The impact of autism on the heritage language of Spanish-English bilingual children

by

Keren Hernández

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Department of Linguistics
University of Alberta

I. Abstract

Research Problem: Research on bilingualism and Autism Spectrum Disorder (ASD) is limited. Existing studies have focused on children's second language (L2) development and little attention has been given to heritage language (HL) development. This thesis responds to the question, "does an autism diagnosis jeopardize an HL?" The goal of this thesis is to determine patterns of dual-language acquisition for three school-aged children with ASD living in a minority language (HL; Spanish) home within majority language (L2; English) communities (Alberta, Canada).

Methods: Three Spanish-English bilingual children with high-functioning ASD, between the ages of 6 to 9 (with 60 to 77 months of English exposure), from homes with high socio-economic status (SES), were examined for a variety of factors including parent attitudes toward bilingualism, language input and output, overall language dominance, and HL maintenance patterns across lexical, morphosyntax, and narrative macrostructure domains.

Results: Family attitudes were generally positive toward bilingualism and parents aimed to maintain the HL. Family-members, overall, provided more HL than L2 input to the children, while children exhibited more HL output directed toward parents than to siblings. Environmental factors corresponded to HL preservation across linguistic domains even though children demonstrated overall language dominance in the L2. HL abilities, however, differed across linguistic domains. Children did not exhibit significant deficits in lexical skills and narrative macrostructure abilities in the HL; in contrast, they did demonstrate deficits in HL morphosyntax. Additionally, when comparing children's L2 performance to typically developing monolinguals, deficits in the morphosyntax domain were also revealed.

Conclusion: In the 3 children examined, an ASD diagnosis did not jeopardize the HL. However, despite parents' best efforts to maintain the HL, children's HL skills remain weaker than their L2 proficiency, especially in the morphosyntax domain. Thus, children with ASD may still be at risk of HL attrition. Results indicated that higher HL skills correlated with more opportunities to listen and practice the HL in the home and community. Findings also demonstrated that morphosyntax abilities in bilingual children with ASD require future attention by researchers and clinicians to help inform parents on how best to support dual-language development in children with ASD.

II. Preface

This thesis is an original work by Keren Hernández. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Health Research Ethics Board: "Spanish-English Development in Bilingual Children with Autism Spectrum Disorder," ID: Pro00067239, November 29, 2016.

Some of the research conducted for this thesis forms part of a larger research project, led by Dr. Johanne Paradis at the University of Alberta. The data in this thesis, however, was collected by me and will be further utilized by the larger bilingual and ASD study. Currently no part of this thesis has been previously published. The methodology (chapter 3) and data analysis (chapter 4) was designed by me with the assistance of Dr. Paradis. The introduction (chapter 1), the literature review (chapter 2), and the discussion (chapter 5) are my original work.

III. Acknowledgement

This thesis is the result of two years' effort and represents my introduction to the rigors of academic research. My sincerest gratitude goes to my supervisor, Dr. Johanne Paradis, who expertly guided me through the completion of this Master of Science degree. I am particularly appreciative of her endless dedication, which she gives to her students regardless of life's circumstances. To the families and children who participated in this thesis project, thank you for your time, for sharing your stories, and for trusting me to tell them to others. Additionally, I want to thank Dr. Tamara Sorenson Duncan for her selfless role as mentor, and for challenging and encouraging me every step of the way. My appreciation also extends to my professors and my colleagues in the linguistics department, to my fellow research assistants in the Language Acquisition Lab, and particularly to Dr. Evangelia Daskalaki and Krithika Govindarajan, who all supported me through numerous facets of the research process. Thank you as well to my examination committee, whose insightful feedback further strengthened this thesis. To my family and friends, thank you for being patient with me, for helping me survive the stress, and providing support along the way. And finally, I acknowledge my husband, Zachary Schoenberger, who is my champion and who believes in me and pushes me to reach new heights. Your unwavering encouragement, your tolerance, and your love makes me smile during the toughest of times.

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VI. Abbreviations

ADOS	Autism Diagnostic Observation Schedule
ALEQ	Alberta Language Environment Questionnaire
ASD	Autism Spectrum Disorder
CI	Complexity Index
CMMS	Columbia Mental Maturity Scale
CS%	Code-switching percent
FM	First mentions (also called referring expressions)
HL	Heritage language; in this thesis the minority language (Spanish)
L1	First language
L2	Second language; in this thesis the majority language (English)
MCDI	MacArthur Bates Communicative Development Inventories
MLU-m	Mean Length Utterance (morphemes)
MLU-w	Mean Length Utterance (words)
NAR	Narrative Samples
NDW	Number of different words
NVIQ	Non-verbal IQ
PPVT	Peabody Picture Vocabulary Test III
SALT	Systematic Analysis of Language Transcripts
SES	Socio-economic status
SG	Story Grammar
SLI	Specific language impairment
SLP	Speech-language Pathologist
SSS	Spontaneous Speech Samples
TD	Typical development
TNW	Total number of words
TTR	Type-token ratio (lexical diversity)
TVIP	Test de Vocabulario en Imagenes Peabody
UTT-long	Longest 5 utterances in a single transcript

1. Introduction

Canada's linguistic diversity is rich and plentiful due in part to people from different countries settling in and making Canada their home. Statistics Canada (2016) reports 21.1% of the Canadian population speaks a non-official (minority) language in addition to at least one official (majority) language (English or French). As a result of this diversity, educators, clinicians, and researchers are faced with important questions regarding how immigrant children acquire the majority language (L2) and maintain their heritage language (HL). *Heritage languages* in Canada are non-official or minority languages spoken by immigrant groups who represent a minority demographic with a lower social, cultural, political status in the host country due to immigration or colonization factors (Montrul, 2015). Parents typically arrive in Canada with stronger proficiency in a minority language, and are required to learn the L2 in adulthood. In contrast, immigrant children's HL skills vary from low to high proficiency, consequently most children tend to have weaker HL and stronger L2 abilities (Montrul, 2015). Bilingualism is, therefore, an essential part of immigrant families' everyday communication.

Bilingualism has been studied in children with typical development (TD) and children with specific language impairment (SLI). Few studies, however, have examined bilingualism in immigrant children with Autism Spectrum Disorder (ASD). ASD is a neurodevelopmental disorder affecting the functional abilities of social communication including language development (DSM-5; American Psychiatric Association, 2013). Existing literature has shown that children with ASD are capable of learning the L2 while being exposed to the HL or the first language (L1) (Hambly & Fombonne, 2011; Ohashi et al., 2012; Petersen et al., 2012; Valicenti-McDermott et al., 2013). These studies are limited in number, and have focused primarily on the L2 lexical domain. Moreover, only two of these studies have examined bilingual children's

lexical domain across *both* languages (Hambly & Fombonne, 2011; Petersen et al., 2012). To determine how bilingual exposure affects language in children with ASD, both languages should be examined across multiple linguistic domains. Therefore, this thesis will examine patterns of HL and L2 acquisition for three school-aged children with ASD living in a minority language (Spanish) home within majority language (English) communities. It will assess parent attitudes toward bilingualism, language exposure and usage in the home, children's overall language dominance, and their degree of heritage language maintenance in the lexical (vocabulary), the morphosyntax (grammar), and the narrative macrostructure (story-telling) domains.

Results will be interpreted to answer the broad research question, "does an ASD diagnosis jeopardize the HL?" I hypothesized that immigrant children diagnosed with ASD will demonstrate language dominance in the L2 and HL attrition across domains. This is based on literature stating that immigrant children undergo a dominance shift to the L2, once heavily exposed to the L2 (Jia & Aaronson, 2003; Montrul, 2015), often through school or intervention. The results will address a gap in the literature on bilingualism and ASD. Additionally, they will inform parents, clinicians, and researchers on how to better support bilingualism in children with ASD. This thesis will be organized to include the following chapters: 2. Literature review, 3. Methodology, 4. Results, and 5. Discussion.

2. Literature Review

Researchers are interested in how children with ASD develop two languages because of the communication and social interaction challenges that characterize ASD. However, the literature on language development in bilingual children with ASD is only emerging. Thus, to help inform this thesis, literature on bilinguals with ASD and related literature will be consulted. Research on bilingual development in other populations has revealed the importance of assessing the impact of parent attitudes (section 2.2), of input and output factors on dual language development (section 2.3), and of overall language dominance (section 2.4), and finally of HL maintenance patterns across specific linguistic domains (section 2.5). Where these topics have gone unaddressed in the literature on bilinguals with ASD, literature on monolinguals with ASD and bilinguals from other populations will help guide the development of research questions, hypotheses, and methods.

2.1. Defining Autism Spectrum Disorder (ASD)

ASD is a neurodevelopmental disorder distinguished by repetitive behaviors, social interaction deficits, restricted interests and activities, and communication problems, and may be accompanied by intellectual deficits (DSM-5; American Psychiatric Association, 2013; Tager-Flusberg et al, 2009). ASD is typically diagnosed before the age of three years old (Rice, 2015). Furthermore, it is a spectrum known to encompass other related disorders where language outcomes for each individual can vary (Tager-Flusberg et al., 2009). Previous language studies found verbal children with ASD can have one of two outcomes: (1) normal language skills with mild pragmatic delays; or, (2) linguistic skills below chronological age expectations resembling the language abilities of children with SLI (Colozzo, Moris & Mirenda, 2015; Condouris, Meyer

& Tager-Flusberg, 2003; Kjelgaard & Tager-Flusberg, 2001; Modyanova et al., 2017). Language impairment includes weak non-word repetition, delayed articulation skills, moderate vocabulary impairments, and profound deficits in syntax and pragmatic tasks (Colozzo et al., 2015; Condouris et al., 2003; Kjelgaard & Tager-Flusberg, 2001; Modyanova et al., 2017). To improve upon these language deficits, clinicians provide intervention by facilitating frequent exposure to high quality language (Paul & Murray, 2017). This can be achieved through practice conversation turn taking, asking open-ended questions when reading books, talking about feelings with multiple conversation partners and using visual cues to help predict future events (Paul & Murray, 2017).

2.2. Parent Attitudes on Language Use in the Homes of Children with ASD

Research on bilingualism across populations has revealed that parent attitudes on language(s) used in the home help determine children's dual language development. Studies have found that parents of children with ASD hold two contradictory attitudes toward the role of language use in the home (Hampton et al., 2017; Kay Raining-Bird et al., 2012; Kremer-Sadlik, 2005; Yu, 2013; 2016). Kay Raining-Bird and colleagues found 25% of parents held a negative attitude, exposing their children to a single language input. This was motivated by the belief that a child listening to two languages receives fewer opportunities to practice one language. In contrast, they found 61% held a positive attitude, exposing them to two languages (2012). The motivation for dual language input was the belief that it supports better communication of family values, reinforces culture and provides future job opportunities (Hampton et al., 2017; Kay Raining-Bird et al., 2012; Kremer-Sadlik, 2005; Yu, 2013; 2016). The existing literature tends to support the latter argument, finding no evidence that a single language approach is beneficial to language development, nor finding evidence that a dual language approach causes harm.

Research on this population, however, is in its infancy and adding empirical evidence through direct observations is needed to better understand how parent attitudes toward bilingualism relate to HL abilities in children with ASD and, consequently, to help inform parents on language use policies in the home and clinicians on dual-language intervention with children. The following section examines existing qualitative studies on negative attitudes (section 2.2.1) and positive attitudes (section 2.2.2) toward bilingualism and corresponding language outcomes for children with ASD.

2.2.1. Negative attitudes toward bilingualism.

As noted above, studies have found that a bilingual approach does not amplify language delays in children with ASD, even though some parents believe that dual language use causes greater frustration and confusion in their children (Hambly & Fombonne, 2014; Hampton et al., 2017; Kremer-Sadlik, 2005; Petersen et al., 2012; Yu, 2013; 2016). This belief parallels the cumulative effects hypothesis prevalent in the literature on early bilingualism and SLI, which states that children with language deficits may experience additional delays when acquiring language because cognitive resources are limited, thus creating a division of resources when learning two languages (Orgassa & Weerman, 2008, as cited in Paradis, 2010). This theory stems in part from some speech-language pathologists, teachers, and pediatricians advising parents against speaking more than one language, due to limited research on how language use affects language outcomes (Kremer-Sadlik, 2005; Yu, 2013; 2016).

Despite parents' fears of a dual language approach, studies have shown that maintaining single language input is a challenge for families with low L2 proficiency. For example, Yu (2016) observed a Mandarin speaking family who elected to use English with their child with

ASD as per professional advice, but observed translation errors occurring in the parent-child dialogs. Similarly, Kremer-Sadlik (2005) revealed how low-proficiency in English can lead to communication breakdown, negatively impacting parent-child communication. To illustrate, Kremer-Sadlik described a parent-child interaction where lexical deficits in the parents' L2 led to a lost opportunity for the parent to effectively interact with the child. In both cases, children lost opportunities to bond with and learn from their parents. Thus, fluency in the L2 and parent attitudes are interrelated and, as a result, it is important to ask parents' L2 proficiency alongside their attitudes toward language use in the home.

2.2.2. Positive attitudes toward bilingualism.

In contrast, other parents, regardless of proficiency in the L2, may, in fact, forego professional advice and opt to maintain the HL to reinforce communication with their child (Kay Raining-Bird et al., 2012; Hampton et al., 2017). Hampton and colleagues (2017) interviewed parents of children with TD and ASD and found the two groups shared similar viewpoints on the advantages of bilingualism including future career opportunities, broadening cross-cultural perspectives, preserving links between heritage culture and minority language, and increasing general intellectual and cognitive development. Parents with children with ASD were distinct in expressing that bilingualism helped maintain close and cohesive relationships with the child. Parents expressed that affection was more naturally demonstrated in the minority language because parents did not fear making grammatical or pronunciation mistakes as they sometimes do when speaking in the L2.

Several case studies have documented effects of dual language environments in the home, noting positive outcomes for dual language approaches. Jegatheesan interviewed three South

Asian families who felt a dual language approach helped their children with ASD achieve high levels in English and in the HL. Moreover, bilingualism allowed the children to participate in school and community events in the L2, and familial, religious, and cultural affairs in the HL. The children felt more emotionally connected to the family as they could engage in thorough conversations and participate in cultural activities with their immediate and extended family by means of the HL, thus contributing to the child's identity and self-esteem (Jegatheesan, 2011). Similarly, Yu (2016) described parent-child interaction to demonstrate how the HL facilitates affection between parents and children with ASD. Parents with basic L2 abilities may be limited to procedural language (i.e. "go to bed," or "put on your shoes") and, therefore, may be unable to use diverse vocabulary and interact playfully in ways that help socialize the child according to the family's norms (Yu, 2016). Additionally, effective conversation between parents and children are vital when children present with developmental disorders because parents are likely to serve as the child's long-term caregiver (Paradis, Genesee, & Crago, 2011). The findings from these qualitative studies corroborate the findings from quantitative studies that have shown that children with ASD can acquire vocabulary in both languages (Hambly & Fombonne, 2014; Petersen et al., 2012). To date, no bilingual ASD studies have shown negative language outcomes resulting from a family's choice to use a dual language approach in the home.

In summary, these studies address motivational factors behind single language or dual language approaches, but they do not directly observe the relationship between parent attitudes and the child's language outcomes. In other words, studies have not yet combined a qualitative and quantitative approach. As a result, this thesis combines a qualitative study of environmental factors, including parent attitudes, with quantitative measurements of children's language abilities. In addressing the relationship between environmental factors and language outcomes,

we can determine whether the HL is in jeopardy or being maintained in bilingual children with ASD.

2.3. The Influence of Input and Output on Children with ASD's Bilingual Development

Input and output are two important factors predicting language dominance and, consequently, HL maintenance in bilingual children (Hammer et al., 2012; Paradis, 2016). Scholars have considered each factor in terms of both quantity and quality. In this thesis, *input quantity* refers to the amount of language exposure received by the child, while *input quality* is the frequency and diversity of those activities which provide the child with models of complex grammar and a wide-ranging vocabulary (Paradis, 2011; 2016). *Output quantity* is related to the number of opportunities the child has to practice the language(s). Because these variables fluctuate depending on the child's current environment, researchers recommend accounting for these factors when studying bilingual development (Bedore et al., 2012; Hambly & Fombonne, 2014; Paradis, 2011; Place & Hoff, 2011). While only one study has tackled environmental factors affecting children with ASD, several have observed other populations and provide helpful reference points for the current investigation. An overview of input factors (2.3.1) and output factors (2.3.2) will help unfold their relationship to language dominance and HL maintenance.

2.3.1. Input factors' impact on dual-language development.

As stated previously, only one study has examined the effect of input quantity on language development in bilingual children with ASD (Hambly & Fombonne, 2014). Hambly and Fombonne were interested in determining what factors best predicted the L1 lexical abilities in children with ASD. Bilingual children in this study were French-English bilinguals residing in Central Canada where French is regarded as a highly-valued minority language serving as one of

Canada's official languages and, therefore, is not considered an HL. Hambly and Fombonne (2014)'s found that proficiency in the minority language depended on the quantity of linguistic input they received. Researchers interviewed parents of 33 children (ages 3 to 7) diagnosed with ASD, reporting vocabulary scores in L1 (French) and L2 (English) using the MacArthur Communicative Development Inventory (MCDI) tool. They did not find L1 abilities were significantly influenced by lexicon size, nor by overall language abilities, nor by severity of social-cognitive impairments; instead, the L1 was predicted by input quantity, followed by dominant expressive language scores. Thus, environmental factors – input and output measures – are essential for assessing language proficiency in bilingual children.

Several studies have examined input quantity in bilingual children with TD and have reached conclusions consistent with results from studies of bilingual children with ASD (Bohman et al., 2010; Bedore et al., 2012; Hammer et al., 2012; Paradis, 2011; Place & Hoff, 2011). Place and Hoff (2011), for example, investigated variations of bilingual input in Spanish-English bilingual toddlers (mean age 2;0) and found higher Spanish proficiency in children correlated with higher Spanish input from parents. Over a span of 7 days, 29 mothers recorded language exposure on an hourly basis, identifying language input (Spanish or English), context (ex. meal-time, bed-time, etc.), and speakers involved (ex. mother, father, sibling, etc.). Families with two Spanish speaking parents provided more Spanish input, compared to families with one Spanish speaking parent, resulting in children's higher Spanish, but lower English vocabularies. These results were also seen in a qualitative study conducted by Guardado (2002) and reinforced by findings from Bedore and colleagues (2012) with older (mean age 5;3) Spanish-English bilinguals with TD, where higher input from native speaking parents is correlated to children's higher proficiency in the HL.

Compared to input quantity, fewer studies have examined input quality, even though higher quality (richness) has been shown to correlate with higher language proficiencies (Hoff et al., 2014; Paradis, 2011; Place & Hoff, 2011). To illustrate, Paradis (2011) assessed language richness for 169 typically developing immigrant children (ages 4 to 7 years old) from linguistically diverse backgrounds. Children's parents identified learning English as an L2 after immigrating to Canada. Children had primarily received L1 input for the first two years and were first exposed to English at school entry (before the age of 6-8 years old). Parents answered a questionnaire on parent education, parent self-rated fluency in English, language use among family members, and the quantity and quality of English input the child currently received. Rich language included frequent and diverse sources, such as books, television, native speaker interactions, storytelling, songs, and so forth. Paradis (2011) found that English exposure at home did not largely predict higher English language skills. In fact, internal factors such as chronological age, first language and language aptitude were most strongly associated to language performance. Influential external factors included length of exposure and richness of English environment, but not English input quantity at home, likely because parents' low fluency did not adequately support richness in the L2. Moreover, by speaking the L2, parents decreased HL input. Thus, Paradis (2011) recommends examining both quantity and quality of language exposure in the homes of bilingual children.

2.3.2. Output factors' impact on dual-language development.

While the studies above indicate the importance of language exposure on language development, several studies have also demonstrated the relevance of language usage. Children tend to demonstrate higher proficiency when they combine the passive act of listening (input) with the active process of language use (output) (Bohman et al., 2010; Hammer et al., 2012). For

example, Hammer and colleagues (2012) determined that output quantity correlates with higher language abilities in the HL specifically. They studied the language abilities and input/output factors of 191 Spanish-English bilingual children (mean age of 5 years) from Spanish speaking parents living in the United States. They found children who used Spanish with their parents and teachers performed better in Spanish than those who spoke Spanish with their mother alone. Thus, these results suggest bilingual children with more opportunities to actively practice Spanish with more than one speaker are more likely to maintain their HL. This was more commonly seen in parents from higher SES families (Hammer et al., 2012; Jia & Paradis, 2015; Paradis, 2016). These findings are confirmed in other studies such as those of Guardado (2002) and Bohman and colleagues (2010), who determined higher output correlates with better dual language abilities across morphosyntax and lexical domains. In light of the importance of environmental factors like input and output on language proficiency, it is important to consider the variability of these factors and how fluctuating language environments can lead to changes in children's language dominance and HL maintenance over time.

2.4. Language Dominance in Bilingual Children with ASD

Bilingual children often display greater fluency and proficiency in one of their two languages, and this is commonly known as *language dominance* (Montrul, 2015; Paradis, Genesee & Crago, 2011). Whereas *language proficiency* describes abilities in one language, *language dominance* is the relationship of proficiencies between two languages (Montrul, 2015). Scholars have remarked that children tend to undergo a shift in language dominance from the HL to the L2 shortly after beginning school (Carreira & Kagan, 2011; Jia & Aaronson, 2003; Montrul, 2015). These studies were conducted on children with TD. To date, researchers have not confirmed whether bilingual children with ASD follow similar dominance patterns. This

thesis combines several language dominance predictors to determine when the switch in dominant language occurs in bilinguals with ASD, as well as the impact on HL maintenance across linguistic domains. First this section will give a description of the dominance shift phenomenon (section 2.4.1). Following this section, an overview of dominance measures will be provided, including language preference, codeswitching patterns, and volubility (section 2.4.2).

2.4.1. Dominance shift.

Prior to beginning school, children from bilingual families tend to benefit from rich HL exposure obtained from the family; over time, however, these opportunities diminish, while the L2 is enriched through frequent and diverse exposure outside the home. Children from bilingual homes, in fact, tend to grow into adults who are dominant in the L2 with varying proficiency in the HL. Carreira and Kagan (2011), for example, surveyed 1732 adult HL speakers in the United States from 22 different language backgrounds including Arabic, Armenian, Cantonese, Hindi/Urdu, Japanese, Korean, Mandarin, Persian, Russian, Spanish, Tagalog, Thai and Vietnamese, among others. They asked questions about attitudes, goals, language experiences, environmental factors, and self-ratings in the HL and the L2 (English). Approximately 80% of participants were born in the United States, or had arrived before the age of six. Most participants (58.9%) reported using their L2 more often than the HL over their lifetime. Additionally, 70.2% reported using the HL before the age of 5, but only 1.3% reported using the HL after the age of 18. Furthermore, 65% of participants indicated native-like abilities in the L2 in adulthood, while only 7.5% reported these abilities in the HL.

Whereas Carreira and Kagan (2011) observed an established L2 dominance in adulthood, Jia and Aaronson (2003) examined how dominance shifted from the HL to L2 in childhood.

They found that bilingual children with TD as young as 6 years old may have already experienced a language dominance shift. Jia and Aaronson (2003) interviewed and assessed a group of young arrivals comprised of 6 Mandarin-English bilinguals (5 to 9 years old) with TD. Researchers conducted a longitudinal study beginning within three months of arrival to the United States until three years after immigration. At arrival, children were dominant in Mandarin (HL) and had limited fluency in English (L2), as measured through the child's self-indicated language preference, language usage reported by parents, and proficiency as observed in grammatical and translation tasks. After three years, children had switched in dominance from Mandarin to English, and demonstrated extensive attrition in the HL. Moreover, researchers found that a contributing factor to L2 dominance was increasing frequency of conversation in the L2 among friends, which also negatively impacted the HL. Measures used by Jia and Aaronson (2003) provides a starting point for determining measures of language dominance in this thesis.

2.4.2. Measures of dominance.

A change in language preference from the HL to the L2 in bilingual children has been revealed as corresponding to a shift in language dominance (Jia and Aaronson, 2003; Miller, 2017). Miller (2017) illustrates this, concluding that children's preference for the L2 occurred around the time children began school, usually before children turned 6 years old. This study examined language preference in 65 simultaneous Spanish-English bilingual children, from similar SES backgrounds, with comparable language abilities. Children were divided in six groups by grade: kindergarten (mean age 5;8), grade 1 (mean age 6;5), grade 2 (mean age 7;8), grade 3 (mean age 8;11), grade 4 (mean age 9;8), and grade 5 (mean age 11;1). Participants were interviewed about their attitudes on language preference, and were tested for lexical abilities to determine language dominance. Researchers found that the youngest children (kindergarten and

grade 1) preferred Spanish, but slightly older children (grade 2 to 4) preferred English. In grade 5, children continued preferring English over Spanish, but they also began expressing appreciation for both languages. A shift in language preference starting at age 7, thus, either precedes or co-occurs with the shift in language dominance described in Jia and Aaronson (2003).

Another way of measuring language dominance is by examining patterns of code-switching in bilinguals. *Code-switching* entails using both languages within a single conversation. Bilinguals code-switch for multiple reasons including filling lexical gaps, avoiding miscommunication, establishing solidarity within a group, or conveying emphasis (Gutiérrez-Clellen et al., 2009; Paradis, 2012). Additionally, researchers have found that children commonly code-switch to retrieve words in their non-dominant language (Paradis, 2012; Paradis & Nicoladis, 2007). For example, Paradis and Nicoladis (2007) examined the role of language dominance in code-switching patterns for 8 children (mean age 3;6 to 4;11), 4 of whom were dominant in English, and 4 in French. Dominance was determined by five variables encompassing morphosyntax and lexical domains. The language that was stronger in at least 3 of 5 variables was revealed to be dominant. When a researcher spoke the child's dominant language, all 8 of the children responded in the same language at least 90% of the time. In contrast, when the researcher spoke the non-dominant language, only 4 of 8 children responded in the same language at least 90% of the time. Additionally, 6 of 8 children code-switched more often in the non-dominant language. The tendency toward code-switching was predominant among English dominant children speaking their non-dominant language (French). In contrast, French dominant children code-switched less frequently when speaking English. Codeswitching frequently occurs when children are speaking the minority language with the use of majority

language words (Spanish-English bilinguals, Gutiérrez-Clellen et al., 2009). This is the case even among bilingual children with SLI who, like children with ASD, have language deficits (Gutiérrez-Clellen et al., 2009). As of yet, research has not determined how deficits in discourse pragmatics, which occur in children with ASD, affect code-switching. Consequently, if the children in this thesis demonstrate code-switching following the directionality outlined above, this will be assessed as an expression of language dominance.

Language dominance can also be determined through volubility, using measures like lexical diversity, sentence lengths, story lengths and volubility in play. *Volubility* refers to how talkative the child is in a given language and, in this thesis, the comparison of volubility between languages will be used to help examine language dominance. To date, however, no studies have examined volubility in bilingual children with ASD. Language skills in monolingual children with ASD have been examined by Condouris and colleagues (2003) using volubility measures. Researchers looked at the spontaneous speech samples of 44 children ages 4 to 14 (mean age: 7;3), diagnosed with high-functioning autism and who possessed high verbal skills. Results revealed that volubility varied between individuals, but the group scored below age-level expectations in lexical diversity (lexical skills) and sentence lengths (morphosyntax skills). Thus, in addition to weak skills in discourse pragmatics typically seen in children with ASD, Condouris et al. (2003)'s study demonstrated children can also have weak skills in other linguistic domains like the lexicon and morphosyntax. Currently, only one study has compared lexical skills between languages to find the dominant language in bilingual children with ASD (Petersen et al., 2012). In a group of 14 Chinese-English bilinguals (3;7 to 6;1 years old), children demonstrated higher lexical skills in the L2 (English) than in the HL (Mandarin/Cantonese). These studies recommend using different volubility measures to

determine whether deficits across linguistic domains are equal between languages or are more pronounced in the non-dominant language.

2.5. Dual-Language Abilities across Linguistic Domains in Bilingual Children with ASD

In the previous section, motivation was given to determine dominance by comparing linguistic skills *between* languages; this section, in contrast, seeks to uncover the degree of proficiency *within* each language. Research on bilingual children with TD has shown that differences in HL skills may vary across linguistic domains (Jia & Paradis, 2015; Montrul, 2015). For example, a study looking at the HL (Mandarin) abilities in bilingual children with TD revealed children fared well in morphosyntax, but demonstrated difficulty in the lexical domain (Jia & Paradis, 2015). In other words, bilingual children demonstrate varying proficiency across linguistic domains within a single language. This variation may be amplified in children with ASD because studies have shown them to also exhibit weaknesses in lexical, morphosyntax and narrative macrostructure domains, albeit for different reasons (Condouris et al., 2003; Tager-Flusberg et al., 2009). Existing literature has focused on lexical skills in bilingual children with ASD but, to date, no published research exists about their abilities in morphosyntax and narrative macrostructure domains. The following section examines research looking at how monolingual children with ASD perform across lexical (vocabulary; section 2.5.1), morphosyntax (grammar; section 2.5.2), and narrative macrostructure (story telling; section 2.5.3) domains and, wherever possible, compares with research on bilinguals with ASD, to help inform hypotheses on HL and L2 acquisition patterns in each domain. When bilingual literature on ASD does not suffice, studies examining related bilingual populations are consulted.

2.5.1. Language abilities in the lexical domain.

Scholars examining lexical development in monolingual children with ASD have found their lexicon is semantically similar, although their development is slower, compared to children with TD (Landa, 2007; Rescorla & Safyer, 2013; Tager-Flusberg & Caronna, 2007). Rescorla and Safyer (2013) sought to uncover whether the repetitive interests and deficits in interpersonal skills in children with ASD leads them to learn different vocabulary compared to peers with TD. Researchers found that children with TD (1;6 to 1;11 years old) scored significantly higher than older children with ASD (1;6 to 5;11 years old) in vocabulary tests. Despite a difference in lexicon size, both groups demonstrated similar vocabulary composition, including a variety of word classes. For example, both groups acquired more nouns than any other word class; nouns included words for foods, body parts, toys, and people. Semantically similar, but smaller, lexicons indicate that children with ASD demonstrate delayed, but not different, lexical abilities (Charman et al., 2003; Ellis Weismer et al., 2010; Lusyster et al., 2008). A smaller lexicon size in monolingual children with ASD suggests that bilingual children with ASD may have smaller lexicons in each language because their lexical skills are distributed across two languages.

As a result, researchers have been interested in examining lexical abilities in bilingual children with ASD, and have generally found no significant differences in lexicon size compared to monolingual peers. To illustrate, Petersen and colleagues (2012) utilized questionnaires and standardized tests to gather information on the lexical abilities of 14 Chinese-English bilingual and 14 monolingual children with ASD (3;7 to 6;1 years old) matched on severity of ASD diagnosis, verbal abilities, chronological age, and non-verbal IQ scores. Bilingualism was defined as children who were exposed to two languages daily before the age of 3. This study was unique in its use of a total conceptual vocabulary score to measure bilinguals' lexicon size across

both languages. To obtain this, researchers combined the lexical knowledge of both languages and, to account for translation equivalents, words known in both languages were counted only once. Results indicated no significant difference in lexicon size between bilingual and monolingual children with ASD. These findings on lexicon size are consistent with those found in French-English bilingual children with ASD (Ohashi et al., 2012), Spanish-English bilingual children with ASD (Valicenti-McDermott et al., 2013), and bilingual children with ASD with various L1 backgrounds and French or English as the L2 (Hambly and Fombonne, 2011). Parallel results across studies provide further evidence that bilingual exposure does not negatively affect lexicon size. Despite these findings, the research is limited because direct observation of both the HL and the L2 is necessary to determine whether children are maintaining the HL and, to date, only one study has accomplished this (Petersen et al., 2012).

2.5.2. Language abilities in the morphosyntax domain.

Researchers have yet to examine morphosyntax deficits in bilingual children with ASD; however, some studies have identified parallel morphosyntax vulnerabilities in monolingual children with ASD and children with SLI (Condouris et al., 2003; Kjelgaard & Tager-Flusberg, 2001; Roberts et al., 2004). For example, a recent study on tense-marking skills revealed a subgroup of children with ASD demonstrated weak English inflectional morphology similar to children with SLI (Modyanova et al., 2017). Researchers tested 83 monolingual participants diagnosed with ASD (ages 4 to 16) age matched with 81 monolinguals with TD controls (ages 3 to 17). Participants with ASD were separated into two groups: normal language, and language impaired, which was determined by vocabulary scores below the normal range. Language impaired participants exhibited significantly more errors in tense and finiteness than the normal language group and the TD controls. In contrast, compared with TD controls, the normal

language group did not significantly differ in tense and finiteness abilities. Morphosyntax difficulties have also been found in Mandarin-speaking monolinguals with ASD (Zhou et al., 2014). Zhou and colleagues (2014) studied morphosyntax using aspect morphemes instead of tense morphemes to account for the typological differences between Mandarin and English. Children with ASD (ages 4 to 6 years old) used fewer aspectual morphemes and displayed shorter MLUs than age-matched children with TD. Thus, as a consequence of morphosyntax impairments in monolinguals with ASD, and despite language backgrounds, children with ASD may display lower morphosyntactic abilities than children with TD.

Another area of research that helps inform this thesis is morphosyntax abilities in bilingual children with SLI. For example, Jacobson and Schwartz (2005) examined the morphosyntax abilities of 27 Spanish-English bilinguals with SLI (mean age of 8;2 years), who were found to score lower in tense-marking abilities compared to age matched controls with TD (mean age of 7;3 years). Specifically, researchers found children with SLI produced more errors in past and present progressive tense in regular and irregular verbs. In addition, children with SLI produced more non-productive errors, compared to children with TD, using bare stems and substituting past tense [-ed] for present progressive tense [-ing]. Whereas Jacobson and Schwartz (2005) examined morphosyntax in English, Morgan, Restrepo, and Auza (2013) found Spanish-English bilinguals with SLI also demonstrated deficits in Spanish morphology. Researchers examined 30 participants divided in 3 groups: bilinguals with SLI, bilinguals with TD, and monolingual (Spanish) controls with SLI. In elicitation tasks examining Spanish grammatical morphemes, children with SLI scored significantly lower than children with TD. No significant difference was found between the Spanish monolingual group with SLI and the Spanish-English bilingual group with SLI. Both Jacobson and Schwartz (2005) and Morgan and colleagues (2013)

revealed deficits in morphosyntax in children with SLI in both their HL (Spanish) and their L2 (English).

Finally, numerous studies report similar findings in bilingual children with language impairment from a variety of language backgrounds (e.g. Bedore & Leonard, 1998; Blom & Paradis, 2013; Kay-Raining Bird, et. al, 2005; Paradis, Genesee, & Crago, 2011; Paradis, 2016). Thus, according to the literature reviewed, some monolinguals with ASD and bilinguals with SLI make significant morphosyntax errors. Consequently, bilingual children with ASD may also demonstrate morphosyntax deficits in both their languages.

2.5.3. Language abilities in the narrative macrostructure domain.

Children with ASD are widely known to display deficits in discourse pragmatics, as seen in their performance in narrative macrostructure tasks (Colozzo, Moris & Mirenda, 2015; Norbury, Gemmell and Paul, 2014; Novogrodsky & Eldeson, 2016). *Narrative macrostructure* is the ability to tell coherent and cohesive stories, and is measured using story grammar and referring expressions[1] (first mentions) variables. *Story grammar* refers to the elements required to establish a coherent story, such as settings, characters, plots, intentions and resolutions (Schneider, Hayward, Dubé, 2006). *Referring expressions* determine the cohesiveness of the story through appropriate character and object introductions (Paradis & Kirova, 2014). Currently, no published studies have examined the narrative macrostructure domain in bilingual children with ASD despite their known discourse pragmatic delays. An overview of existing literature related to this population will reveal that monolingual children with ASD show deficits in

[1] Referring expressions are often categorized as *narrative micro*structure because they require the speaker to understand specific linguistic knowledge, such as grammar, in order to introduce characters and objects appropriately. In this thesis, however, because first mentions use the same linguistic constructions in Spanish as in English, first mentions was categorized instead as a *narrative macro*structure variable.

narrative macrostructure, while bilingual children with TD demonstrate generally equal narrative macrostructure abilities across their languages.

Many studies have examined narrative macrostructure abilities in monolingual children with ASD and have shown that even high-functioning children with sufficient expressive abilities routinely exhibit weaknesses in referring expressions and story grammar (Colozzo, Moris & Mirenda, 2015; Norbury, Gemmell and Paul, 2014; Novogrodsky & Eldeson, 2016). For example, Norbury, Gemmell and Paul (2014) examined narrative macrostructure abilities in 75 children (from 6;6 to 15;9 years old) with ASD, SLI, and TD. Groups were matched for age and nonverbal abilities. Researchers found that the ASD group generated shorter stories, excluded more story grammar elements, introduced extraneous information, and elicited more ambiguous referring expressions, than any other group, thus, revealing pragmatic difficulties in all or some of the ASD group. Researchers speculate that referencing errors may be due to the ASD group's difficulty in "theory-of-mind" tasks, which is the ability to account for the listener's needs and address story characters' intentions, emotions, and actions. This study indicates children with ASD, of all ages, who show high cognitive and verbal abilities might still demonstrate challenges in narrative macrostructure. These findings are also reflected in Colozzo, Moris and Mirenda (2015) with children 6;0-10;0 year-old and Novogrodsky and Eldeson (2016) with 6;1-14;3 year old.

As mentioned above, no studies have examined narrative macrostructure in bilinguals with ASD, but by investigating literature focusing on the bilingual population with TD, we can anticipate the cross-language effects that bilinguals with ASD may exhibit in this domain. Specifically, researchers looking for cross-language effects in Spanish-English bilinguals with TD have found similar macrostructure scores across their two languages (Fiestas & Peña, 2004).

In a study looking at story grammar, Fiestas and Peña (2004) explained that Spanish-English bilingual children (ages 4;0-6;11 years old) demonstrated similar narrative abilities between languages because coherent stories require the same elements regardless of language or culture. Thus, story grammar can be viewed as a cognitive measure that is universally the same across languages despite the language background or culture of participants (Paradis & Kirova, 2014). In contrast to story grammar, referring expressions are linguistically dependent (Paradis & Kirova, 2014). For example, although Spanish and English both introduce characters using indefinite articles, they differ in how they reintroduce previously mentioned characters; English uses definite articles, while Spanish more commonly reintroduces using null subjects (Montrul, 2004; Gutiérrez -Clellen et al, 2008). Thus, studies have noted referring expression introductions are not an issue for Spanish-English bilinguals because both languages rely on the same linguistic devices (Álvarez, 2003; Gutiérrez-Clellen, Simon-Cereijido, Wagner, 2008). Because this thesis will examine character introductions (first mentions) and story grammar elements, bilingual children with ASD are expected to obtain similar scores across both languages but score low in both narrative macrostructure measures. Currently, no research has examined discourse pragmatics using narrative macrostructure in bilingual children with ASD across both languages. By comparing skills in both languages, this thesis aims to address this gap in the literature.

2.6. Research Questions

Despite the growing population of immigrant children in Canada (Statistics Canada, 2016), the population of bilingual children diagnosed with ASD is generally underrepresented in the literature. Most research on bilingual children with ASD has focused only on parent attitudes toward bilingualism or on lexical abilities in the L2. Even in these areas, more questions remain

to be explored, especially with respect to comparing the L2 and the HL developmental trajectory, and tying direct observational data to qualitative findings. Using these combined methods can lead us to answer the broad question posed in this thesis, *does an ASD diagnosis jeopardize HL maintenance in bilingual children?* It is hypothesized that the HL, of bilingual children with ASD, is in jeopardy. This stems from evidence that bilingual children often demonstrate difficulty maintaining the HL into adulthood due to a lack of opportunities to practice the HL (Carreira & Kagan, 2011; Montrul, 2015), this shift is especially seen in school-age children (Jia & Aaronson, 2003; Miller, 2017). Children with ASD could be at an even greater risk to HL attrition because they receive intensive and early L2 intervention (Hampton et al., 2017; Kay Raining-Bird et al., 2012;), thus decreasing HL exposure, and exposing them to the L2 from an earlier age than most bilingual children with TD. A comprehensive examination of language development in three bilingual children with ASD was conducted for this thesis, focusing on parent attitudes toward bilingualism, input and output factors impacting bilingual development, language abilities in each language across linguistic domains (lexical, morphosyntax, and narrative macrostructure) and overall language dominance.

2.6.1. How do environmental factors impact HL maintenance in bilingual children with ASD?

Q.1: What are parents' attitudes toward bilingualism in their children with ASD?

Q.2: How does language exposure (input) and language usage (output) in the home vary across languages for each child?

Hypothesis. It is anticipated that parents with positive attitudes toward bilingualism will reject the one-language approach, which will support HL maintenance observed through high HL

outcomes in children (Yu, 2013; Kremer-Sadlik 2005; Jegatheesan, 2011). In contrast, parents with negative attitudes will likely embrace a one-language approach, which will contribute to HL attrition, demonstrated through low HL scores (Yu, 2013; Kremer-Sadlik 2005; Hampton et al, 2017). Positive parent attitudes should correspond to high input quantity, high input quality, and high output quantity in the HL, which would indicate HL maintenance in the child (Bedore et al, 2012; Bohman et al, 2010; Hambly & Fombonne, 2014; Hammer et al, 2012; Paradis, 2011; Place & Hoff, 2011). Negative attitudes would result in the reverse outcome.

2.6.2. What do language abilities indicate about HL maintenance in bilingual children with ASD?

Q.3: What is the overall dominant language in these bilingual children with ASD?

Q.4: How does performance across linguistic domains in bilingual children with ASD compare to age-based norms for monolingual children with TD?

Q.5: What linguistic domains (lexical, morphosyntax, and/or narrative macrostructure) are vulnerable in bilingual children with ASD?

Hypothesis: Children are expected to demonstrate overall language dominance in the L2 (English). Due to early L2 exposure through intervention, it is expected school-age children will have already undergone a dominance shift from the HL to the L2 (Jia & Aaronson, 2003). This will be examined through L2 language preference, code-switching patterns using L2 words, and higher L2 volubility (Carreira and Kagan, 2011; Condouris, Meyer and Tager-Flusberg, 2003; Gutiérrez-Clellen et al., 2009; Jia & Paradis, 2015; Paradis & Nicoladis, 2007; Miller, 2017). Additionally, based on previously discussed literature on monolingual children with ASD, bilingual counterparts will likely demonstrate lower scores in standardized tests across multiple

domains compared to monolingual norms with TD, with their greatest gaps being in morphosyntax and narrative macrostructure (Colozzo et al., 2015; Condouris et al., 2003; Modyanova, et al., 2017; Norbury, et al., 2014; Novogrodsky & Eldeson, 2016; Rescorla and Safyer 2013; Roberts et al., 2004; Tager-Flusberg et al., 2009). Finally, I predict children will exhibit low abilities in the HL in all domains (lexical, morphosyntax and narrative macrostructure) because these children have had more practice in the L2 through early intervention, and because they are school-age children having received at least two years of schooling in a majority language community, thus possibly restricting access to listening and using the HL. Examining children's HL abilities across domains will also determine if risks to HL maintenance might be greater in some domains than in others, as seen in other studies of HL acquisition (Jia & Paradis, 2015). Integrating results on environment with those on dual-language abilities will indicate the extent to which bilingual children with ASD demonstrate HL maintenance.

3. Methodology

The following chapter describes the methodology used to conduct three case-studies of bilingual children with ASD. Three bilingual children with ASD were visited by a researcher (myself) three times during a six-month period to collect data on their dual-language skills. Section 3.1 describes participant characteristics; subsequently section 3.2 describes procedures including data collection, transcription, and coding to yield variables; and, lastly section 3.3 describes the scoring analysis.

3.1. Participants.

Three children diagnosed with ASD, aged 6-9 years, were recruited through my professional networks in local school districts. Based on parent reports, participants were high functioning, verbal Spanish-English bilinguals with a range of 60-77 months of exposure to English as an L2. Children had IQ scores in the normal range, based on the Columbia Mental Maturity Scale (CMMS; Burgemeister, Blum, & Lorge, 1972), which I administered as part of my research (see below). These criteria allowed me, a bilingual speaker of English and Spanish, to conduct language tasks in both languages across multiple linguistic domains. Three children, from two families, participated in this study. They included two boys, Miguel and Sergio, and one girl, Daniela. Sergio and Daniela were siblings sharing the same parents. The children's names have been changed to protect their privacy.

As detailed below (Table 3.1), parent reports provided information about the participants' early development, including: home language use, developmental milestones, hours of therapy, diagnostic process, schooling information, and anecdotes about children's verbal and concentration abilities. All parents enrolled children in a pre-school early learning program,

which led to a healthcare referral and an ASD diagnosis. Children were clinically diagnosed with ASD at three years of age by professionals at a local health care centre using a multi-disciplinary diagnostic assessment. Children in this study were exposed to English at a young age (before three years), and therefore, can be considered simultaneous bilinguals (Paradis, Genesee, and Crago, 2011). Before the study began, children had received approximately 1008 to 3456 English language intervention hours, including speech-language and behaviour therapy. At the time of the thesis data collection, children were no longer receiving therapy at home or at school. All children attended inclusive, regular-track schooling. Miguel (grade one) was in a bilingual Spanish-English school, and Sergio (grade four) and Daniela (grade two) attended English medium schools. Table 3.1, summarizes the characteristics of the participants' scores at every testing session (T1, T2, T3) during the six-months of testing.

Table 3.1. Participants' demographic information (over six-month period).

	Schooling	Age at testing sessions	CMMS scores	Age of Diagnosis	Total intervention	Age of first word	Age of English Exposure	Amount of English exposure
Miguel	Grade 1, Bilingual program (SPA & ENG)	T1: 6;3	103	44	1008	12	14	60
		T2: 6;5	101	44	1008	12	14	63
		T3: 6;8	109	44	1008	12	14	66
Sergio	Grade 4, Regular program (ENG)	T1: 8;7	123	30	3456	24	32	71
		T2: 8;10	107	30	3456	24	32	75
		T3: 9;1	145	30	3456	24	32	77
Daniela	Grade 2, Regular program (ENG)	T1: 6;5	104	30	2376	18	17	60
		T2: 6;8	113	30	2376	18	17	63
		T3: 6;11	104	30	2376	18	17	66

Note. Age at testing is indicated by years;months during first session (T1), second session (T2), and third session (T3). CMMS are portrayed in standard scores. Age of diagnosis is described in months. Total intervention is provided in hours. Age of first word, Age of English Exposure and Amount of English exposure are given in months.

Participants in this study experienced similar language environments. Children were born and raised in Alberta, Canada where Spanish is not widely spoken (Statistics Canada, 2016); thus, all children were learning their HL in a potentially subtractive environment possibly leading child to incomplete attainment of the HL (Jia & Paradis, 2015; Montrul, 2015). Subtractive environments are susceptible to negative HL consequences because the larger community might prioritize L2 development and L2 culture over that of the HL (Cummins, 2000). All three children lived with two, native Spanish-speaking parents. Each child belonged to a family of four, with a mother, father, and sibling. Parents spoke Spanish and English, but primarily Spanish in the home. Miguel's younger sibling spoke primarily Spanish; while Sergio and Daniela were each other's siblings and spoke primarily English together.

Parents of the participants also shared similar characteristics. Parents were first generation Canadians, having immigrated as adults 11 to 16 years ago from Colombia to Alberta, Canada. Parents self-identified as being proficient Spanish-English bilinguals, but Spanish was their preferred language. Additionally, parents' English skills were self-rated as 'quite fluent' or 'very fluent.' Ratings were obtained using the Alberta Language Environment Questionnaire (ALEQ, Paradis 2011; see Table 3.3 below). According to the ALEQ, 'quite fluent' indicated "can understand English adequately for work and most other situations;" and 'very fluent' meant "understand almost everything and very comfortable expressing myself in English in all situations." The parents of all three participants had professional careers and post-secondary education, thus all participants had similar and high socio-economic status backgrounds (Ensminger & Fothergill, 2003). Table 3.2 summarizes information about the parents.

Table 3.2. Parents' demographic information.

	Country of Origin	Post-Secondary Education	Years in Canada	Language Preference at home	Parents' self rating of English fluency
Miguel's mother	Colombia	Bachelor's Degree	13	Spanish	Quite fluent
Miguel's father	Colombia	Bachelor's Degree	12	Spanish	Quite fluent
Sergio & Daniela's mother	Colombia	Bachelor's Degree	11	Spanish	Quite fluent
Sergio & Daniela's father	Colombia	Master's Degree	16	Spanish	Very fluent

3.2. Procedure.

Three sessions were conducted over six months between July 2016 and February 2017 in the participants' homes. Every two months, two graduate research assistants (myself and a colleague) conducted 2 to 4 hours of language activities in Spanish and English. Children assented to being recorded for the study in English and in Spanish for all three sessions. Data were collected at each session through three types of methods including standardized tests, parent questionnaires administered as interviews, and language samples. The same tasks were administered at each visit. Language activities were counter-balanced to avoid order-effect. For example, sometimes the child would begin with an English task and other times they began with a Spanish task. The following section summarizes data collection procedures and coding for variables obtained.

3.2.1. Data collection using standardized tests[2].

Two types of standardized tests were administered: first the Columbia Mental Maturity Scale (CMMS; Burgemeister, Blum, & Lorge, 1972) determined participants' non-verbal IQ scores, second both the Peabody Picture Vocabulary Test III (PPVT; Dunn and Dunn, 1997) and the Test de Vocabulario en Imagenes Peabody (TVIP; Dunn, 1986) examined receptive vocabulary size in English and Spanish, respectively. The CMMS yields a norm-referenced, non-verbal IQ score for children ages 3 to 9 years old. It consists of 8 increasingly complex levels. Each level contained a series of pattern sequences consisting of four figures. Children must decipher the pattern and identify the figure that does not belong within the pattern sequence. No verbal response is required. A normal range score for each child participant in this thesis indicated an absence of an intelligence disability. The PPVT and TVIP measured the children's lexical abilities in each language. Experimenters provided children with a word and asked children to point to the image, from an array of four images, that best matched the word.

3.2.2. Data collection using parent questionnaire.

The Alberta Language Environment Questionnaire (ALEQ: Paradis, 2011) was administered to gather information about the child's language environment in the home. Information included family demographics, parents' self-rated fluency in English, parents' education level, family language-use patterns, and child activities in English and in the HL inside and outside the home (Paradis, 2011). Variables derived from the ALEQ questions are input

[2] Participants' standardized scores provide a point of reference with which to contextualize the language abilities of these bilingual children with ASD relative to what is known about their monolingual peers with TD. It is important to note, however, that children with ASD form a highly heterogenous population that is likely to demonstrate variations in performance (DSM-5, 2013; Tager-Flusberg et al, 2009). Thus, the scores obtained from standardized tests cannot be generalized to the wider bilingual ASD population.

quantity and quality. Quantity measures the relative input and output in each language among family members, and quality is a measure of the richness of the language input.

Measures of input and output quantity. Relative quantity measures were calculated for parent-child, sibling-child, and family-child relationships, thus yielding six separate, rating scale scores (3 input and 3 output). Parent-child input and output variables are averaged from the scores of both parents. Sibling-child input and output variables are averaged across siblings; however, in this thesis, each participant had only one sibling. Family-child input and output variables are averaged across parents and siblings; in this thesis, each participant had two parents and one sibling. Family-child input and output variables are therefore the result of an average between three people. To obtain relative input quantity, family members were asked on a 5-point rating scale the extent to which they speak English or Spanish with the child (0 - only Spanish and never English; 2 – half English, half Spanish; 4 - only English and never Spanish). The same method was used to obtain output quantity variables. Averaging across the rating scales and dividing by the total number yielded a percentage of English input-output, ranging from 0 to 100%. The percentage of Spanish input-output was obtained by subtracting the English score from 100 (i.e. 100-25=75%). Percentages were used because the quantities of English and Spanish input combine to form the participant's total input in the home (English input + Spanish input = 100% of input). The same applies to output quantity.

Measures of input quality. In contrast, input quality yielded separate and non-dependent scores for each language. Input quality was calculated using a proportional scale ranging from 0 to 1 for each language. The richness of the language input was determined by the variety and frequency of activities that promote language development. These activities consist of native-speaker input, which typically provide complex grammar and diverse vocabulary. Examples

include bilingual schooling, screen-time (e.g. television and computer), extra-curricular activities (e.g. sports or clubs), and religious activities (e.g. church), book reading, storytelling, singing or interactions with native speakers like friends or teachers (Paradis, 2011). In this thesis, HL (Spanish) richness and L2 (English) richness scores were obtained from the ALEQ. Input quality was evaluated by assigning points based on the number of language-rich activities engaged in by the child and the frequency of the activities performed in an average week. For example, reading books every day received two points, reading once a week received one point, and reading less than once a week was zero. A child that regularly performed a greater number of language-rich activities per week would receive a higher score. Points were added and divided by the maximum number of points to generate proportions for each language.

Qualitative questions on children's language development. An additional parent interview, consisting of seven qualitative questions, was also conducted in Spanish. Topics included parents' language goals for children, family language policy, language supports, children's language preference, benefits and challenges to maintaining the HL, professional recommendations on language use in the home, and attitudes about bilingualism. Responses provided background information to contextualize and interpret children's test performance. Only two parent responses were obtained because two participants, Daniela and Sergio, belonged to the same family and shared the same parents. Recordings were transcribed and translated by the researcher. The ALEQ and parent interview questions can be found in Appendix A.

3.2.3. Data collection using language samples.

At every testing session, children provided two types of language samples: spontaneous speech and narrative. These samples were conducted in English and in Spanish; thus, in sum, the children contributed twelve samples each to the overall corpus. Language samples were video-recorded and transcribed by native English or native Spanish speaking research assistants. Ten percent of the English corpus was transcribed and coded independently by a second research assistant. Moreover, in cases where disagreement between transcription occurred, a third research assistant was consulted to determine the outcome. Comparisons between transcriptions resulted in 97% reliability for words and 95% for utterance boundaries.

Spontaneous Speech Samples (SSS). Spontaneous speech recordings consisted of child-led play sessions in both languages. Language samples were 10 to 20 minutes in length. Transcriptions (100 utterances for each child) were then analyzed using CLAN speech data analysis software (MacWhinney, 2017). Using the same number of utterances allowed for a fair comparison between subjects, as per Brown's recommendation (1973; as cited in MacWhinney, 2017). CLAN analysis of language samples produced the following variables in Spanish and English: number of different words (NDW), total number of words (TNW), lexical diversity (also called type-token ratio; TTR), mean length of utterance in words (MLU-w), mean length of utterance in morphemes (MLU-m), longest utterance (UTT-long), and code-switching percentage (CS%). Descriptions and use of these variables will be given in detail in the section below, "Coding linguistic variables."

Narratives Samples (NAR). Narrative samples were elicited with the Edmonton Narrative Norms Instrument (ENNI; Schneider, Dubé, & Hayward, 2006), a story-generation

tool used to gather language information. The ENNI includes a set of six stories presented through images and depicting two to four characters. Children were asked to narrate the ENNI stories in each language at each testing interval. Narrative samples were analyzed through CLAN for the same measures listed above for spontaneous samples: NDW, TNW, TTR, MLU-w, MLU-m, and CS%. Moreover, analysis of narrative samples using ENNI guidelines yielded the following additional variables: complexity index (CI), first mentions (FM), and story grammar (SG). Descriptions and use of these variables will be given in detail in the section below, "Coding linguistic variables."

Coding Linguistic Variables. The language samples above yielded multiple linguistic variables that were grouped in different ways to determine overall language dominance as well as to measure abilities across lexical, morphosyntax and narrative macrostructure domains.

Language dominance. Overall dominant language was calculated across three dimensions: language preference, volubility and code-switching patterns. Language preference was obtained by asking parents their perspective on children's overall preferred language at each session. One point was given to the language the parents identified at each of the three sessions. Half point (0.5) was given if parent identified child preferred speaking both language during the time of testing. To find children's volubility in each language, four distinct measures were used to compare volubility in each language: First, lexical diversity was examined through NDW in NAR transcripts, as story content was the same in both languages, and therefore controlled for length of transcript. Second sentence length was calculated using UTT-long, which averaged the 5 longest utterances in SSS transcripts, providing the scope of the child's morphosyntactic complexity in each language. These five utterances did not include instances of code switching. Third, story length in both languages was obtained by considering TNW extracted from NAR.

Fourth, children's volubility in play was also calculated using TNW this time in the SSS transcripts. Finally, code-switching was also calculated to determine dominance by comparing the number of times children spoke English during Spanish tasks, with the times they said Spanish words during English tasks. Below are utterances illustrating code-switching:

1) *CHI:	el	uno	que	lo	construyo	está	muy	surprised@s.
	the	one	that	it	build	is	very	surprised.
	'the one that build it is very surprised.'							
2) *CHI:	un	balloonero@s		tenia	muchos	balloons@s.		
	a	balloon-SUFFIX		had	many	balloons.		
	'a balloon seller had many balloons.'							

The first child demonstrated classic code-switching, using the English word 'surprised' in a Spanish utterance, where the child filled lexical gaps in their non-dominant language. The second example presented filling a lexical gap for the word 'vendedor de globos' (balloon seller; *lit: 'seller of balloons'*). The derivational suffix '-ero' is applied to Spanish nouns to form a new word that describes somebody who works with that noun. For example, zapato (shoe) + -ero = 'zapatero' (*cobbler*). In this case, the child is creating the word 'balloon seller' by adding the Spanish suffix '-ero' to the English noun 'balloons'. Because code-switching in children often occurs in the non-dominant language, this variable was used to determine language dominance.

Lexical abilities. The primary measure utilized to calculate lexical abilities was TTR, which was calculated by dividing NDW (types) by TNW (tokens) from 100 utterances. TTR provided information on children's expressive lexical abilities by providing a measure of lexical diversity. These 100 utterances did not contain code-switching. Lexical abilities were compared in NAR and SSS transcripts for each language.

Morphosyntax abilities. Additionally, morphosyntax abilities were calculated using mean length utterances (MLU) and complexity index (CI). CLAN generated MLU for words (MLU-w)

and for morphemes (MLU-m).[3] For each transcript in both languages, MLU-w and MLU-m were calculated to avoid language specific biases that exist between the typologies of Spanish and English.[4] Calculating MLU required same length transcripts; therefore, 100 utterances were selected from each SSS transcript. NAR samples were similar in length because children told the same six stories in each session; therefore, all utterances were included to calculate MLU for narrative samples. An additional morphosyntax variable is the complexity index (CI). Following the ENNI guidelines, CI is determined by comparing the number of dependent clauses to the total number of independent clauses in a sample. Even though dependent clauses have verbs, they are embedded in an independent matrix clause. The following example is from the data:

1) *CHI: there was a giraffe and an elephant again.
*CHI: and the giraffe brought a toy.
*CHI: but the elephant dropped it because they were at the swimming pool.
*CHI: then the giraffe cried because he was the little kid.

The example consists of four utterances. Each utterance is scored as an independent clause; additionally, two dependent clauses are underlined. To calculate the CI, the total number of clauses (dependent and independent) are divided by the number of independent clauses (i.e. 6/4) to obtain a CI score of 1.5. Thus, children with more embedded, dependent clauses score higher than children with more simple sentences (Schneider, et. al., 2006).

Narrative Macrostructure abilities. Story grammar (SG) and first mentions (referring expressions) are narrative macrostructure variables calculated from the ENNI to provide

[3] Alternatively called "mean length of communication" (MLCU) according to the ENNI. In this thesis, MLCU is referred to as MLU-w.
[4] One the one hand, Spanish's rich verb morphology may inflate MLU-m scores and place English MLU-m at a disadvantage (Bedore, Peña, Gillam, & Ho, 2010). On the other hand, English uses more prepositions and overt subjects, which may increase the score for MLU-w and provide an advantage over MLU-w in Spanish. Calculating morphemes and words can help balance morpho-syntactic differences in Spanish and English. Scores for these variables, however, should be interpreted with caution.

information about discourse pragmatic skills (see chapter 2, section 2.5.3). English raw ENNI scores were converted to standard scores for norm-referencing participants' performance relative to typically developing monolingual children (see footnote 2 on page 30). Additionally, when comparing between languages, only raw scores were used, since ENNI standard scores in Spanish are not available. Recall, in section 2.5.3 (Chapter 2), narrative macrostructure abilities include variables of story grammar and first mentions which convey children's ability to tell coherent and cohesive stories. English story grammar was calculated using the ENNI criteria, and an adapted version was used to determine Spanish story grammar scores (see Appendix B). As per the ENNI, story grammar elements were worth different points. For example, including a character gave children one point, but identifying initiating events, attempts, or outcomes earned two points each. Despite the difference in point values, scoring was still "all or nothing;" that is, elements gained points if they were included but received no points if they were excluded. In total, a child may earn up to 13 points for a simple story (e.g. ENNI A1) and earn up to 37 points for a complex story (e.g. ENNI A3).

First Mentions (FM), on the other hand, refers to introductions of characters and objects in a story. In English and Spanish, new characters and objects are introduced by an indefinite article (English: *a* giraffe; Spanish: *una* jirafa); thus, this noun phrase would be awarded 3 points. Character introduction using a definite article (English: *the* giraffe; Spanish: *la* jirafa) would obtain 2 points and 1 point is given to character introductions using a pronoun (English: *she/he;* Spanish: *ella/él*) with no prior mention. ENNI first mentions scoring does not extend to character or object maintenance (reintroductions) in the discourse. Thus, only referring expressions introductions (first mentions) were calculated in this thesis. In total, raw scores were added across all six stories for a possible total score of 42 (see Appendix C for more details).

3.3. Scoring Analysis.

The measures used in this study provided a comprehensive examination of the children's language learning environment and their abilities across multiple linguistic domains. Reasons for how scores were analyzed will be given in the following section, starting with a summary of all variables (section 3.3.1), an analysis in determining overall language dominance (section 3.3.2) and ending with the analytical reasoning for averaging scores across testing sessions (section 3.3.3).

3.3.1. Summary of variables.

Table 3.3 provides a summary of variables that will be used to analyze results. The "dimension" column indicates the linguistic area being measured, "method" indicates the data collection tool used, "variable" indicates the abbreviated form of a measurement derived from the instrument, and "description" provides an explanation of the abbreviation.

Table 3.3. Summary of variables and their description.

Dimension	Method	Variable	Description
Background	CMMS	NVIQ	Non-Verbal IQ. Used to determine intellectual disabilities and as a measure of analytical reasoning. Measured in standard scores.
	Parent Interview	Response	Interview responses to questions about attitudes toward bilingualism.
Input Quantity	ALEQ	PAR:CHI	Average input percentage (0-100%) received by the child from the two parents.
		SIB:CHI	Input percentage (0-100%) received by the child from the one sibling.
		FAM:CHI	Average input percentage (0-100%) received by the child from their immediate family. For all three participants, the FAM:CHI percentage results from an average of three people (two parents and one sibling).
Output Quantity	ALEQ	CHI:PAR	Average output percentage (0-100%) provided to the two parents by the child.
		CHI:SIB	Output percentage (0-100%) provided to the sibling by the child.
		CHI:FAM	Average output percentage (0-100%) provided to the immediate family by the child. For all three participants, the CHI:FAM percentage results from an average of three people (two parents and one sibling).
Input Quality	ALEQ	ENG:RICH	Diversity of language input in English measured in proportion (0-1.0).
		SPA:RICH	Diversity of language input in Spanish measured in proportion (0-1.0).
Overall Dominance (7)	Parent Interview	Preference	(1) Child's language preference as reported by the parents.
	Spontaneous Speech Sample (SSS) & Narrative Sample (NAR)	Volubility	(2) Lexical diversity measured using NDW (number of different words; types) in NAR transcripts.
			(3) Story length measured using TNW (total number of words; tokens) in NAR transcripts.
			(4) Sentence length measured using UTT-long (longest utterance average) calculated the average number of words in the 5 longest utterances in each transcript. Utterances without CS were selected.
			(5) Degree of volubility (TNW (tokens)) measured during a 15-minute play session with researcher.
		CS%	(6 & 7) Code-switching Percent. Frequency in percentage where child used the alternate language (e.g. CS% = English % spoken during Spanish tasks) measured across all utterances in NAR and SSS transcript.
Lexical	PPVT	Recep. Vocab.	Receptive vocabulary. The child's ability to comprehend vocabulary. Measured in standard score.
	SSS & NAR	NDW	Number of Different Words (types).
		TNW	Total number of Words (tokens).
		TTR	Type-Token Ratio. The lexical diversity for a sample of 100 utterances divided by the length of the transcript (in words). Formula*: NDW / TNW = TTR*
Morphosyntax	SSS & NAR	MLU-w	Mean length of utterances from a sample of 100 utterances, measured in words.
		MLU-m	Mean length of utterances from a sample of 100 utterances, measured in morphemes.
	NAR	CI	Complexity Index. Number of dependent clauses compared to the total number of independent clauses.
Narrative Macrostructure	NAR	FM	First Mentions. Assessment of new character introductions in a narrative.
		SG	Story Grammar. Assessment of child's use of story elements to form a coherent, logical narrative.

3.3.2. Determination of dominance.

Bilinguals rarely display equal proficiencies in both languages, therefore, it is important to bilingual research to determine the dominant language in bilingual children (Paradis, Genesee, and Crago, 2011). In this thesis, the dominant language is the more advanced language, as demonstrated by higher scores in language preference, volubility measures and code-switching percent which yield seven different variables compared across both languages (see table 3.3, under "Overall Dominance"). An odd number of language measures were included in order to determine the child's overall dominant language. If the child scored higher in one language on 4 or more out of 7 measures, he or she was determined to be dominant in that language.

3.3.3. Averaging scores across testing sessions.

Because this thesis is based on three case studies, descriptive statistics were used in the analysis to address the research questions. Scores for each variable from the three testing sessions were averaged to obtain a single score per child for the analyses. For example, scores were added together (T1 + T2 + T3 = X) and divided by three to obtain an average (X/3 = average score). Averaging across testing sessions helped protect against inconsistencies that can result from testing children with ASD. Children with ASD may fluctuate in their willingness to interact with strangers, in their levels of engagement with tasks, in their moods, and so forth, and this can impact the results on expressive language tasks in particular. The six-month testing interval for school-age children was likely not long enough for real longitudinal change to be visible, so averaging the scores did not result in loss of developmental information. This was confirmed by inspecting scores across the three sessions, finding no outliers, and determining standard scores to be within the same confidence interval.

4. Results

The following chapter is divided into five research questions (see chapter 2, section 2.6) to help answer the broad research question: '*does an ASD diagnosis jeopardize HL maintenance in bilingual children?*' Results examine each child individually utilizing descriptive statistics. In the discussion chapter (chapter 5) the relationship between trends across linguistic dimensions will be used to identify the extent of children's HL maintenance.

4.1 Q.1 - What are parents' attitudes toward bilingualism in their children with ASD?

As discussed in the literature review (see chapter 2), parents are the primary resource for supporting HL maintenance within the home (Guardado, 2002; Montrul, 2015). In this research, parent attitudes toward bilingualism provided insight into why the child has or has not been able to maintain their HL. The following are qualitative responses that resulted from a series of seven open-ended interview questions asked of the parents. Responses were provided in Spanish and translated into English.

Table 4.1. Miguel's parents' attitudes about bilingualism.

1.	Family Language Policy:
	"Everyone speaks only Spanish at home. I make an effort to remind Miguel to speak Spanish when he comes home from school. Sometimes he forgets because he has been speaking lots of English throughout the day at school."
2.	Language goals for the child:
	"I hope Miguel will read, write, and speak fluently in Spanish. We [mother and father] would like him to be fully bilingual in all areas. This is the reason we chose to put him in a bilingual school."
3.	Advice given to you by therapists:
	"The therapists always told me to use Spanish. If they had told me to use English, I would definitely not follow that advice. It is important for me to use my language - Spanish. I would not use English instead of Spanish."
4.	Supports in place to help child learn HL:
	"We use Spanish apps on the iPad, we take out Spanish books from the library, we listen to Spanish music, and we interact with a large network of Spanish families where the parents also speak Spanish to the children. A challenge is media like English TV shows. We are actually working on getting satellite channels to broadcast Spanish TV programs for the children."
5.	Benefits to dual-language exposure:
	"Bilingualism will help when Miguel goes to Columbia to visit his extended family. It is also good for him to know two languages. In the future it will open doors for him regarding his education and future career goals. I feel he would have more possibilities with two languages and I hope he can pass Spanish to his future family."
6.	Challenges to dual-language exposure:
	"If we were immersed in Spanish, wow, his Spanish would increase drastically! He would get more exposure outside, TV, people, friends, of course he could learn much more! The difficulties in keeping Spanish is due to the lack of exposure but I don't believe it's because his brain can't process it. I see it when he speaks to his grandma, he knows she isn't bilingual and he only uses Spanish. His Spanish skills might even be better than other kids without autism."
7.	Overall satisfaction with child's language abilities:
	"I feel happy and proud of his abilities in his Spanish spelling. If I had not taught him Spanish it would be difficult to travel, to converse with his grandparents, even to express myself 100% with him. I have many more words in Spanish than in English. I can be funny and defend myself well in Spanish. It would be a real challenge to talk to him [in English]. The truth is I feel closer to him because I can speak Spanish. I feel like he gets to know me. In my experience, it can be done [children with autism can be bilingual]. Yes, they can do it! To what point can they do it well without 100% immersion? I'm not sure. In my case, my mother tongue is how I show love. It's more natural for me to speak in my language. It's a real privilege to use it with my children. We can't forbid them [children] the privilege. That would be a sin."

To summarize, Miguel's family is actively reinforcing the HL in their home by providing an additive environment where the HL is being supported in the home and school and the L2 in the community and school. At home, they have adopted a Spanish-only language policy which is currently supported by a younger brother who speaks primarily Spanish and by Miguel's Spanish-English bilingual schooling. Parents are motivated to encourage HL maintenance because they believe Miguel will benefit from a strengthened connection to his parents and extended family, as well as from potential career advancement. Miguel's family expressed a positive sentiment in his language learning capabilities despite his autism diagnosis. Moreover, Miguel's parents have been encouraged by therapists and have sought out opportunities to maintain the HL through diverse sources such as, books, Spanish TV and a Spanish community network. Even with the strong emphasis on HL maintenance, Miguel's mother stated the biggest challenge is the dominance of English in the community (even in the bilingual school) and an over-abundance of English resources. Despite these challenges, evidence suggested that Miguel is supported in maintaining his HL.

Table 4.2. Sergio & Daniela's parents' attitudes about bilingualism.

1.	Family Language Policy:
	"The rule is that they have to speak Spanish with us [parents] but between themselves [siblings] there are no rules. They choose to speak English to each other usually."
2.	Language goals for the children:
	"I want them to speak it [Spanish] fluently with correct grammar. They don't have to have correct pronunciation. I absolutely believe they can meet that goal. I've been considering putting them into a Spanish bilingual school, so they can learn more."
3.	Advice given to you by therapists:
	"Yes, there have been some [home] language suggestions from my children's therapists when they were receiving therapy. Most of them speech-language pathologists. A few of them recommended I speak English but that I didn't have to do it. But there was one therapist I placed a lot of trust and she told me to continue speaking Spanish. She said she came from an immigrant family, somewhere in Europe, and she had a lot of experience working with children with autism. She recommended we speak Spanish and not English because my children were going to learn English anyway and there would be no interference. And that is what we chose to do. But at the time, it was very confusing because everyone was not in agreement. But, deep down I've always thought I should speak Spanish with my children. Because first, I knew my children were able to understand Spanish words and second, I thought about the family around me. I thought if I ever want them [children] to communicate with them [family] I'd be creating a barrier in the long run if I didn't teach my children Spanish."
4.	Supports in place to help children learn the HL:
	"I support by speaking Spanish to them. I sit down and read in Spanish together. We go on vacation to Spanish speaking countries. Many of our family and friends speak Spanish. We go to church in Spanish. I think it would be helpful if speech-language pathologists provided materials and activities in Spanish. I have noticed in my time interacting with therapists that they give a lot of support but only in English. But I have never felt they were interested or thought about giving me strategies to help reinforce the children's Spanish. No, that's never happened. I don't think it's a priority for them. It's not their concern. It's as if that's our problem [the family's]. I don't believe it's even part of the multi-disciplinary teams' agenda. Because I was part of many teams for both my children and every year therapists would change but never was the topic on bilingualism ever touched as part of the therapy."
5.	Benefits to dual-language exposure:
	"Yes. It is good professional development and it gives them the ability to communicate with family members who don't speak English. It is also important they don't lose their cultural roots."

6. Challenges to dual-language exposure:
"Well now, they prefer to speak in English when retelling stories from school or when interacting with other Spanish speaking children. TV, friends, books are all in English. English is everywhere. Both my children prefer English. It is automatic for them. They are dominant in English and weaker in Spanish. But I believe they are definitely capable of learning more Spanish. They learn new [Spanish] words every day. I know they can continue learning because they are intelligent and because language learning difficulties are not linked to the diagnosis. It's because their environments are mostly in English. In a day, they hear more English and little Spanish. I've seen other children (typically developing) show the same challenges when learning Spanish."
7. Overall satisfaction with children's language abilities:
"Yes, I'm very happy. I was impressed with the children's ability to communicate with the extended family. At our last visit to Columbia, my family was surprised the children spoke as much as they did in Spanish because the children were able to communicate and form relationships with their grandmother, uncles, aunts and cousins. This makes me very happy. Teaching them Spanish has also allowed my husband and I to continue going to church in Spanish. The children have enough Spanish to be able to participate in catechism in Spanish. Because I taught them Spanish I've been able to share my religion and my culture with them. This is something we can share as a family." "I guess I would have also liked it if they [SLPs] could give me the certainty that I was doing the right thing in speaking Spanish. Because it was always more of an intuition. I think it would have been helpful if the activities they [SLPs] gave me or even just the instructions could have been given in both languages. That would have helped. Of course, materials and instructions in my language would have made me feel much better. Of course, because we [parents] don't know where we are walking! They give me the therapy and they give me the tools, but what language to speak is something I'm choosing to do and sometimes I question myself whether I'm harming or interfering with their language development. Maybe certain milestones won't be achieved in the time they are supposed to because I'm speaking another language? I would have liked to know then what I know now. My children are definitely capable of learning two languages."

Parent responses for Sergio and Daniela were combined because the mother reported she has the same expectations for both her children. Sergio and Daniela's family is attempting to maintain the HL in the home. The family has a Spanish-only policy but only when talking to the parents. Both children choose to speak English with each other. Their mother encouraged HL maintenance through travel, books, network and church participation. She believes bilingualism can benefit her children by providing deeper connections with extended family and enhanced career opportunities. Already, Sergio and Daniela's parents have seen the rewards of bilingualism through their shared experience, such as traveling to Spanish-speaking countries

together where their children learn about their cultural roots, and by exploring their religion through the parents' mother tongue. Sergio and Daniela's mother does not believe an ASD diagnosis is responsible for their difficulties in learning their HL, since other typically-developing children also demonstrate difficulty maintaining the HL. Sergio and Daniela's family, however, have been faced with obstacles regarding HL maintenance; for example, speech-language pathologists provided mixed opinions on the topic of bilingualism and autism. The mother reported that speaking the HL was never strongly discouraged but was also rarely supported professionally. The conflicting professional advice did not provide external validation, and, in turn, the mother questioned her decision to maintain the HL. Moreover, intervention tasks and materials were always provided in English, Spanish materials were never provided and, more importantly, bilingualism was never a topic of focus during therapy. Additionally, maintaining the HL is made difficult by the overwhelming amount of English exposure at school, the community, and friendships. Despite these hardships, it is apparent that Sergio and Daniela are receiving some support necessary for maintaining their HL.

4.2 Q.2 - How does language exposure (input) and language usage (output) in the home vary across languages for each child?

The home environment is typically the child's primary source of HL exposure. Consequently, examining language input and output in the home can help uncover the extent of HL maintenance. Three external language factors were measured: input quantity measured the amount of language directed at the child by family members, output quantity measured the active language usage produced by the child to each of their family members, and, finally, input quality measured the frequency and diversity of activities promoting language development (see chapter 3, section 3.2.2).

Input quantity scores across participants are summarized in Table 4.3. Miguel's parents reported speaking entirely in Spanish with Miguel (100%). Parents reported Miguel's younger brother speaking 75% Spanish and 25% English with Miguel. Finally, when the three family members (two parents and one sibling) are averaged together, Miguel received 92% Spanish and 8% English in the home. During the testing period, Miguel's younger brother began attending English pre-school for the first time. At this point, the English sibling input quantity increased dramatically from 0% English input in the first two sessions to 75% in the final session, thus averaging 25% across all three sessions. This is indicative of the constantly changing nature of language use in the home. In contrast to Miguel, Sergio's parents reported speaking 83% Spanish and 17% English with him. Sergio received 17% Spanish and 83% English from his younger sister Daniela. This reversal is likely due to the family's language policy, where Spanish is spoken with parents, but any language is spoken among siblings (see table 4.2 above). Averaging the three family members together, Sergio received 67% Spanish and 33% English in his home. Consistent with Sergio, his sister, Daniela, also received 83% Spanish and 17% English from her parents. Daniela, however, received exclusively English input (100%) from Sergio. This is likely because Sergio is older and has received more exposure to English in his lifetime making him more comfortable speaking English. Averaging scores across the three family members, Daniela received 63% Spanish and 37% English.

Table 4.3. Participants' input quantity (scores averaged from three sessions).

	Input-quantity PAR:CHI		Input-quantity SIB:CHI		Input-quantity FAM:CHI	
	English	*Spanish*	*English*	*Spanish*	*English*	*Spanish*
Miguel	0%	100%	25%	75%	8%	92%
Sergio	17%	83%	83%	17%	33%	67%
Daniela	17%	83%	100%	0%	37%	63%

Note. PAR:CHI, parent input to child; SIB:CHI, sibling input to child; FAM:CHI, family (including both parents and the sibling) input to child.

Output quantity scores are presented in Table 4.4. Miguel spoke more Spanish (83%) than English (17%) with his parents. With his sibling, Miguel also spoke more Spanish (58%) and less English (42%); however, the difference was more balanced compared to parent-directed output. Finally, Miguel's average family output was substantially less English (22%) and more Spanish (78%). Sergio also spoke more Spanish (54%) than English (46%) to his parents. In contrast, Sergio spoke exclusively in English (100%) with Daniela. This increase in English between siblings affected the overall family language, which revealed Sergio to speak more English (58%) than Spanish (42%) in the home. Daniela demonstrated a similar pattern to Sergio. She also spoke more Spanish (58%) to her parents than English (42%), yet more English to her brother (83%) than Spanish (17%). On average, Daniela used more English (51%) than Spanish (49%) with her family members.

Table 4.4. Participants' output quantity (scores averaged from three sessions).

	Output-quantity CHI:PAR		Output-quantity CHI:SIB		Output-quantity CHI:FAM	
	English	*Spanish*	*English*	*Spanish*	*English*	*Spanish*
Miguel	17%	83%	42%	58%	22%	78%
Sergio	46%	54%	100%	0%	58%	42%
Daniela	42%	58%	83%	17%	51%	49%

Note. CHI:PAR, child output to parent; CHI:SIB, child output to sibling; CHI:FAM, child output to family (including both parents and the sibling).

Input quality or language richness scores are given below in Table 4.5. Miguel's language richness was similar in proportion between Spanish (.67) and English (.73). He demonstrated slightly richer English compared to Spanish, however input quality in both languages remained high (>.50). Attending a bilingual school provided Miguel with access to Spanish books, stories, songs, computer programs, and friendships, all of which likely contributed to higher Spanish richness. Attending bilingual school and belonging to an English-speaking community also contributed to high English richness. In contrast, Sergio and Daniela demonstrated lower Spanish richness (<.50), and higher English richness (>.50). The children share the same home and school environment, thus resulting in similar richness scores. Low scores in Spanish richness for Sergio (.19) and Daniela (.23) indicate less diverse and less frequent Spanish activities. In contrast, richness scores in English for Sergio (.77) and Daniela (.81) reflect frequent engagement in a variety of English activities. Attending an English medium school and belonging to an English-speaking community resulted in an overwhelming prevalence of spoken and written English activities. This was reflected in Daniela and Sergio's parents, who reported Spanish-language books were difficult to obtain at the English school, making the children's love for reading difficult to transfer into a tool for maintaining Spanish.

Table 4.5. Input quality, richness scores (averaged across three sessions).

	ENGLISH RICHNESS			SPANISH RICHNESS		
	Score (0-1.0)	*High Freq. Activities*	*Low Freq. Activities*	*Score* (0-1.0)	*High Freq. Activities*	*Low Freq. Activities*
Miguel	.73	-Bilingual school -Reading -Storytelling -Singing -Friendships	-Screen time -Sports	.67	-Bilingual school -Reading -Storytelling -Singing -Church	-Screen time -Friendships
Sergio	.77	-English school -Reading -Screen time -Storytelling -Friendships	-Singing -Sports	.19	-Church	-Storytelling -Singing -Friendships
Daniela	.81	-English school -Reading -Screen time -Storytelling -Singing -Friendships	-Sports	.23	-Church -Storytelling	-Singing -Friendships

Note. High freq. (frequency) activities refers to activities performed more than once per week on average. Low freq. activities refers to activities performed once or less per week on average.

4.3 Q.3 - What is the overall dominant language in these bilingual children with ASD?

In this section, participants' HL and L2 scores are compared across measures of preference, volubility and code-switching patterns to determine each child's overall dominant language (see chapter 3, section 3.3.2 for more information). Most Spanish variables in this study did not have standard scores available; therefore, raw scores for Spanish and English variables were compared. For each of the seven variables, children's scores in both their languages were compared to determine the language with the highest score. The highest scoring language was deemed the child's dominant language (see section 3.3.2). Percent differences between languages were also calculated to show the extent of deviation between language scores.

Overall language dominance scores are shown in Table 4.6. All participants demonstrated strong dominance in their L2 (English), each scoring in favour of English dominance in 7 of 7 variables. Parents identified all children preferred to speak English at almost every testing session. The only exception was at Miguel's first session where his parents indicated he preferred Spanish; in testing sessions to follow, however, parents reported Miguel shifted to an English preference. In terms of volubility, all children's L2 scores were consistently higher than their HL scores in lexical diversity, sentence length, volubility in play, and story length. In fact, in these four volubility measures, children demonstrated at least a 10% difference between language scores. Finally, code-switching patterns were also examined across children during SSS and NAR sessions. Miguel demonstrated significant use of English words during Spanish tasks (>10%), but did not use Spanish words during English tasks. Similarly, Sergio also only code-switched using English words during Spanish tasks, but not the other way around, although his CS% was not significant (<10%). Additionally, Daniela code-switched less than 10%, using English words during Spanish tasks, but she did not code-switch during English tasks; her CS% scores were also not significant.

Table 4.6. Participants' overall language dominance scores.

	Dominance Variables	English avg. score	Spanish avg. score	Percent Difference	Dominant Language
Miguel	Language Preference	2	1	na	L2 (ENGLISH)
	Lexical Diversity	141.3	104.0	↓26%	L2 (ENGLISH)
	Sentence Length	16.15	11.70	↓28%	L2 (ENGLISH)
	Volubility in Play	1054	384	↓64%	L2 (ENGLISH)
	Story Length	405	319	↓21%	L2 (ENGLISH)
	CS % – SSS	44%	0%	↓44%	L2 (ENGLISH)
	CS % – NAR	14%	0%	↓14%	L2 (ENGLISH)
Sergio	Language Preference	3	0	na	L2 (ENGLISH)
	Lexical Diversity	134.3	105.3	↓22%	L2 (ENGLISH)
	Sentence Length	20.57	18.57	↓10%	L2 (ENGLISH)
	Volubility in Play	1125	541	↓52%	L2 (ENGLISH)
	Story Length	416	317	↓24%	L2 (ENGLISH)
	CS % – SSS	6%	0%	↓6%	L2 (ENGLISH)
	CS % – NAR	9%	0%	↓9%	L2 (ENGLISH)
Daniela	Language Preference	3	0	na	L2 (ENGLISH)
	Lexical Diversity	141.7	116.0	↓18%	L2 (ENGLISH)
	Sentence Length	24.33	21.65	↓11%	L2 (ENGLISH)
	Volubility in Play	1450	785	↓46%	L2 (ENGLISH)
	Story Length	464	367	↓21%	L2 (ENGLISH)
	CS % – SSS	3%	0%	↓3%	L2 (ENGLISH)
	CS % – NAR	3%	0%	↓3%	L2 (ENGLISH)

Note. CS %, code-switching percent; SSS, spontaneous speech sample; NAR, narrative sample (ENNI, Edmonton Narrative Norms Instrument). Percent difference less than 10% indicated no language preference (-). Cells are highlighted in black when Spanish < English scores by 10% or more which indicated preference for English.

4.4 Q.4 - How does performance across domains, in bilingual children with ASD, compare to age-based norms for monolingual children with TD?

Participants' language scores across linguistic domains were compared to the standard norms for monolingual children with TD of the same age. These scores provided a starting point for determining the participants' language skills. Standard scores for bilingual children must, however, be interpreted with caution because bilingual children may acquire language skills at different rates across domains compared to monolingual norms (Paradis, 2016). Standard scores

exist for receptive vocabulary variables in English (PPVT) and Spanish (TVIP), and in English for variables derived from the ENNI narrative task. Scores below the normal range indicated potential weaknesses in that linguistic domain; and, alternatively, scores within the normal range indicated no delay, relative to monolingual peers.

Average standard scores are presented in Table 4.7. Miguel was within the normal range for Spanish and English lexical receptive skills and English expressive skills. His narrative macrostructure skills were also within the normal range. Thus, in lexical and narrative macrostructure domains, Miguel demonstrated no evidence of delay. In morphosyntax, however, Miguel tested within the low-normal range for complexity index (CI) and below the normal range for MLU. Miguel's low morphosyntax scores might indicate a potential delay in the morphosyntax domain. Sergio was within the normal range for Spanish and English lexical receptive skills and English expressive skills, albeit on the lower-end of normal in each of these scores (<mean). His narrative macrostructure skills were also within the normal range, but also below the mean. As a result, Sergio demonstrated no evidence of a delay in lexical and narrative macrostructure domains. In morphosyntax, however, Sergio scored below the normal range in both CI and MLU indicating a potential delay in this domain. Daniela scored within the normal range for Spanish and English lexical receptive skills and English expressive skills. Her narrative macrostructure skills were on the higher end of the normal range (above the mean). Daniela, therefore demonstrated no delay in lexical and narrative macrostructure domains. In morphosyntax, Daniela scored below the normal range in CI, but achieved a standard mean score in MLU. Thus, her scores do not show consistently low abilities across both measures of morphosyntax.

Table 4.7. Participants' standard scores.

Linguistic domains	Variables	Standard Scores		
		Miguel	Sergio	Daniela
Lexical – Receptive	SPA – TVIP	102	85	99
	ENG – PPVT	102	90	104
Lexical – Expressive	ENG – NDW	10	8	10
	ENG – TNW	8	7	9
Morphosyntax	ENG – CI	7	5	6
	ENG – MLU	6	5	10
Narrative Macrostructure	ENG – FM	8	9	**11**
	ENG – SG:A1	7	7	**11**
	ENG – SG:A3	10	7	**11**

Note. TVIP, Test de Vocabulario en Imagenes Peabody; PPVT, Peabody Picture Vocabulary Test; NDW, number of different words (types); TNW, total number of words (tokens); CI, complexity index; MLU, mean length of utterance; FM, first mentions (referring expressions); SG, story grammar (A1, simple story; A3, complex story). Standard score means (normal range) for each variable: TVIP & PPVT = 100 (85-115). NDW, TNW, CI, MLU, FM, SG = 10 (7-13). The cells highlighted in black fall *below* the normal range. The cells highlighted in grey indicate *lower* performance but still within the normal range. The bolded numbers indicate high performance *above* the normal range.

4.5 Q.5 - What linguistic domains (lexical, morphosyntax, and/or narrative macrostructure) are vulnerable in bilingual children with ASD?

As stated in the literature review (see chapter 3), language patterns may vary, within a language, across different linguistic domains (Jia & Paradis, 2015). Investigating bilingual children's language abilities across linguistic domains in each of their language can provide insight into vulnerable language areas affecting HL maintenance in bilingual children with ASD. Thus, this question is divided into three subsections addressing participants' abilities in each linguistic domain (Q.5.1 – lexical, Q.5.2 - morphosyntax, Q.5.3 - narrative macrostructure). To determine whether Spanish scores were sufficiently different from English scores, raw scores needed to differ by a threshold of 10% (a logical but arbitrary criterion). In other words, if variables differed less than ±10%, skills were considered similar in both languages. For each

variable, L2 and HL scores were categorized according to the following: “stronger” indicated the Spanish score exceeded the English score in the given linguistic variable; “similar” indicated no difference between the Spanish and English scores, and “at risk” indicated the Spanish score was lower than English score in the variable of interest. In sum, HL maintenance was determined separately for each domain when more variables were marked “stronger” or “similar” compared to variables coded as “at risk.”

Q.5.1: Lexical domain. Three variables composed the lexical domain: receptive vocabulary (PPVT/TVIP), and expressive vocabulary (TTR for SSS and TTR for NAR) as shown in Table 4.8. In all three variables, the participants demonstrated similar performance patterns. All three children achieved less than 10% difference between their Spanish and English scores for PPVT and TVIP, as well as TTR for narrative samples. Additionally, the participants scored stronger in TTR for SSS in Spanish, indicating they each possessed diverse lexical skills when conversing in their HL. In summary, Miguel, Sergio, and Daniela each demonstrated lexical skills in the HL are not presently at risk.

Table 4.8. Participants' lexical raw scores in Spanish & English.

	Lexical Variables	English avg. score	Spanish avg. score	Percent Difference	HL (Spanish) Skills
Miguel	Receptive (PPVT vs. TVIP)	102	102	0%	SIMILAR
	Expressive (TTR – SSS)	0.344	0.457	↑33.85%	STRONGER
	Expressive (TTR – NAR)	0.351	0.329	↓6.27%	SIMILAR
Sergio	Receptive (PPVT vs. TVIP)	90	85	↓5.56%	SIMILAR
	Expressive (TTR – SSS)	0.319	0.409	↑28.21%	STRONGER
	Expressive (TTR – NAR)	0.323	0.332	↑2.79%	SIMILAR
Daniela	Receptive (PPVT vs. TVIP)	104	99	↓4.81%	SIMILAR
	Expressive (TTR – SSS)	0.262	0.356	↑35.88%	STRONGER
	Expressive (TTR – NAR)	0.307	0.318	↑3.58%	SIMILAR

Note. PPVT, Peabody Picture Vocabulary Test; TVIP, Test de Vocabulario en Imagenes Peabody; TTR, type-token ratio; SSS, spontaneous speech sample; NAR, narrative sample (ENNI, Edmonton Narrative Norms Instrument). Cells are highlighted in black when Spanish < English scores by 10% or more ('AT RISK'). Cells are highlighted in grey when Spanish > English scores by 10% or more ('STRONGER').

Q.5.2: Morphosyntax domain. Five variables made up the morphosyntax domain: MLU-words and MLU-morphemes in SSS and NAR, and complexity index (CI) from the narrative sample (see Table 4.9). Miguel demonstrated similar results between languages for CI (NAR) and MLU-m (SSS), where both variables differed by less than 10%. He also showed stronger performance in Spanish MLU-m (NAR) (>10%). Miguel's Spanish skills were considered at risk for MLU-w for both SSS and NAR. Despite the bias that MLU-m would favor Spanish, it was only higher in the NAR samples and not SSS. In sum, two of the five variables showed stronger English skills than Spanish skills, two variables demonstrated similar skills in English and in Spanish and one variable was stronger in Spanish than English. Therefore, Miguel's Spanish morphosyntax domain appeared to be slightly weaker than his English morphosyntax domain. Sergio's morphosyntax results indicated similar scores between languages for CI (NAR) and MLU-m (NAR). MLU-w (SSS and NAR) and MLU-m (SSS) scores, however, were lower in Spanish compared to English by more than 10%. Three of five

morphosyntax variables indicated weak Spanish skills; therefore, Sergio's results indicated his HL morphosyntax domain is also at risk. Finally, Daniela demonstrated stronger CI (NAR) (> 20%) in Spanish compared to English. Additionally, Daniela showed similar performance in MLU-m (NAR) in both languages. On the other hand, Daniela was weak in three of five variables measuring Spanish morphosyntax abilities, including MLU-m (SSS) and MLU-w (SSS and NAR). Daniela scored higher in English than in Spanish for three of five variables, revealing that, like her brother (Sergio), her HL morphosyntax skills are at risk.

Table 4.9. Participants' morphosyntax raw scores in Spanish & English.

	Morphosyntax Variables	English avg. score	Spanish avg. score	Percent Difference	HL (Spanish) Skills
Miguel	MLU-words – SSS	3.766	3.297	↓12.45%	AT RISK
	MLU-morphemes – SSS	3.889	3.645	↓6.27%	SIMILAR
	MLU-words – NAR	6.399	5.564	↓13.05%	AT RISK
	MLU-morphemes – NAR	7.046	7.786	↑10.54%	STRONGER
	CI– NAR	1.179	1.292	↑9.58%	SIMILAR
Sergio	MLU-words – SSS	5.508	3.475	↓36.91%	AT RISK
	MLU-morphemes – SSS	5.699	4.762	↓16.44%	AT RISK
	MLU-words – NAR	6.924	5.911	↓14.63%	AT RISK
	MLU-morphemes – NAR	7.546	7.974	↑5.67%	SIMILAR
	CI– NAR	1.183	1.241	↑4.90%	SIMILAR
Daniela	MLU-words – SSS	6.951	4.182	↓39.84%	AT RISK
	MLU-morphemes – SSS	7.310	5.916	↓19.07%	AT RISK
	MLU-words – NAR	7.647	6.368	↓16.73%	AT RISK
	MLU-morphemes – NAR	8.447	8.669	↑2.63%	SIMILAR
	CI– NAR	1.153	1.406	↑21.94%	STRONGER

Note. MLU, mean length of utterance; CI, complexity index; SSS, spontaneous speech sample; NAR, narrative sample (ENNI, Edmonton Narrative Norms Instrument). Cells are highlighted in black when Spanish < English scores by 10% or more ('AT RISK'). Cells are highlighted in grey when Spanish > English scores by 10% or more ('STRONGER').

Q.5.3: Narrative macrostructure domain. Narrative macrostructure domain was composed of three variables: two story grammar scores, a simple story A1 and a complex story A3; as well as first mentions scores (referring expressions), from the ENNI (see Table 4.10).

Miguel and Daniela both performed similarly between languages across all narrative macrostructure variables. Results indicated that the narrative macrostructure domain in the HL is not at risk for either Miguel or Daniela. Sergio also demonstrated similar performance in story grammar scores between languages; his first mentions English scores, however, exceeded his Spanish scores by slightly more than 10%. Overall children scored in the lower end for story grammar scores compared to first mentions scores and this was consistent between languages.

Table 4.10. Participants' narrative macrostructure raw scores in Spanish & English.

	NAR macrostructure Variables	English avg. score	Spanish avg. score	Maximum Score	Percent Difference	HL (Spanish) Skills
Miguel	SG – A1	8	8	/13	0%	SIMILAR
	SG – A3	24	22	/37	↓8%	SIMILAR
	FM	34	32	/42	↓6%	SIMILAR
Sergio	SG – A1	9	9	/13	0%	SIMILAR
	SG – A3	24	22	/37	↓8%	SIMILAR
	FM	38	34	/42	↓11%	AT RISK
Daniela	SG – A1	9	8	/13	↓8%	SIMILAR
	SG – A3	25	23	/37	↓8%	SIMILAR
	FM	38	39	/42	↑3%	SIMILAR

Note. SG, story grammar (A1, simple story; A3, complex story); FM, first mentions (referring expressions). Cells are highlighted in black when Spanish < English scores by 10% or more ('AT RISK'). Cells are highlighted in grey when Spanish > English scores by 10% or more ('STRONGER').

5. Discussion

Existing research on bilingualism and ASD has either been conducted qualitatively to uncover parent attitudes on language use in the home (Hampton et al., 2017; Kay Raining-Bird et al., 2012; Kremer-Sadlik, 2005; Yu, 2013; 2016) or quantitatively to examine the effects of bilingual exposure on children's lexical skills (Hambly and Fombonne, 2011; Petersen et al., 2012; Ohashi et al., 2012; Valicenti-McDermott et al., 2013). This thesis uniquely contributes to the literature by integrating both qualitative and quantitative approaches to unravel the complex interactions between environmental factors and linguistic domain abilities in both the HL and L2 of three high functioning bilingual children with ASD from families with high SES (see section 3.1.). Research on these interdependencies in other bilingual populations led me to pose the broad question, *does an ASD diagnosis jeopardize HL maintenance in bilingual children?* It was hypothesized that children with ASD were at risk of not maintaining the HL due to impairments in language (DSM-5, 2003; Tager-Flusberg et al., 2009), early English language intervention (Hampton et al., 2017) and the fragile state of the HL seen in other bilingual populations (Jia & Aaronson, 2003; Jia & Paradis, 2015; Montrul, 2015). The data, however, revealed that children were successfully maintaining the HL. Despite children's overall HL retention, some linguistic domains were found to be weaker than others, suggesting that bilingual children with ASD may still be at risk of HL attrition as they grow older. In this chapter, trends in environmental factors (section 5.1.) and language abilities in both languages (section 5.2.) are discussed with respect to the extent of HL maintenance across the three children. Each section will reiterate, and answer research questions posed in chapter 2 (see section 2.6.). The discussion chapter will conclude by highlighting limitations and future directions (section 5.3), as well as clinical implications (section 5.4) and conclusions (section 5.5.) that emerge from this thesis.

5.1. How do environmental factors impact HL maintenance in children with ASD?

Previous research on child bilingualism (see section 2.2 and 2.3) has revealed that variations in environmental factors can largely influence children's dual-language development (Paradis, Genesee & Crago, 2011; Paradis, 2011; Place & Hoff, 2011); these relationships, however, remain to be empirically examined in bilingual children with ASD (Hambly & Fombonne, 2014). Therefore, one of the goals for this thesis was to investigate the role of various external factors on the HL acquisition of three Canadian-born school-aged children. At the time of testing, all children were diagnosed with high functioning ASD, had received a total amount of 60 to 77 months of English exposure and minimum of 1008 hours of L2 intervention. All children belonged to parents with high SES and whose intentions were to provide an additive environment that encouraged HL maintenance in their children (see table 3.1). In this section, the findings for two research questions pertaining to environmental factors will be discussed. Section 5.1.1 answers the question, *what are parents' attitudes toward bilingualism in their children with ASD?* Section 5.1.2 will respond to the second question, *how does language exposure (input) and language usage (output) in the home vary across languages for each child?* To conclude, this section will summarize the relevance of environmental determinants to better understand dual-language acquisition of bilingual children with ASD.

5.1.1. What are parents' attitudes toward bilingualism in their children with ASD?

It was hypothesized, based on previous literature, that positive attitudes toward bilingualism would align with support for a dual-language approach and higher HL maintenance (Hampton et al., 2017; Jegatheesan, 2011; Kay Raining-Bird et al., 2012; Kremer-Sadlik, 2005).

Findings suggested that parents' positive attitudes toward bilingualism supported HL maintenance in children. Families held a conviction that bilingualism would benefit their children's relationships through communication with the extended family and better options for future careers (see question 5 on tables 4.1 and 4.2). Moreover, parents reported feeling comfortable and more at ease using the HL to express their affection and their identity (see question 7 on tables 4.1 and 4.2). Parents also showed agreement on the obstacles to HL maintenance, including English-centric practitioner advice, intervention resources, media, books, and friendships (see questions 3 & 6 on tables 4.1 and 4.2). Importantly, all parents believed their children were capable of being bilingual regardless of their children's ASD diagnosis (see questions 1 & 7 on tables 4.1 and 4.2). In addition to having positive attitudes, parents provided children with ample opportunities to interact in the HL (Spanish) through Spanish-only language policies in the home, bilingual school, church in Spanish, and the Spanish community (see questions 1 & 4 on tables 4.1 and 4.2). This thesis' hypothesis on the influence of parent attitudes toward bilingualism was therefore supported.

These findings coincide with other studies that found parents are more inclined to expose their children with ASD to two languages when children demonstrated early verbal abilities (Hampton et al., 2017; Kay Raining-Bird et al., 2012). Children in this study were also reported to be high functioning with high verbal abilities, and parents, in turn, also exposed their children to two languages (see section 3.1). Similarly, motivations for and hindrances to HL maintenance, reported by parents in this thesis, are paralleled by previous studies examining parents' attitudes toward bilingualism (Kay Raining-Bird et al, 2012; Kremer-Sadlik, 2005; Hampton et al., 2017; Jegatheesan, 2011; Yu, 2016). For example, Yu (2013) and Hampton et al. (2017) found parents in their studies also preferred speaking the HL.

> *"Mainly, we feel that Chinese is an important language too. For us, the parents, it's the mother tongue. Victor and I speak to each other at home and I think Jessica should understand what we're saying. Also, as we age, and they grow up, our English is probably not going to keep pace with theirs; then we would have difficulties communicating, I think."* (Janet; as cited in Yu 2013, p. 16)

> *"The native languages are much closer to home, family, community, so for me that's very important that I'm speaking to him in that language because I feel much closer to him"* (Alasdair; as cited in Hampton et al., 2017, p. 443).

Participants, in these studies, also discussed similar themes on the benefits of communication with the extended family and the challenges posed by the overwhelming presence of English only advice, intervention and resources:

> *"I think that being exposed to Portuguese and English made Erico more welcoming of my mum and sister because I can see he knows it's not English—they're speaking different. And he doesn't mind"* (Adelaide; as cited in Hampton et al., 2017, p. 440).

> *"The family doctor, speech therapist, and teacher from the school district, they all told me not to speak Chinese with [Shane] anymore. His family doctor said that because Shane had a language delay, he recommended that I speak only one language with him to keep him from being confused."* (Julie; as cited in Yu, 2013, p. 18)

In summary, in this thesis, parents prioritized supporting the HL by adopting strategies such as, HL policies in the home, attending or considering bilingual schooling, traveling to Spanish speaking countries, and encouraging communication with extended family. These strategies appeared to contribute to HL input and output supports in the home (see table 4.3, 4.4, and 4.5). Responses obtained from parents correspond to those from other studies that show HL maintenance facilitates stronger ties between family members and the community, and supports the transmission of cultural and traditional teachings to the children (Tseng & Fuligni, 2000; Wong Fillmore, 1991). Parents' positive attitudes toward bilingualism promoted ideal conditions to support their children in learning and maintaining the HL while simultaneously acquiring the L2.

5.1.2 How does language exposure (input) and language usage (output) in the home vary across languages for each child?

Linguistic environments, which shape language abilities, are influenced not only by positive attitudes, but also by patterns of language input, output, and richness in the home (Paradis, 2011). In this thesis, participants' linguistic environments exhibited high HL input. This supported the hypothesis, informed by previous research, which found families with two Spanish-speaking first-generation Canadian parents, with higher levels of education, are commonly strong advocates for HL maintenance and, consequently, they provide high HL input in the home (Guardado, 2002; Hammer et al., 2012; Paradis, 2016; Place & Hoff, 2011). In particular, higher maternal education has been positively correlated to higher HL input quantity in the home (Hammer et al., 2012; Jia & Paradis, 2015), and the mothers in this thesis also possessed higher education (i.e. a bachelor degree; see table 3.2), indicating these families belong to a high SES (Ensminger & Fothergill, 2003). Higher HL input is also common among Hispanic parents when both identify Spanish as their dominant language (Place & Hoff, 2011). Higher HL input and output scores can also be explained by looking at parents' home language policies. Recall in section 4.1. the family language policies such as, *"Everyone speaks only Spanish at home"* (Miguel's mother, see table 4.1) and *"The rule is that they have to speak Spanish with us [parents] but between themselves [siblings] there are no rules"* (Sergio & Daniela's mother, see table 4.2). This section will discuss the influence of these home language policies on input quantity, output quantity and input quality pertaining to HL maintenance.

Input & Output quantity. Parents' Spanish preference (see table 3.2) and language policies in the home likely contributed to the high (83-100%) parent HL input (see PAR:CHI column in table 4.3), and children's HL high output scores with parents (54-83%) and with family (42-

78%) (see CHI:PAR and CHI:FAM columns in table 4.4). Recall that input/output for a given language was measured as a percentage of total language input/output in the home, and high quantity was recognized as 50% or greater in the given language (see "quantity measures of input and output" in section 3.2.2.). Miguel, who received particularly rich language supports from his parents, exceeded Sergio and Daniela (42-49%) in parent-directed HL output (78%) (see CHI:PAR in table 4.4). These finding parallels research on other bilingual populations which has reported HL maintenance depends largely on the quantity of linguistic input received and output produced in the home (Bedore et al., 2012; Bohman et al, 2010; Hambly & Fombonne, 2014; Hammer et al, 2012).

Interestingly, overall family HL input (62-92%) was notably lower compared to the HL input from parents alone (88-100%) (see table 4.3). The lower family HL input can be attributed to lower sibling input in the HL (0-75%) relative to the L2 (25-100%) (i.e. see SIB:CHI column in table 4.3). Previous studies on bilingual children with TD have also shown that siblings, especially school-age children, tend to provide considerable L2 input, which contributed to stronger L2 abilities (Armon Lotem et al., 2014; Rojas et al., 2016). This pattern was seen in Sergio and Daniela, who were both school-age (> 6;5 years old) siblings, and directed more L2 input (83-100%) than HL input (0-17%) to each other. Additionally, children with high functioning ASD in this thesis, were more likely to provide L2 output to their siblings (42-100%) than to their parents (17-46%) (see CHI:SIB and CHI:PAR columns in table 4.4). As bilingual children progress through the educational system and into adulthood, they demonstrate increasingly strengthened abilities in the L2 (Paradis, Genesee & Crago, 2011). This phenomenon, which begins after children begin school and when they first receive an influx of the L2, has been identified as "the dominance shift" (Carreira and Kagan 2011; Jia & Aaronson,

2003; Miller, 2017). The L2 preference demonstrated by children in this thesis is likely demonstrative of this shift. Without longitudinal data, however, we cannot pinpoint where, exactly, these children are in the course of this shift.

Input quality. Language richness is a measure of the frequency and diversity of activities performed that provide language and literacy practice (Paradis, 2011). In this thesis, language richness was expressed as a proportional score between zero and 1, where greater than 0.50 indicated high language richness. Overall, all children displayed high L2 richness (>0.50), but HL richness was low for Sergio (0.19) and Daniela (0.23), and high for Miguel (0.67) (see Spanish richness under table 4.5). Recall, L2 richness scores for Miguel, Sergio, and Daniela were 0.73, 0.77, and 0.83, respectively (see English richness under table 4.5). High L2 language richness was not unexpected, as children's lives are saturated by English language books, television, friendships, and extra-curricular activities. Moreover, an emphasis is often placed on bilingual children's L2 language and literacy skills both at school and through intervention (Kay Raining-Bird et al., 2012; Murphy & Evangelou, 2015; Paradis 2016; Rojas et al., 2016). Finally, even though parent attitudes encouraged HL input and output, they can also be negatively impacted by clinicians' conflicting advice regarding bilingualism (see contrast in question 3 of table 4.1 and table 4.2). The imbalance between high L2 richness and low HL richness ultimately prioritizes L2 acquisition, which facilitates a subtractive bilingual environment and HL attrition (Cummins, 2000).

In contrast to the consistently high L2 richness, children varied in their HL richness. Parents encouraged bilingualism by providing diverse language supports. While Miguel frequently received diverse supports in the HL (HL richness = 0.67), Sergio (0.19) and Daniela (0.23) received considerably fewer. Miguel's parents chose Spanish-English bilingual education

for Miguel, which likely reinforced Miguel's high levels of HL richness. In contrast, Sergio and Daniela attended English regular schooling programs. Bilingual school allowed Miguel to hone his Spanish skills through activities, such as, reading stories which helps children learn new lexical items (e.g. Oller & Eilers, 2002), talking to different interlocuters which solidifies correct morphosyntax constructions (e.g. Montrul, 2015), and story-telling which strengthens discourse pragmatic skills in both languages (e.g. Montanari, 2004). Recall, Miguel's parents mentioned they had not been discouraged to promote bilingualism (see question 3, table 4.1) and, hence, they believed Miguel could develop strong bilingual abilities. Alternatively, Sergio and Daniela's parents were given mixed messages about bilingualism and led their mother to be more skeptical of their dual language capabilities (see question 3 & 7, table 4.2). These findings align with other studies which found more active use of the HL is correlated to higher HL proficiency and faster acquisition of the HL (Bohman et al., 2010; Hammer et al., 2012).

In summary, environmental determinants discussed above (sections 5.1.1 and 5.1.2) pointed toward favorable conditions for HL maintenance in these bilingual children with ASD. It was hypothesized, based on previous literature, that parents' positive attitudes toward bilingualism would align with dual-language support focusing on the HL at home and the L2 at school which, in turn, would correspond to more input quantity and quality, and more output opportunities in the HL than in the L2 in the home (De Houwer, 2009; Paradis, Genesee & Crago, 2011). Overall, all children belonged to families who valued dual-language development and, thus, to the best of their abilities, these families created a supportive bilingual environment for their children.

5.2. What do language abilities indicate about HL maintenance in bilingual children with ASD?

The topic of dual-language abilities across linguistic domains in bilingual children with ASD has, prior to this thesis, largely been overlooked. In the bilingualism and ASD literature (see section 2.5), studies have mainly concentrated on L2 development, and few have examined the other language (L1/HL) (Hambly & Fombonne, 2011; Petersen et al., 2012). Examining both languages is important because bilinguals' abilities vary both *between* their languages (Bedore et al., 2012; Hambly & Fombonne, 2014; Paradis, Genesee & Crago, 2011; Place & Hoff, 2011). Additionally, to date, studies on language abilities of bilingual children with ASD have focused solely on lexical development (Hambly and Fombonne, 2011; Petersen et al., 2012; Ohashi et al., 2012; Valicenti-McDermott et al., 2013); hence linguistic skills in the morphosyntax and narrative macrostructure domains remain to be empirically examined. Assessing language abilities across domains in a single language is relevant because bilinguals may also vary *within* each language (Jia & Paradis, 2015; Montrul, 2015; Paradis & Kirova, 2014). This thesis, therefore, examines the extent of HL maintenance in bilingual children with high functioning ASD by looking at abilities between languages and, also, across multiple domains within each language.

This section is divided according to three research questions pertaining to language abilities. Section 5.2.1 will respond to the question, "*What is the overall dominant language in these bilingual children with ASD?"*; Section 5.2.2 will provide an L2 linguistic profile by answering the question, *"How does performance across domains in bilingual children with ASD compare to age-based norms for monolingual children with TD?*; and, subsequently, section 5.2.3 will reveal children's HL linguistic profile by addressing the question, *"What linguistic*

domains are vulnerable in bilingual children with ASD?" Finally, this section will review findings to assess whether bilingual children with ASD demonstrate robust abilities in the HL or are at risk of HL attrition.

5.2.1 What is the overall dominant language in these bilingual children with ASD?

Children often show dominance in one language over the other (Carreira & Kagan, 2011; Jia & Aaronson, 2003; Montrul, 2015; Paradis, Genesee & Crago, 2011). Previous research on bilingual children with TD has demonstrated children often go through a shift shortly after beginning school, around the ages of 6 to 8 years old (Jia & Aaronson, 2003; Miller, 2017). Because the children in this study were between 6;3-9;1 (see table 3.1), I hypothesized participants would be more dominant in their L2 than the HL. As expected, results indicated children were dominant in their L2, as determined by language preference, volubility comparisons, and code-switching patterns.

Language preference was one of three determiners of overall L2 dominance. The bilingual children with ASD in this thesis preferred to speak English (as reported by their parents, see section 4.4) like bilingual children with TD of the same age (Jia & Aaronson, 2003; Miller, 2017). For Sergio and Daniela, parents reported English preference at every testing session. Alternatively, for Miguel, parents reported Spanish at the first session, and English at the following two sessions. These results indicate Sergio and Daniela had shifted language preference before participating in the study, and Miguel had likely shifted at the beginning of the study. Results are not surprising because children had already received an influx of English exposure through school. It is possible that the bilingual shift occurs sooner for bilingual children with ASD, since they usually receive exposure to the L2 through intervention around

the age of 3;0 years old (Paul & Murray, 2017), while other bilinguals from immigrant families often begin to receive substantial exposure to the L2 around 5;0 years old when they start school (Paradis, Genesee, & Crago, 2011). It is important to note, however, that in this thesis, the child's language preference was obtained via parent report. Directly asking children about their language preference may reveal more information about their shifting preferences (Miller, 2017).

Another indicator of overall L2 dominance was children's higher L2 volubility scores, as seen through lexical diversity, sentence lengths, volubility in play, and story lengths (see table 4.6). For all children, abilities in English were higher than Spanish by at least 10% or more (arbitrary threshold, see section 4.5). To illustrate, children performed better in the L2 than the HL in lexical diversity in narrative samples (NAR) by 18-26%, in sentence lengths in spontaneous speech samples (SSS) by 10-28%, in volubility in play by 46-64% and, finally, in story lengths by 21-24% (see table 4.6). The strongest indication of dominance was volubility in play, where children produced approximately 50% more words during play sessions in English compared to sessions in Spanish. This drastic difference may be indicative of children's fluency, ease, and comfort when speaking the L2 in a natural activity like play. It is also unsurprising that children performed better in the L2 in lexical diversity and story lengths because children likely tell stories more at school than at home (Bohman et al., 2010; Fiestas & Peña, 2004). Additionally, higher L2 performance in sentence lengths and volubility in play could be attributed to children's experience playing in English with friends, and inexperience playing in Spanish. Thus, to summarize, in addition to preference for the L2, children displayed L2 dominance through high L2 volubility.

Dominance was also assessed through code-switching (CS) patterns in narrative and spontaneous speech samples (see "Coding linguistic variables" under section 3.2.3). Children

code-switched exclusively during Spanish activity sessions by integrating English words (see table 4.6). They did not use any code-switching during English tasks. Children were also more inclined to code-switch during spontaneous speech samples than during narrative samples. Results for code-switching were not significant for Sergio and Daniela but they were for Miguel (CS more than 10% difference between languages). Miguel's CS patterns can be interpreted as revealing English dominance. It is important to note, however, that CS patterns may actually be measuring other social phenomenon, and not dominance. Previous research on CS has found bilingual children more frequently code-switch during *minority* language tasks by incorporating *majority* language words, than in the other direction, regardless of their language dominance (Gutiérrez-Clellen, et al., 2009; Paradis & Nicoladis, 2007). Researchers have explained that CS is a sophisticated interaction between interlocuters and, as such, there are numerous reasons why bilinguals may code-switch, only one of which is filling lexical gaps to compensate for a non-dominant language (Paradis, 2012). The cause of Miguel's CS patterns is, in fact, unclear, as he received 100% HL input from his parents (see table 4.3) and had ample opportunities to practice the HL at his bilingual school (see table 4.4), but used more CS in English with a Spanish experimenter (14-44%, see table 4.6) compared to Sergio (6-9%, see table 4.6) and Daniela (3%, see table 4.6), whose linguistic environment lacked HL richness (see table 4.5). Miguel does not appear to be code switching to fill lexical gaps and, consequently, this does not lead me to argue that Miguel's CS patterns strictly point to L2 dominance. At the very least, this thesis reveals that bilingual children with ASD, like bilinguals with TD and SLI (Gutiérrez-Clellen, et al., 2009), can code-switch and do so for reasons that require further examination. Regardless of the limitation presented by the CS measure, children were tested using a battery of dominance measures and, given that children's L2 scores were consistently higher than their HL scores in all

measures, I argue that the findings support the hypothesis that all children in this study were dominant in the L2.

5.2.2 How does performance across linguistic domains, in bilingual children with ASD, compare to age-based norms for monolingual children with TD?

An overview of children's L2 language abilities across domains, in comparison to monolingual norms, is presented in this section. It was predicted that bilingual children with high functioning ASD would score lower than TD monolingual norms in lexical, morphosyntax, and narrative macrostructure domains, as some monolinguals with ASD also exhibit developmental language delays or disorders (Colozzo et al., 2015; Condouris et al., 2003; Modyanova, et al., 2017; Norbury, et al., 2014; Novogrodsky & Eldeson, 2016; Rescorla and Safyer 2013; Roberts et al., 2004; Tager-Flusberg et al., 2009). In addition, it was predicted bilingual children with ASD would differ in abilities *within* each language, showing more weakness in morphosyntax and narrative macrostructure compared to the lexical domain (see section 2.5). Unexpectedly, results demonstrated bilingual children with ASD performed similarly to monolingual children with TD (see table 4.7). Also, surprising, these bilingual children with ASD's L2 profile demonstrated strong abilities in the narrative macrostructure domain, as well as the lexical domain, yet weaker abilities in the morphosyntax domain (see table 4.7). Thus, in this section, findings demonstrating stronger than expected L2 skills will be compared to previous studies to better understand why the hypotheses were only partially upheld.

L2 Lexical Abilities. Research on bilingualism and ASD has primarily focused on children's L2 lexical skills. These studies have shown lexicon in monolinguals and bilinguals with ASD do not significantly differ in size (Hambly and Fombonne, 2011; Petersen et al., 2012;

Ohashi et al., 2012; Valicenti-McDermott et al., 2013), indicating that the lexical domain is not particularly vulnerable in bilingual children with ASD. Additionally, it was expected children would fare well in L2 lexical abilities because they were school-age and had received an abundance of English exposure by the time of testing, which contributed to their overall L2 dominance (see Age of English exposure in table 3.1.). Results matched these expectations. All children scored within the normal range relative to monolingual norms in lexical skills both in receptive and expressive variables (see rows PPVT, NDW, and TNW, in table 4.7). Another reason for their possible success in the lexical domain may be high L2 richness (input quality) seen across all three children (recall "English richness" in table 4.5). Hart and Risley (1995) found that monolingual children with TD who received diverse input had larger vocabularies. Interestingly, Hart and Risley (1995) observed the strongest trends among children with mothers of higher education because they provided greater linguistic input both in quantity and quality, which is also the case for the children in this thesis (recall section 5.1.2 and see table 3.2). Examining children's linguistic environments alongside their language abilities demonstrates the importance of examining the interdependence of environmental factors and language abilities in bilingual children with ASD.

L2 Narrative Macrostructure Abilities. Another trend was the strong performance in narrative macrostructure across all children, each of whom performed within the normal range for variables of referring expressions and story grammar (see rows FM, SG:A1, & SG:A3 in table 4.7). In fact, Daniela even scored above the mean in all three variables; and, even though Miguel and Sergio scored toward the low-end in one narrative macrostructure variable, they scored within the normal range for all three variables (see table 4.7). This finding is surprising because discourse pragmatic skills are known to be problematic for individuals with ASD

(Colozzo, Moris & Mirenda, 2015; Norbury, Gemmell and Paul, 2014; Novogrodsky & Eldeson, 2016; Paul & Murray, 2017; Tager-Flusberg et al. 2009). Moreover, these findings run counter to current literature on language deficits in monolinguals with ASD of the same age (Colozzo, Moris & Mirenda, 2015; Norbury, Gemmell and Paul, 2014; Novogrodsky & Eldeson, 2016). Thus, children's performance in narrative macrostructure does not uphold the hypothesis predicting children's lower scores in this domain.

Two reasons for these findings are possible. The first possibility is that children were part of an ASD subgroup identified in studies by Condouris and colleagues (2003), Tager-Flusberg and colleagues (2009), and Modyanova and colleagues (2017), where narrative abilities are more comparable to that of children with TD. These studies often used a heterogenous sample, where monolingual children with ASD ranged from non-verbal to mild pragmatic deficits. Because children with high functioning ASD in this thesis had strong verbal abilities and IQ scores in the normal range (see table 3.1), they may be part of the subgroup that compare closer to children with TD. The second possibility is that the tool used for measuring these scores was not sensitive enough to effectively capture important nuances in narrative macrostructure. Recall, children with ASD have been known to have difficulty in "theory-of-mind" tasks, which results from children's difficulties accounting for their interlocuters' needs when telling a coherent story (Colozzo et al., 2015; Norbury et al., 2014; Novogrodsky & Eldeson, 2016). Referring expressions, especially character reintroductions, require the teller to be aware of the listener's needs and are, therefore, integral to cohesive storytelling. The ENNI First Mentions scoring rubric (for English version see Appendix D; for Spanish version see Appendix E), however, only accounted for initial character introductions, and did not account for characters' reintroductions. In addition, the ENNI Story Grammar scoring rubric (see Appendix B and C) provided a global

standard score but did not examine the specific story units that are more often omitted in the stories generated by children. Thus, a study using a larger sample comparing the absent story units produced by bilingual children with ASD to the excluded story units of monolinguals with TD may help determine if, and where, deficits occur.

L2 Morphosyntax Abilities. As expected, all children performed below the standard mean compared to monolingual TD norms in at least one morphosyntax variable (see table 4.7). This expectation stemmed from studies on monolinguals with ASD where a subgroup demonstrated similar morphosyntax deficits as children with SLI (Codouris, Meyer, & Tager-Flusberg, 2003; Kjelgaard & Tager-Flusberg, 2001; Modyanova, Perovic, & Wexler, 2017; Roberts, Rice & Tager-Flusberg, 2004; Tager-Flusberg et al., 2009). Morphosyntax performance differed slightly across the three children, where Sergio demonstrated the most difficulty, scoring below the standard mean on both measures, followed by Miguel who scored below the mean on one variable and within the normal low range for the other and, then by Daniela, who also scored below the mean for one variable yet scored the mean on the other variable (see morphosyntax under table 4.7.). Relative to lexical and narrative macrostructure domains, children demonstrated particularly low morphosyntax scores, suggesting bilingual children with ASD may possess vulnerabilities in the morphosyntax domain. Therefore, it is recommended that researchers and clinicians examine children's structural language (i.e. morphosyntax) alongside functional language (i.e. discourse pragmatics) because deficits may exist in both domains (Modyanova, Perovic, & Wexler, 2017). This is evidently the case even in these bilingual children with ASD who display early verbal abilities and are considered high functioning. Additionally, the pronounced morphosyntax deficits seen in these case-studies (see table 4.7), and in the sub-group identified in other studies (Codouris et al., 2003; Kjelgaard & Tager-

Flusberg, 2001; Modyanova et al., 2017; Roberts et al., 2004; Tager-Flusberg et al., 2009; Zhou et al., 2014), need to be accounted for as part of a theory of language acquisition for bilingual children with ASD.

In summary, children obtained stronger than expected standardized scores in lexical and narrative macrostructure domains, reflecting strong L2 skills. It is likely these skills may have been positively influenced by children's overall L2 dominance (see above section 5.2.1.). Children were older and had thus undergone a change in their linguistic soundscape since beginning school (De Houwer, 2009), giving them ample opportunities to learn new vocabulary and to practice story-telling in English at school. Despite their strong skills, however, children performed weaker in morphosyntax compared to other domains. Future research should examine children's performance across domains, and especially morphosyntax, to confirm and extend these findings.

5.2.3 What linguistic domains (lexical, morphosyntax, and/or narrative macrostructure) are vulnerable in bilingual children with ASD?

The central purpose of this thesis was to investigate whether bilingual children with ASD maintain the HL across linguistic domains. Currently, the TVIP is the only standard score based tool for measuring receptive vocabulary in Spanish-English bilingual children, so the extent of participants' proficiency is largely unknown. Thus, to contextualize children's HL proficiency, this thesis primarily compared children's L2 and HL raw scores across linguistic domains and, whenever possible, to the lexical monolingual norm. Comparisons helped decipher whether vulnerable domains are more affected in the child's HL than in the L2 (see section 3.2.1. for a review). It was hypothesized that children's HL development would be in jeopardy, and that,

within the HL, children would perform better in lexical and worse in narrative macrostructure and morphosyntax domains. This hypothesis mirrors that of the previous section (5.2.2), as bilinguals with impairments usually display language deficits in both languages (Paradis, 2016). Moreover, this hypothesis was derived from several factors, including the prevalence of the L2 in the participants' lives compared to the HL, which is typically limited to the home (Paradis, 2016). Additionally, bilinguals with developmental disorders are introduced to the L2 at a much earlier age (3;0 years old, see section 3.1) than those with TD (5;0 years old) (Paradis, Genesee, & Crago, 2011). Finally, children in this study were school-aged and, therefore, were more likely to be dominant overall in the L2 (section 5.2.1). Successful maintenance of the HL was demonstrated by a score of 10% or better (an arbitrary criterion) in their Spanish skills compared to their English skills (see section 4.5). Unexpectedly, results demonstrated children were successfully maintaining the HL overall. Their abilities across domains, however, were varied and certain domains indicated potentially higher risk of HL attrition. This section will provide a linguistic profile of the children's HL across lexical, narrative macrostructure and morphosyntax domains.

HL Lexical Abilities. Children in this study demonstrated balanced abilities between languages in the lexical domain rather than clear L2 dominance (see table 4.8). For example, all children scored within the normal range for receptive vocabulary compared to children with TD (see "lexical receptive, SPA - TVIP" row under table 4.7). In their expressive skills, all children also demonstrated similar or stronger abilities in the HL than the L2 (see "expressive" rows under table 4.8). In other words, all children used similar or more diverse words in the HL than in the L2 during play sessions. Children's strong lexical skills in the HL indicated the hypothesis was not upheld and, additionally, these results raise interesting questions with respect to the

literature, which has found bilingual children with ASD of the same age show stronger lexical abilities in the L2 than the L1 (French; Hambly & Fombonne, 2011) or than the HL (Chinese, Petersen, Marinova-Todd, and Mirenda, 2012). In fact, results are surprising given children were school age and had already received 60-77 months of English exposure at the time of testing (table 3.1).

A reason for these surprising results may be due to the measure used for obtaining them. Lexical diversity was measured using type-token ratio (TTR) in this thesis. TTR is calculated by dividing the number of different words (types) by all the words produced (tokens). Scholars have noted that TTR is affected by the length of transcript because more tokens can result in a lower type-token ratio, which can misrepresent the lexicons of more talkative children (Covington & McFall, 2010; Koizumi & In'nami, 2012; Richards, 1987). To mitigate this problem, it is recommended that the number of tokens is standardized across samples. This thesis, however, followed these recommendations by selecting 100 utterances from each transcript. Thus, another reason for surprisingly strong HL lexical scores may be data collection methods. While testing, children demonstrated reluctance to speak in Spanish, thus the Spanish experimenter (myself) asked more probing questions than the English experimenter. Children may have demonstrated more diverse vocabulary because they were prompted to talk about more diverse topics. To rectify, a new study should formulate set questions to be used in each language session to ensure language samples reflect the same content.

On the other hand, the surprising HL lexical scores may reflect strong HL input in the home, which helped support parallel vocabulary growth in the HL and the L2 (Hammer et al., 2012; Place & Hoff, 2011). Perhaps children in previous studies did not receive such strong HL input. A future area of investigation may consider calculating children's total conceptual score

to note the semantics of all words known in each language. Rescorla and Safyer (2013) found that vocabulary in young monolingual children with ASD are largely composed of everyday words like food, body parts, toys and people. Additionally, Bialystok and colleagues (2010) found bilingual children's lexicon skills are distributed between both languages where words relating to the home are primarily known in the HL (e.g. food and household items) and words relating to school are known in the L2 (e.g. professions, animals, shapes, etc.). To help explain the surprising HL results, a total conceptual score could determine whether lexical items examined in this thesis focused more on home than school vocabulary. Nevertheless, these lexical results demonstrate that English is not severely affected nor is the HL in the lexical domain.

HL Narrative Macrostructure Abilities. As hypothesized for the L2, bilingual children were expected to show poor performance in narrative macrostructure HL abilities since monolinguals with high functioning ASD are known to show deficits in discourse pragmatics (Colozzo, Moris & Mirenda, 2015; Norbury, Gemmell and Paul, 2014; Novogrodsky & Eldeson, 2016) and language deficits are typically seen in each language (Paradis, Genesee & Crago, 2011; Paradis, 2016). Instead, children demonstrated parallel abilities in Spanish and English (see table 4.10). Recall children scored the same as monolingual age-matched controls with TD (see section 5.2.2), thus these bilingual children with high functioning ASD demonstrated equally proficient narrative macrostructure skills in both their languages. As explained earlier, this was an unexpected finding possibly due to insensitive measurement tools or due to children possibly belonging to a subgroup with above average skills (see "L2 Narrative Macrostructure Abilities" in section 5.2.2). Although the hypothesis conflicted with studies on monolinguals with ASD, it did not conflict with studies on bilinguals with TD where children performed

equally in both languages (Álvarez, 2003; Gutiérrez-Clellen, et al., 2008; Fiestas & Peña, 2004). One reason for balanced performance between languages in story grammar may be because story grammar has been described as a universal cognitive skill that translates similarly between languages (Fiestas & Peña, 2004). For this reason, bilingual children with TD typically demonstrate stronger story grammar skills than first mentions because they do not rely on specific-linguistic knowledge needed for referring expressions. In the case of these children, however, first mentions were performed better than expected. First mentions may not have been strongly affected in this study because character introductions are produced using similar linguistic devices (i.e. indefinite article + noun) in both Spanish and English (Álvarez, 2003; Gutiérrez-Clellen, Simon-Cereijido, Wagner, 2008). This commonality between languages does not transfer when producing character reintroductions, as they are performed differently in each language (Montrul, 2004; Gutiérrez-Clellen et al, 2008). This skill, however, was not examined in this thesis. Subject reintroductions are known to be problematic for Spanish-English adult HL speakers producing Spanish narratives (Montrul, 2004), but not for Spanish-English child HL speakers producing English narratives (Gutiérrez-Clellen et al., 2008). Therefore, a more detailed examination of referring expressions, with attention given to character reintroductions, may tell us more about the cognitive and linguistic abilities of bilingual children with ASD.

HL Morphosyntax Abilities. It was hypothesized that children would perform poorly in HL morphosyntax relative to the HL lexical domain. Results indicated mixed findings among children; however, scores for all children revealed that at least 2 morphosyntax variables were "at risk" for HL attrition. Daniela and Sergio both scored lower in the HL than the L2 by more than 10%, in 3 out of 5 morphosyntax variables (see table 4.9). These findings agree with other research that has examined HL proficiency in bilinguals with TD, finding that children with a

highly inflectional HL demonstrate morphosyntax difficulties in rich verbal agreement, gender, number and case (Boon & Polinsky, 2015; Montrul; 2015; Polinsky, 2006; Polinsky 2008). Alternatively, Miguel demonstrated the opposite pattern, displaying higher or similar skills, in the HL, relative to the L2, in 3 of the 5 morphosyntax variables (see table 4.9). Miguel's higher HL scores indicated some HL maintenance in the morphosyntax domain. His results underscore the importance of his bilingual schooling in his HL (Spanish) maintenance across domains but especially in the morphosyntax. Bilingual programming provided more access to Spanish speaking interlocuters giving Miguel richer input with more complex sentences and giving him more opportunities to receive feedback on how to use grammatical morphemes accurately from native speakers. Perhaps morphosyntax skills in the HL require active use of the language (i.e. output) (Bohman et al., 2010; Hammer et al., 2012) in addition to passive listening (i.e. input) (Bedore et al., 2012; Place & Hoff, 2011). Given that morphosyntax errors are an area of linguistic weakness *for bilingual children with developmental disorders* (Blom & Paradis, 2013; Jacobson & Schwartz, 2005; Kay-Raining Bird, et. al, 2005; Morgan, Restrepo & Auza, 2013); *for monolinguals with ASD* (Condouris et al., 2003; Kjelgaard & Tager-Flusberg, 2001; Modyanova et al., 2017; Roberts et al., 2004; Zhou et al., 2014); and, *for bilingual children with TD speaking the HL* (Montrul, 2015; Polinksy, 2006; Polinksy 2008); this thesis reveals a new knowledge gap with respect to the importance of morphosyntax as a potential area of vulnerability in bilingual children with ASD, and encourages future research to examine this domain more closely.

5.3. Limitations and Future Directions.

This thesis revealed how environmental factors help support HL maintenance in bilingual children with ASD. This was achieved through a focused, in depth analysis of school aged

children's dual language abilities. Despite gathering valuable insights, this thesis is not without limitations. Most importantly, the small sample size provides a preliminary example for further replication with larger sample sizes, which may strengthen findings. Another limitation was the absence of standardized norms for bilingual children with ASD. In this thesis, bilingual children with ASD were compared to norms of monolingual children with TD; this was problematic, as bilingual children show a protracted development trajectory (Paradis, 2010; Paradis, 2016), and monolingual children with ASD also show differences in language development compared to children with TD (Colozzo et al., 2015; Modyanova, et al., 2017; Novogrodsky & Eldeson, 2016; Rescorla and Safyer 2013; Tager-Flusberg et al., 2009). Without appropriate standardized norms, this thesis was not able to confidently place participants' observed abilities relative to expected milestones. In hindsight, this shortcoming may have been partially remedied by performing an Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) or by using Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2012) which has norms for Spanish and English bilinguals in the United States. Similarly, some of the tools used in this thesis were not sensitive enough to reveal some important nuances in children's linguistic skills. For example, the ENNI detected character first mentions, but not character reintroductions, which would have been particularly important when comparing Spanish to English referring expressions. Finally, an additional limitation is the absence of longitudinal analysis. A long-term longitudinal analysis may help identify the timing of the language dominance shift before children are exposed to the L2 (2;0 to 10;0 years). This is important for understanding HL maintenance or attrition in bilingual children. Alternatively, the present thesis could have benefited from a cross-sectional design that compared different age populations and various

minority language groups to determine how these factors also impact HL maintenance in bilingual children with ASD.

Despite its limitations, this thesis exposes a variety of avenues for future research. Parallel to past studies on child bilingualism, it found that parent-to-child input corresponded to higher language abilities. In a future study of bilingual children with ASD, observational data on parent-child interactions would lend further evidence for the influence of input and output on HL maintenance in specific linguistic domains. Additionally, a larger sample size using the ADOS would provide a stronger indication of how individual differences (i.e. severity of ASD) may assist in determining language abilities in bilingual children from across the ASD spectrum.

5.4. Clinical Implications.

This thesis offers clinical suggestions for families and practitioners working with immigrant children diagnosed with ASD with particular attention to high functioning children from high SES homes. To start, parents should be encouraged to speak the HL in the home, as the findings in this thesis indicate children with ASD can successfully maintain the HL while still learning the L2 outside the home. In fact, children's L2 skills were not greatly affected by HL exposure. Additionally, results indicated that higher language input and higher language richness (more frequent and varied activities) in the HL – bilingual schooling in particular – corresponded to stronger HL abilities. Thus, because children primarily receive the HL from their parents, parents should be encouraged to provide these enriched HL environments. Although HL exposure primarily happens in the home, HL maintenance can be improved by increasing exposure outside the home. As mentioned by parents, obtaining dual language resources can be difficult as they are reportedly sparse (see section 5.1.1.), and the L2 is

overwhelmingly dominant in the lives of school-aged children (see section 5.2.1.). Moreover, Canada is a multilingual nation where over 140 minority languages are spoken (Statistics Canada, 2016). Obtaining resources in many of these HLs may be difficult, if not impossible. Therefore, practitioners could collaborate with parents to create resources in the family's HL and share these resources with other clinicians.

Additionally, this thesis exposed children's vulnerabilities in specific linguistic domains. Bilingual children with TD (Blom & Paradis, 2013; Montrul, 2015; Polinksy, 2006; Polinksy 2008) and children with developmental disorders (Jacobson & Schwartz, 2005; Morgan, Restrepo & Auza, 2013; Kay-Raining Bird, et al., 2005; Modyanova et al., 2017; Zhou et al., 2014) display deficits in the morphosyntax domain and, consequently, bilingual children with ASD are likely to be more affected in morphosyntax than other domains. In fact, in this thesis, morphosyntax was revealed to be the weakest domain. Clinicians should, therefore, convey to parents the importance of addressing HL deficits in specific domains, particularly in grammar. For example, clinicians could encourage parents to read books in the HL and to increase opportunities for exposure to native-like grammar. Finally, as part of assessing the child's proficiency in the L2, clinicians could consult parental questionnaires to obtain information on children's HL proficiency and information about language environment such as the child's dominant language and language use in the home. Although this thesis examined high functioning children with ASD from high SES homes, these clinical recommendations on HL development could also be adjusted for children with ASD with lower language abilities, because bilinguals with ASD with lower language abilities may likely have parents who serve as their lifetime caregivers (Paradis, Genesee & Crago, 2011) and, therefore, communication between child and parent remains a primary goal.

5.5. Conclusion.

Canada is a multilingual nation where parents of children with ASD often arrive as newcomers, speaking minority languages in the home. Clinicians, teachers, researchers and, most of all, parents, need to know how to best meet the language needs of their bilingual children with ASD. This thesis, therefore, is the first to examine three case studies of school-aged, Spanish-English bilingual children with high functioning ASD from newcomer Canadian families. Previous studies on bilinguals with ASD have primarily focused on lexicon size or parent attitudes, and have largely ignored direct observation in other linguistic domains. In response to this gap in the literature, this thesis provided both qualitative data on environmental factors and direct observational data on language abilities, in various linguistic domains, presenting findings on how these data relate. School-age children are an ideal subject, as they are sufficiently exposed to the L2, which should cause the HL to become less stagnated and for patterns of attrition to emerge. Moreover, language abilities are distributed across languages and, therefore, examining both languages is the gold standard when studying language abilities in bilingual children (Paradis, 2016). In other words, these case-studies contribute to the growing literature on bilingualism and ASD both in terms of research methodology and findings.

Although the results cannot be generalized beyond these participants, the findings provide examples of potential outcomes in bilingual children with ASD. Contrary to popular belief, verbal bilingual children with ASD are capable of being competent speakers of two languages, despite deficits in discourse pragmatics and their overall L2 dominance. Moreover, in this thesis, environmental factors in favor of bilingualism appeared to correspond to HL maintenance. These bilingual children with ASD demonstrated greater resilience to HL attrition when they were frequently engaged in diverse language activities. Practitioners and parents can therefore help

maintain the HL by providing opportunities and encouraging frequent and diverse language activities. In conclusion, for the children studied in this thesis, an ASD diagnosis *did not* put the HL in jeopardy.

VI. References

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VII. Appendices

Appendix A

ALBERTA LANGUAGE ENVIRONMENT QUESTIONNAIRE (ALEQ)

Participant Code:

Date of interview:

Date of birth:

Interpreter or broker (*if any*) / Research Assistant:

"target child" = use the child's name in the oral interview

Summary information to be completed post-interview in the lab:

Age at Test			**Age of Arrival**			**Months of Exposure**
	Year Month Day			Year Month Day		*Copy from page 8*
Date of Testing			Date of Arrival			
Date of Birth			Date of Birth			
Chronological age			Chronological age			

A. Questions to the target child's MOTHER:	
1a. How many years have you been in Canada? _____ Approximate date of arrival (month/year)?	Converts to months:
1b.Did the target child come to Canada at the same time? Yes No If not, when did the target child come to Canada? **Note**: If mother/parents came to Canada before the child was born, was the child born in Canada? Yes No	Date of Arrival (use to calculate age of arrival above):

2. How much English do you speak? (Parental self-rating)

0 **Not Fluent in English** No understanding or speaking ability	**1** **Limited Fluency in English** Some understanding and can say short, simple sentences	**2** **Somewhat Fluent in English** Good understanding and can express myself on many topics	**3** **Quite Fluent in English** Can understand and use English adequately for work and most other situations	**4** **Very Fluent in English** Understand almost everything. Very comfortable expressing myself in English in all situations
	e.g. can answer the phone in English	*e.g.* can go to the doctor and explain what is wrong	*e.g.* can communicate effectively with teachers at parent teacher interviews; could work in the service-industry; can follow movies or television shows	

Comments/descriptions of the abilities in English:

3. What language(s) do you speak with the target child?

0 **ENG never** **MT always**	**1** **ENG seldom** **MT usually**	**2** **ENG 50%** **MT 50%**	**3** **ENG usually** **MT seldom**	**4** **ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

4. What language(s) does the target child speak with his/her mother?

0 **ENG never** **MT always**	**1** **ENG seldom** **MT usually**	**2** **ENG 50%** **MT 50%**	**3** **ENG usually** **MT seldom**	**4** **ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

5. What language do you speak with the other people in your home?

0 **ENG never** **MT always**	**1** **ENG seldom** **MT usually**	**2** **ENG 50%** **MT 50%**	**3** **ENG usually** **MT seldom**	**4** **ENG almost always MT almost never**

Score: /4

6a. Do you work outside the home? Yes No
Or are you a student?

6b. If yes, is the language of the workplace/school English?

0	1	2	3	4
ENG never MT always	**ENG seldom MT usually**	**ENG 50% MT 50%**	**ENG usually MT seldom**	**ENG almost always MT almost never**

Score: /4

7. How many years of education do you have (including home country and Canada)?

Education	Completed?		Years of School
Primary	Yes	No	6
Secondary	Yes	No	6
College	Yes	No	2
University – Degree	Yes	No	4
University – Master	Yes	No	2
University – PhD	Yes	No	4

Please note any other educational experiences here:

B. Questions to the target child's FATHER

8. How many years have you been in Canada? _____

Approximate date of arrival (month/year)?

9. How much English do you speak? (Parental self-rating)

0 **Not Fluent in English** No understanding or speaking ability	**1** **Limited Fluency in English** Some understanding and can say short, simple sentences	**2** **Somewhat Fluent in English** Good understanding and can express myself on many topics	**3** **Quite Fluent in English** Can understand and use English adequately for work and most other situations	**4** **Very Fluent in English** Understand almost everything. Very comfortable expressing myself in English in all situations
	e.g. can answer the phone in English	*e.g.* can go to the doctor and explain what is wrong	*e.g.* can communicate effectively with teachers at parent teacher interviews; could work in the service-industry; can follow movies or television shows	

Comments/descriptions of the abilities in English:

10. What language(s) do you speak with the target child?

0 **ENG never** **MT always**	**1** **ENG seldom** **MT usually**	**2** **ENG 50%** **MT 50%**	**3** **ENG usually** **MT seldom**	**4** **ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

11. What language(s) does the target child speak with his/her father?

0 **ENG never** **MT always**	**1** **ENG seldom** **MT usually**	**2** **ENG 50%** **MT 50%**	**3** **ENG usually** **MT seldom**	**4** **ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

12. What language do you speak with the other people in your home?

0 **ENG never**	**1** **ENG seldom**	**2** **ENG 50%**	**3** **ENG usually**	**4**

Score: /4

MT always	MT usually	MT 50%	MT seldom	ENG almost always MT almost never

13a. Do you work outside the home? Yes No
Or are you a student?

13b. If yes, is the language of the workplace/school English?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

Score: /4

14. How many years of education do you have (in home country and in Canada)?

Education	Completed?	Years of School
Primary	Yes No	6
Secondary	Yes No	6
College	Yes No	2
University – Degree	Yes No	4
University – Master	Yes No	2
University – PhD	Yes No	4

Please note any other educational experiences here:

C. Questions to parents about OTHER FAMILY MEMBERS in the home

15a. Are there other adult relatives in the home? For example, a grandmother?
Yes No
15b. If yes, how many? _____

16. If yes, is one of these adults the child's primary caregiver?
Yes No

If yes, proceed to question 17 and 18. If no, skip to question 19.

17. If yes, what language(s) does the primary caregiver speak with the target child?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

Score: /4

Include in Language Use Score (on page 7)

18. If applicable, what language(s) does the target child speak with the primary caregiver?

0	1	2	3	4
ENG never MT always	**ENG seldom MT usually**	**ENG 50% MT 50%**	**ENG usually MT seldom**	**ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

19a. If there are other adults in the home (who are not the primary caregiver), do they regularly interact with the target child? Yes No

19b. If yes, what language(s) does the adult relative(s) speak with the target child?

0	1	2	3	4
ENG never MT always	**ENG seldom MT usually**	**ENG 50% MT 50%**	**ENG usually MT seldom**	**ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

If there is more than one adult in this category, record a value for each adult.

20. If applicable, what language(s) does the target child speak with the adult relative(s) (who are not the primary caregiver)?

0	1	2	3	4
ENG never MT always	**ENG seldom MT usually**	**ENG 50% MT 50%**	**ENG usually MT seldom**	**ENG almost always MT almost never**

Score: /4

Include in Language Use Score (on page 7)

If there is more than one adult in this category, record a value for each adult.

21. Does the target child have brothers or sisters? Yes No

If yes, answer questions 22-27

22. **Sibling 1:** Older Younger

Gender: M F

Date of Birth: _____

23. What language(s) does **Sibling 1** speak with the target child?

0	1	2	3	4
ENG never MT always	**ENG seldom MT usually**	**ENG 50% MT 50%**	**ENG usually MT seldom**	**ENG almost always MT almost never**

Score: /4

24. What language(s) does the target child speak with **Sibling 1**?

0	1	2	3	4
ENG never	**ENG seldom**	**ENG 50%**	**ENG usually**	

MT always	MT usually	MT 50%	MT seldom	ENG almost always MT almost never	Score: /4

25. **Sibling 2:** Older Younger
Gender: M F
Date of Birth: _____

26. What language(s) does **Sibling 2** speak with the target child?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never	Score: /4

27. What language(s) does the target child speak with Sibling 2?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never	Score: /4

(Continue with 35-40 until all siblings are included – see Appendix)

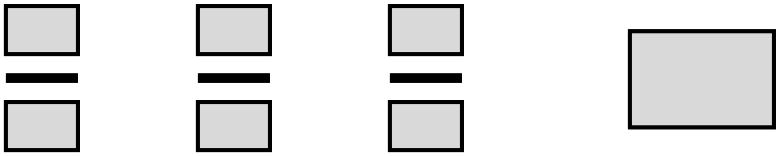
Language Use in the Home (to be completed post-interview in the lab)

NOTE: Higher scores (greater than 0.5) indicate more English use in the home. Lower scores (less than 0.5) indicate more Mother tongue use in the home.

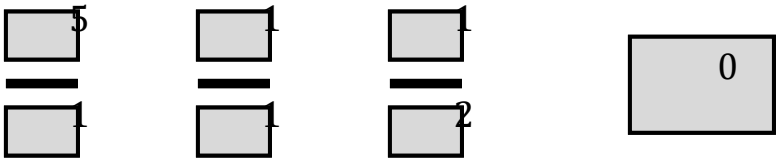
	SCORE EXAMPLE		SCORE EXAMPLE
Mother to Child (Question 3)	1	Child to Mother (Question 4)	3
Father to Child (Question 10)	1	Child to Father (Question 11)	3
Other Adult to Child (Primary Caregiver) (Question 17)	NA	Child to Other Adult (Primary Caregiver) (Question 18)	NA
Other Adult to Child * (not Primary Caregiver) (Question 19b)	NA	Child to Other Adult * (not Primary Caregiver) (Question 20)	NA
Sibling 1 to Child ** (Question 23)	3	Child to Sibling 1 ** (Question 24)	4
Sibling 2 to Child ** (Question 26)	NA	Child to Sibling 2 ** (Question 27)	NA

Additional Sibling(s) to Child**/*** (Appendix)	NA	Child to Additional Sibling(s) **/*** (Appendix)	NA
TOTAL:		**TOTAL:**	
Sum of scores / *Number of scores x 4*	**5/12**	*Sum of scores* / *Number of scores x 4*	**10/12**

To Calculate Language Use in the Home:
Add both totalstogether and then divide to get a proportion score:



Example:



** include a score for each additional adult*
*** do not include siblings who are less than 2 years of age.*
****include a score for each additional sibling*

D. Questions to parents about the TARGET CHILD

28. What school does the target child currently attend?

What special needs services? (i.e. Therapy sessions, education centre, etc.)

Does your child receive services at school?

How many hours of intervention (i.e. SLP, OT, behavior therapists, interventionists…) at school?

Does your child receive services at home?

How many hours of intervention (i.e. SLP, OT, behavior therapists, interventionists…) at home?

How much English exposure does your child receive per week outside the home?
Here are some possible places your child might receive English input. You can indicate more than one.

		Hours per week	**Language**
☐	daycare/babysitter/after school care		
☐	early education centre / special needs / therapy		
☐	junior or senior kindergarten:		

☐ grade _____ _____

This scale is meant to quantify the above information, please circle the most appropriate value (to represent the proportion of English the child hears each week, outside of the home. The examples below are meant as guidelines only):

0.00	0.25	0.50	0.75	1.00
e.g., No English outside the home in any context	e.g., two half days days a week of English at education centre	e.g. half-days, four to five days a week in kindergarten, pre-school, or education centre	As appropriate	e.g. all-day schooling plus education centre /therapy

29a. At what age did the target child start receiving consistent and significant exposure to English outside the home? Age = _____
29b. Date of entry into program (month/year) = _____
29c. At what age was your child diagnosed with a developmental delay/ASD? Age = _____
29d. How old was your child when they began intervention? Age = _____

To be completed post-interview in the lab:

Age of Exposure

	Year	Month	Day
Date of Exposure			
	_____	____	____
Date of Birth			
	_____	____	____
Age of Exposure			
	_____	____	____

Additional Information:
(i.e. Traveling to different country)

Months of Exposure

(1) Convert Age of Exposure to Months:

(2) Convert Age at Test to Months (page 1):

(3) Subtract: Age at Test – Age of Exposure

Please note any interruptions to the target child's exposure to English (e.g. an extended trip to the home country where the child did not receive English input). For children with interrupted periods of 6 months or more, adjust their months of exposure accordingly. For children who had very little exposure to English before the interruption (e.g. less than 6 months), calculate their Age of Exposure from their return to an English-speaking environment.

30. What literacy and other language activities does the target child do each week?
(Please circle all that apply)

Reading: includes having books read to them/looking at books. Most younger children will not know how to read themselves.
Computer: includes internet, games, storybooks on CD-ROMs, etc.(include only those computer activities that involve language
Movies: video or DVD (on computer or television)

	ENGLISH			MOTHER TONGUE		
Activities	everyday	at least once a week	almost never/ never	everyday	at least once a week	almost never/ never
a. Reads books or magazines	2	1	0	2	1	0
b. Uses a computer / device	2	1	0	2	1	0
c. Watches TV or movies	2	1	0	2	1	0
d. Storytelling	2	1	0	2	1	0
e. Singing Songs	2	1	0	2	1	0
TOTAL (by column):						
TOTAL (by Language):	/10			/10		

Comments on Activities:
(Please note what type of storytelling the child does. For example, does the child come home from school and relay the day's events? Or does the child tell fictional stories? If the child tells fictional stories, does he/she use picture books when telling the story?)

31a. What literacy and other language activities (that relate specifically to the MT) does the target child do each week? For example, a weekend language school in the MT or cultural activities or religious services.

How often:
4 = Child is registered in a full-time bilingual program at school (e.g. Grade 1)
3 = Child is registered in a part-time bilingual program at (e.g. Kindergarten)
2 = Child experiences mother tongue activities outside of school (more than one day/week)
1 = Child experiences mother tongue activities outside of school (once a week)
0=Child experiences little or no activities in his/her mother tongue

MT score: /4

31b. Does your child attend any organized extra-curricular activities? What language do they take place in?

Examples: sports, dance, music, art, clubs

	every day	At least once a week	almost never/ never
English:	2	1	0
Mother Tongue:	2	1	0

ENG Score: / 2

MT Score: / 2

32. What are the languages spoken between your child and the friends he/she plays with regularly?

ENG Score:
4. ENG always
3. ENG usually
2. ENG 50%
1. ENG seldom

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

0. ENG never

ENG Score: /4

MT score:
REVERSE SCALE
4. MT always
3. MT usually
2. MT 50%
1. MT seldom
0. MT almost never

MTScore: / 4

To be completed post-interview in the lab:
Calculating Richness Scores:
Sum the numerators and denominators for each score and then divide the resulting fraction to generate the Richness Scores.

English Richness Score			**Mother Tongue Richness Score**	
Question 30	10		Question 30	_____ 10
Question 31b	2		Question 31a	_____ 4
Question 32	_____ 4		Question 31b	_____ 2
			Question 32	_____ 4
Total:	**16**		**Total:**	_____ **20**

I. Appendix: For ADDITIONAL SIBLINGS/ADULTS

35. **Sibling 3**: Older Younger
Gender: M F
Date of Birth: _____

36.What language(s) does **Sibling 3** speak with the target child?	**SIB3-CHI**

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

Score: /4

CHI-SIB3

37. What language(s) does the target child speak with **Sibling 3**?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

Score: /4

38. **Sibling 4**: Older Younger
Gender: M F
Date of Birth: _____

SIB4-CHI

39. What language(s) does **Sibling 4** speak with the target child?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

Score: /4

CHI-SIB4

40. What language(s) does the target child speak with **Sibling 4**?

0 ENG never MT always	1 ENG seldom MT usually	2 ENG 50% MT 50%	3 ENG usually MT seldom	4 ENG almost always MT almost never

Score: /4

E. EXTRA QUESTIONS for children with ASD

1. Does your household have a family rule about language in your home?
2. What are your expectations for your child from learning Spanish?
3. What advice were you given by therapists to help teach language (either Spanish, English, or both) ?
4. What strategies do you use with your child to help them learn Spanish?
5. What do you believe are the benefits of learning two languages?
6. What are the challenges you've faced in teaching Spanish in Canada?
7. Are you satisfied with the progress your child has made in Spanish?

Appendix B

Edmonton Narrative Norms Instrument
ENGLISH Story Grammar Scoring Sheet for Story A1

Child's Name: _____ Age:_____ Date: _____

Please read the section of the Manual on scoring SG units before using this sheet.

SG Unit	Acceptable *[child need only have one alternative per unit to get credit for that unit]*	Score
Character 1	giraffe / male / boy (or any type of animal such as horse) [not acceptable: pronoun]	0 1
Character 2	elephant / female / girl (or any type of animal such as cow) [not pronoun]	0 1
Setting	swimming pool had a ball / playing with ball / want to play ball	0 1
Initiating Event	ball goes in water/pool/sand/mud ball is in water they see a ball	0 2
Internal Response	one / both want to get ball elephant says, e.g., "look what happened," "what am I going to do?" Elephant upset / sad [not: he/she/they want to go swimming]	0 1
Internal Plan	giraffe decides to / thinks he will get the ball	0 1
Attempt	giraffe jumps in pool / swims toward ball / tries to get ball [*not*: giraffe swimming (without goal); giraffe falls in water]	0 2
Outcome	giraffe gets ball / gives ball to elephant [not: elephant gives ball to giraffe, unless it is noted as unexpected, e.g., 'but instead, Elephant gets it and gives it to him']	0 2
Reaction of Giraffe	giraffe is happy / proud / smiles giraffe says "You're welcome" giraffe's teeth are chattering / giraffe is cold/wet	0 1
Reaction of Elephant	elephant is happy / is grateful / says thank you elephant hugs the ball [not: holds/has the ball]	0 1
Reaction both or unknown	"they" are happy/in love [code only as replacement for Reaction of Character 1 or 2; there should not be more than 2 reactions total]	0 1
	Total raw score:	
	Standard Score:	

Edmonton Narrative Norms Instrument

ENGLISH Story Grammar Scoring Sheet for Story A3

Child's Name: _____ Age: _____ Date: _____

SG Unit	**Acceptable** ***[child need only have one alternative per unit to get credit for that unit]***	**Score**
Character 1	giraffe / male / boy (or any type of animal such as horse) (not acceptable: pronoun)	0 1
Character 2	elephant / female / girl (or any type of animal such as cow) [not pronoun]	0 1
Setting	at swimming pool / going swimming / are playing has/is holding airplane / one asks other to play	0 1
Initiating Event	G playing with airplane/making airplane fly G shows/gives E his airplane	0 2
Internal Response	E wants / is interested in airplane	0 1
Internal Plan	E decides to take airplane	0 1
Attempt	E takes airplane / zooms airplane around / makes airplane fly / G gives E a turn	0 2
Outcome	airplane falls in pool / E throws plane in pool	0 2
Reaction of Giraffe	G angry/yells/stares at plane	0 1
Reaction of Elephant	E feels bad/embarrassed/scared / E stares at plane/says oops	0 1
Reaction - both/unknown	"they" are unhappy [code only as replacement for Reaction of Character 1 or 2; there should not be more than 2 reactions total]	0 1
Character 3 (C3)	lifeguard / other elephant /other male / her father / her brother	0 1
Initiating Event	C3 shows up/comes over / E sees C3 / C3 sees plane in water / C3 asks what happened	0 2
Internal Response	E/G hopes C3 can help / C3 wants to help	0 1

Internal Plan	E/G decides to ask for help/explains what happened /asks C3 to get plane / lifeguard decides to try NOT: E talks to C3 (without specifying what about)	0 1
Attempt	C3 tries to get plane / reaches for plane	0 2
Outcome	C3 can't reach plane / plane was too far/sinking	0 2
Reaction C1	G upset / sad / worried / cries / stares at plane	0 1
Reaction C2	E upset / feels bad / feels guilty / looks sheepish / apologizes	0 1
Reaction C3	C3 disappointed / shrugs / says he can't reach it	0 1
Reaction of both/unknown	"they" are disappointed/feels bad [code only as replacement for Reaction of another character; there should not be more than 3 reactions total]	0 1
Character 4 (C4)	other lifeguard / other elephant / other female / her mother / her sister /other person	0 1
Initiating Event	C4 comes over / has net	0 2
Internal Response	C4 wants to help / knows how to get plane / offers to help	0 1
Internal Plan	C4 decides to try / has idea / says she will get it E/G/C3 asks C4 to get it	0 1
Attempt*	C4 reaches for plane / is going to get it / tries to get it C4 gets plane	0 2
Outcome*	C4 gives plane to G / G has plane	0 2
Reaction of Giraffe	G happy / amazed / excited / hugs plane / says thanks	0 1
Reaction of E 1	E happy / relieved / feels better / says thanks	0 1
Reaction C4	female lifeguard relieved / pleased	0 1
Reaction of both/unknown	"they" are happy/excited / say thanks [code only as replacement for Reaction of another character; there should not be more than 3 reactions total]	0 1
Total score:		
Standard Score:		

Appendix C

Edmonton Normative Norms Instrument (Spanish Adapted)

SPANISH Story Grammar Scoring Sheet for Story A1
(Criterios de evaluación para la gramática de la historia, A1)

Nombre del niño: _____ Edad: _____ Fecha: _____

SG Unit	*Acceptable* *[child need only have one alternative per unit to get credit for that unit]*	*Score*
Character 1	jirafa, macho, niño (o cualquier animal) [no aceptable: un pronombre]	0 1
Character 2	elefante / mujer / niña(o cualquier animal) [no aceptable: un pronombre]	0 1
Setting	una piscina tenía una pelota/ juega con una pelota /quiere jugar con una pelota	0 1
Initiating Event	la pelota entra en el agua / la piscina / la arena / el barro la pelota está en el agua ven una pelota	0 2
Internal Response	uno quiere / ambos quieren obtener la pelota El elefante dice, ex: "mira lo que sucedió", "¿qué haré?" el elefante está dolorido / triste [no aceptable: él / ella / ellos quieren ir a la piscina]	0 1
Internal Plan	la jirafa decide / cree que va a recibir la pelota	0 1
Attempt	la jirafa salta a la piscina / nada a la pelota / trata de atrapar la pelota [no aceptable: la jirafa nada (sin un objetivo); la jirafa cae al agua]	0 2
Outcome	la jirafa recibe la pelota / le da la pelota al elefante	0 2
Reaction of Giraffe	la jirafa está feliz / orgullosa / sonreía la jirafa dice "de nada" los dientes de la jirafa ondean / la jirafa está fría / mojada	0 1
Reaction of elephant	el elefante está feliz / agradecido / dice 'gracias' el elefante aprieta la pelota en estos brazos [no aceptable: tiene / tiene la pelota]	0 1

Reaction of both or unknown	"Ellos" son felices / enamorados [marca solo como reemplazo de la Reacción de Personaje 1 o 2; no debe haber más de 2 reacciones en total]	0 1
	Total raw score:	
	Standard score:	

Edmonton Normative Norms Instrument (Spanish Adapted)

SPANISH Story Grammar Scoring Sheet for Story A3
(Criterios de evaluación para la gramática de la historia, A3)

Nombre del niño: _____ Edad: _____ Fecha: _____

SG Unit	Acceptable [child need only have one alternative per unit to get credit for that unit]	Score
Character 1	jirafa, macho, niño (o cualquier animal) [no aceptable: un pronombre]	0 1
Character 2	elefante / mujer / niña(o cualquier animal) [no aceptable: un pronombre]	0 1
Setting	una piscina tenía un avion/ juega con un avion /quiere jugar con un avión	0 1
Initiating Event	J juega con el avión / vuela el avión J le muestra / da al E su avión	0 2
Internal Response	E quiere / está interesado en el avión	0 1
Internal Plan	E decide agar el avión	0 1
Attempt	J nada hacia el avión	0 2
Outcome	el avión cae en la piscina / E tira el avión en la piscina	0 2
Reaction of Giraffe	J está enojado / grita / mira el avión	0 1
Reaction of elephant	E se siente mal / avergonzado / asustado / E mira fijamente el avión / dice '¡Uy!' (“oops”)	0 1
Reaction of both or unknown	"Ellos" son infelices [marca solo como reemplazo de la Reacción de Personaje 1 o 2; no debe haber más de 2 reacciones en total]	0 1
Character 3 (C3)	salvavida / otro elefante / otro hombre / su padre / hermano	0 1
Initiating Event	C3 llega / aparece / E ve C3 / C3 ve el avión en el agua / C3 pregunta qué pasó	0 2

Internal Response	E / J espera que C3 pueda ayudar / C3 quiere ayudar	0	1
Internal Plan	E / J decide pedir ayuda / explica lo que pasó / le pide a C3 que tome el avión / el salvavida decide intentarlo NO: E habla con C3 (sin especificar sobre qué)	0	1
Attempt	C3 intenta obtener el plano / estiramientos para el avión	0	2
Outcome	C3 no puede alcanzar el avión / el avión está lejos / se hunde	0	2
Reaction C1	J está dolido / triste / preocupado / llorando / mirando el avión	0	1
Reaction C2	E está herido / se siente mal / se siente culpable / se ve tímido / se disculpa	0	1
Reaction C3	C3 está decepcionado / se encoge los hombros / dice que no puede alcanzarlo	0	1
Reaction of both/unknown	"Ellos" están decepcionados / sienten mal [marca solo como reemplazo de la Reacción de otro personaje; no debe haber más de 3 reacciones en total]	0	1
Character 4 (C4)	Otro salvavida de baño / otro elefante / otra mujer / su madre / hermana / otra persona	0	1
Initiating Event	C4 aparece / tiene una red	0	2
Internal Response	C4 quiere ayudar / sabe cómo obtener el avión / ofrece ayudar	0	1
Internal Plan	C4 decide probar / tiene una idea / dice que la recibirá / E/J/C3 solicita la ayuda de C4 para obtenerlo	0	1
Attempt*	C4 se estira para el avión / obtendrá el avión / intenta obtener / C4 obtiene el avión	0	2
Outcome*	C4 le da el avión a J J tiene el avión	0	2
Reaction of Giraffe	G está feliz / sorprendido / abraza el avión en sus brazos / dice 'gracias'	0	1
Reaction of Elephant 1	E está feliz / aliviado / se siente mejor / dice 'gracias'	0	1
Reaction C4	El salvavida (mujer) se siente aliviada	0	1
Reaction of both/unknown	"Ellos están felices / emocionados / dicen 'gracias' [marca solo como reemplazo de la Reacción de otro personaje; no debe haber más de 3 reacciones en total]	0	1
	Total raw score:		
	Standard score:		

* For this story and this episode, either her attempt to get the plane or her actually getting it qualify as the Attempt, while the Outcome is her giving the plane to the giraffe, because the goal of the episode is to get the plane back to the giraffe.

Appendix D

Edmonton Narrative Norms Instrument
ENGLISH First Mentions Scoring Sheet

Name_____ Age_____ Date_____

Circle the expression that best fits the child's first mention of the character or object, using the first mentions scoring criteria and directions. If none of the descriptions fits, choose a level that seems most appropriate. A score of 0 indicates that the referent was not mentioned.

Referent	**Expression used by child for first mention**	**Score (circle the appropriate number)**
Giraffe		3 / 2 / 1 / 0 not mentioned
Elephant		3 / 2 / 1 / 0 not mentioned
Ball		3 / 2 / 1 / 0 not mentioned
Lifeguard		3 / 2 / 1 / 0 not mentioned
Airplane		3 / 2 / 1 / 0 not mentioned
Lady Elephant		3 / 2 / 1 / 0 not mentioned
Net		3 / 2 / 1 / 0 not mentioned
Dog		3 / 2 / 1 / 0 not mentioned
Rabbit		3 / 2 / 1 / 0 not mentioned
Sandcastle		3 / 2 / 1 / 0 not mentioned
Doctor		3 / 2 / 1 / 0 not mentioned
Balloon (first)		3 / 2 / 1 / 0 not mentioned
Balloon Seller		3 / 2 / 1 / 0 not mentioned
Balloon(s) (end)		3 / 2 / 1 / 0 not mentioned
Total of each column (3s, 2s, 1s):		___ + ___ + ___ =
TOTAL FIRST MENTIONS SCORE:		

Edmonton Narrative Norms Instrument

ENGLISH First Mentions Scoring Criteria

Character	Score as 3	Score as 2	Score as 1
Giraffe – story A1	**a/this** _____ (e.g., *a giraffe, this cow*) **name** (e.g., *Gerry, Geegee*) **possessive + noun** (e.g., *her friend* if 'she' already introduced) **another animal** **the other animal** (if C mentioned 2 animals and one animal mentioned previously) **1st person pronoun** (if C is putting self in story)	**the/that** _____ (e.g., *the giraffe*) **a [invented word],** e.g, *a geegee* **someone / somebody** **possessive + noun** (if other character not yet introduced) **another/the other** _____ (e.g., *the other animal* if no animal mentioned previously)	**pronoun** (*he, she, it*) **the [invented word]**, e.g., *the geegee* (an invented **name** would be scored as 3)
Elephant – Story A1	**a/this** _____ (e.g., *a elephant*) **name** (e.g., *Ellie*) **possessive + noun** (e.g., *her friend* if 'she' already introduced) **another** _____ *(e.g., another animal* if other character introduced as animal*)* **the other** _____ (e.g., *the other animal* if C mentioned 2 animals and one animal mentioned previously) **1st person pronoun** (if C is putting self in story)	**the/that** _____ (e.g., *the elephant*) **a [invented word]** **someone / somebody** **possessive + noun** (if other character not yet introduced) **another/the other** _____ (e.g., *the other animal* if no animal mentioned previously)	**pronoun** (*he, she, it*) **the [invented word]** (an invented **name**would be scored as 3)
Ball – Story A1	**a/this** _____ (e.g., *a ball, a balloon, an orange*) **possessive + noun** (e.g., *her ball, the elephant's ball*) **the ball** if character is 'playing ball'	**the /that**_____ **vague or empty term**, e.g., *athingy/something/ whatchacallit* **a [invented word]**	**pronoun** (*it, this, that*) **the [invented word]**
Lifeguard – Story A2	**a/this** _____ (e.g., *a lifeguard, a guy)* **the lifeguard** / **the coach**(only if *pool* or *swimming*or *diving board* previously mentioned) **name** his/her/their [family member] (e.g., *daddy*, *brother* if clear whose family member)	**the/that** _____ (including *the lifeguard* if no mention of pool, swimming, or diving board, and family member, e.g., *the daddy*, unless main characters were introduced as brother and sister) **a [invented word]** **someone / somebody**	**pronoun** (*he, she, it*) **the [invented word]** (an invented **name**would be scored as 3)
Airplane – Story A3	**a/this** _____ (e.g., *a plane, a toy)* **possessive + noun** (e.g., *his toy, the giraffe's plane)*	**the/that** _____ indefinite vague or empty term, e.g., *a thingy/something* **a [invented word]**	**pronoun** (*it, this, that*) definite vague or empty term, e.g., *the thingy* **the [invented word]**
Woman with net – Story A3	**a/this** _____ (e.g., *a lady, a elephant, a person)*	**the/that** _____ (e.g., *the*	**pronoun** (*he, she, it*) **the [invented word]** (an

	another _____ (e.g., *lifeguard*, *elephant* or *girl*if at least one previous character identified with same term) **someone / somebody** **the _____ + relative clause** (if a plausible role, e.g., *the person who cleans the pool*) **name**	*woman, the person who catches toys*) **a [invented word]**	invented **name**would be scored as 3)
Net	**a/this** _____ **possessive + noun** (e.g., her net)	**the/that** _____ indefinite vague or empty term, e.g., *a thingy/something* **a [invented word]**	**Pronoun** (*it, this, that*) definite vague or empty term, e.g., *the thingy* **the [invented word]**
Dog – Story B1	**a/this** _____ (e.g., *a dog, a mouse*) **name** (e.g., *Susie*) **possessive + noun** (e.g., *her friend* if 'she' already introduced) **another animal** **the other animal** (if C mentioned 2 animals and one animal mentioned previously)	**the/that** _____ (e.g., *the dog*) **a [invented word]** **someone / somebody** **possessive + noun** (if other character not yet introduced) **another/the other** _____ (e.g., *the other animal* if no animal mentioned previously)	**pronoun** (*he, she, it*) **the [invented word]**(an invented **name**would be scored as 3)
Rabbit – Story B1	**a** _____ (e.g., *a rabbit, a bunny*) **name** (e.g., *Ellie*) **possessive + noun** (e.g., *her friend* if 'she' already introduced) **another animal** **the other animal** (if C mentioned 2 animals and one animal previously mentioned)	**the** _____ (e.g., *the rabbit*) **a [invented word]** **someone / somebody** **possessive + noun** (e.g., *his friend* if other character not yet mentioned by other than a pronoun) **another/the other** _____ (e.g., *the other animal* if no animal mentioned previously)	**pronoun** (*he, she, it*) **the [invented word]**
Sandcastle – Story B1	**a/this** _____ (e.g., *a castle)* **possessive + noun** (e.g., *her castle, the dog's sandcastle*)	**the/that** _____ indefinite vague or empty term, e.g., **a thingy/something** **a [invented word]**	**pronoun** (*it, this, that*) definite vague or empty term, e.g., **the thingy** **the [invented word]**
Doctor – Story B2	**a/this** _____ (e.g., *a doctor, this woman)* **name** (e.g., Dr. Bunny) his/her/their [family member] (e.g., *her mommy,*if clear whose family member)	**the/that** _____ (including family member, e.g., *the mommy*, unless main characters were introduced as brother and sister) **family member**, if not clear whose (e.g., *the mommy*)	**pronoun** (*he, she, it*) **the [invented word]**(an invented **name**would be scored as 3)

Balloon – Story B3	**a/this _____** (e.g., *a balloon)* **possessive _____** (e.g., *his balloon)*	**the/that _____** vague or empty indefinite term, e.g., **a thing/something** **a [invented word]**	**pronoun** (*it*) **the [invented word]** vague or empty definite term, e.g., **the thing**
Balloon seller – Story B3	**a/this _____** (e.g., *a rabbit, a man*) **name** (e.g., *Mr. Balloon Man*) **the + relative clause** if clear from context, e.g., *the man who had sold her the balloon; there were balloons…the man selling the balloons* **another animal**	**the/that_____** (e.g., the balloon seller)	**pronoun** (*he*)
Balloon(s) at end of Story B3*	*a balloon* *balloons* *two balloons* *their own balloon(s)*	*the/that balloon* *those balloons*	**pronoun** (*it, them*)

* Note: Score the first expression that refers to a specific balloon or balloons that the animals get at the end, if possible. For example, if the child says, “He wanted a balloon. He saw a guy with balloons. He asked the guy for a balloon. But he had no money for a balloon. He asked the doctor to buy him a balloon. She gave the man money for balloons. Then they each had a balloon/they had two balloons.” Score only the last expression (either *a balloon* or *two balloons*). The earlier expressions were *nonreferential*, that is, they did not refer to a specific balloon but only to the class of objects. The last expression refers to specific balloons.
If the child gives a nonreferential expression followed by *one* or *some*, such as, "She gave him money for balloons…Then they each had one", score *one* as 3 points.

Appendix E

Edmonton Narrative Norms Instrument (Spanish Adapted)

SPANISH Scoring criteria for First Mentions
(Criterios de evaluación para la introducción de personajes)

Personajes	*Tres puntos*	*Dos puntos*	*Un punto*
Jirafa – Historia: A1	**(1) Uno/una _____** (ex: "una jirafa", "un elefante") **(2) nombre propio** (ex: "Justin", "Gigi") **(3) adjetivo posesivo + sustantivo** (ex: "su amigo/a" si el/ella ya ha sido mencionada) **(4) "Otro animal"** **(5) "el otro animal"** (si el niño menciona 2 animales y uno de ellos fue mencionado anteriormente)	**(1) el/la _____** (ex: la jirafa) **(2) una [palabra inventada]** (ex : "una gigi") **(3) "alguien"** **(4) adjetivo posesivo + sustantivo** (si el otro personaje no se ha presentado todavía) **(5) otro _____** (ex: "el otro animal" si aún no se ha mencionado un animal)	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]** (ex : "el gigi") (NB: 3 puntos por un nombre inventado)
Elefante – Historia: A1	**(1) Uno/una _____** (ex: "una jirafa", "un elefante") **(2) nombre propio** (ex: "Justin", "Gigi") **(3) adjetivo posesivo + sustantivo** (ex: "su amigo/a" si el/ella ya ha sido mencionada) **(4) "Otro animal"** **(5) "el otro animal"** (si el niño menciona 2 animales y uno de ellos fue mencionado anteriormente)	**(1) el/la _____** (ex: la jirafa) **(2) una [palabra inventada]** (ex : "una gigi") **(3) "alguien"** **(4) adjetivo posesivo + sustantivo** (si el otro personaje no se ha presentado todavía) **(5) otro _____** (ex: "el otro animal" si aún no se ha mencionado un animal)	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]** (ex : "el gigi") (NB: 3 puntos por un nombre inventado)
Bola/Pelota – Historia: A1	**(1) Uno/una _____** (ex: "una pelota") **(2) adjetivo posesivo + sustantivo** (ex: "su pelota" si es claro de quien apártense la pelota en este contexto) **(3) "el/la sustantivo + de + sustantivo** (ex: "la pelota del elefante" **(4) "la pelota"** (si el personaje juega con la pelota")	**(1) el/la _____** (ex: la pelota) **(2) una [palabra inventada]** (ex : "una gigi") **(3) "algo"** **(4) Término indefinido** vago o sin sentido (ex : <u>una</u> cosa)	**(1) pronombre (él, ella, eso, esto)** **(2) el/la [palabra inventada]** (ex : "el gigi") **(3) Término indefinido** vago o sin sentido (ex : <u>la</u> cosa)
Salvavida Historia: A2	**(1) Uno/una _____** **(2) nombre propio** **(3) adjetivo posesivo + sustantivo**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "alguien"**	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]**
Avión Historia : A3	**(1) Uno/una _____** **(2) adjetivo posesivo + sustantivo** **(3) "el/la sustantivo + de + sustantivo**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "algo" o "una cosa"**	**(1) pronombre (él, ella, eso, esto)** **(2) el/la [palabra inventada]** **(3) Término indefinido**

Mujer con una red Historia: A3	**(1) Uno/una _____** **(2) nombre propio** **(3) adjetivo posesivo + sustantivo** **(4) otra/otro _____** **(5) la persona que _____**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "alguien"**	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]**
Red/neta Historia: A3	**(1) Uno/una _____** **(2) adjetivo posesivo + sustantivo** **(3) "el/la sustantivo + de + sustantivo**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "algo" o "una cosa"**	**(1) pronombre (él, ella, eso, esto)** **(2) el/la [palabra inventada]** **(3) Término indefinido**
Perro – Historia: B1, B2	**(1) Uno/una _____** **(2) nombre propio** **(3) adjetivo posesivo + sustantivo** **(4) otra/otro _____** **(5) la otra/el otro _____**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "alguien"**	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]**
Conejo – Historia: B1	**(1) Uno/una _____** **(2) nombre propio** **(3) adjetivo posesivo + sustantivo** **(4) otra/otro _____** **(5) la persona que _____**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "alguien"**	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]**
Castillo de arena Historia: B1	**(1) Uno/una _____** **(2) adjetivo posesivo + sustantivo** **(3) "el/la sustantivo + de + sustantivo**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "algo" o "una cosa"**	**(1) pronombre (él, ella, eso, esto)** **(2) el/la [palabra inventada]** **(3) Término indefinido**
Doctor/Doctora Historia: B2	**(1) Uno/una _____** **(2) nombre propio** **(3) adjetivo posesivo + sustantivo** **(4) otra/otro _____** **(5) la persona que _____**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "alguien"**	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]**
Globo – Historia: B3	**(1) Uno/una _____**	**(1) el/la _____**	**(1) pronombre (él, ella, eso, esto)**

	(2) adjetivo posesivo + sustantivo **(3) "el/la sustantivo + de + sustantivo**	**(2) una [palabra inventada]** **(3) "algo" o "una cosa"**	**(2) el/la [palabra inventada]** **(3) Término indefinido**
Vendedor de globos – Historia: B3	**(1) Uno/una _____** **(2) nombre propio** **(3) adjetivo posesivo + sustantivo** **(4) otra/otro _____** **(5) la persona que _____**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "alguien"**	**(1) pronombre (él, ella)** **(2) el/la [palabra inventada]**
Los globos al fin de la historia Historia: B3	**(1) Un globo/los globos/dos globos** **(2) adjetivo posesivo + sustantivo** **(3) "el/la sustantivo + de + sustantivo**	**(1) el/la _____** **(2) una [palabra inventada]** **(3) "algo" o "una cosa"**	**(1) pronombre (él, ella, los, eso, esto)** **(2) el/la [palabra inventada]** **(3) Término indefinido**