–34.

Te Kete Ipurangi. (8 April 2016). Teach and Learn NZSL. Retrieved from http://www.nzsl.tki.org.nz/Introduction/Teach-and-learn-NZSL

Toohey, E. N. (2010). *Phonological development in hearing children of deaf parents* (Honors thesis). University of Connecticut, Connecticut, USA.

van den Bogaerde, B., & Baker, A. (2009). Code mixing in mother-child interaction in deaf families. In A. Baker & B. Woll (Eds.), *Sign Language Acquisition* (pp. 141–164). Amsterdam: John Benjamins Publishing.

van den Bogaerde, B., & Baker, A. E. (2005). Code mixing in mother-child interaction in deaf families. *Sign Language & Linguistics*, *8*, 151–74.

van den Bogaerde, B., & Baker, A. E. (2008). Bimodal language acquisition in Kodas (kids of deaf adults). In M. Bishop & S. L. Hicks (Eds.), *Hearing, mother father deaf : hearing people in deaf families.* (Vol. 14, pp. 99–131). Washington, DC: Gallaudet University Press.

Walton, W. (2006). Sign language as a first language: some experiences of a hearing child of Deaf parents. *SITES: New Series*, *3*, 168–182.

Warren, P. (2012). *Introducing Psycholinguistics*. Cambridge: Cambridge University Press.

Woll, B. (2001). The sign that dares to speak its name: Echo phonology in British Sign Language. In P. Boyes Braem & R. L. Sutton-Spence (Eds.), *The hands are the head of the mouth* (pp. 87–98). Hamburg: Signum Press.

Young, A., & Temple, B. (2014). *Approaches to Social Research The Case of Deaf Studies*.

New York: Oxford University Press.

Zimmermann, K., & Brugger, P. (2013). Signed soliloquy: Visible private speech. *The Journal of Deaf Studies and Deaf Education*, *18*, 261–270.