How Does Maternal Education Influence Language Acquisition?

Interdependencies between Environment and Input in the Bilingual Development of Immigrant and Refugee Children

by

Tamara G. Sorenson Duncan

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Department of Linguistics
University of Alberta

Abstract

Research examining monolingual children's acquisition demonstrates that children's language development is intricately connected to the linguistic input they receive. However, their input varies on an individual basis; input is shaped by the broader social context in which they live (environment). Thus far, few studies have empirically investigated interdependencies between environment and linguistic input for bilingual children. To address this knowledge gap, this study uses a social interactionist approach to explicitly examine the relationship between the linguistic input child second language (L2) learners receive and their mothers' level of education.

It is generally assumed that higher levels of maternal education will be associated with increased language abilities in children because mothers with higher levels of education provide their children with more linguistic input. This assumption, however, is based largely on studies about monolingual children. Existing research suggests that the relationship between maternal education and linguistic input is more complicated for child L2 learners. For example, some researchers have proposed that higher maternal education is associated with more first language (L1) input and less L2 input but others have suggested the opposite effect. Such discrepancies highlight the need to better understand the interdependencies between maternal education and linguistic input.

The specific research questions asked in this thesis are: (RQ1) Is maternal education a determinant of children's L1 and L2 development? If so, are higher levels of education associated with higher language scores? (RQ2) Does maternal education impact the linguistic input migrant children receive at home? If so, does maternal education have the same effect on the linguistic input provided to immigrant compared to refugee children? (RQ3) Besides maternal education, what other variables influence the linguistic input children receive at home?

(RQ4) Do these intermediary environment and input factors determine children's L1 and L2 development? And, (RQ5) Do the results presented to address Question 1 align with the results presented to address Questions 2, 3 and 4?

Participants were 89 immigrant/refugee children, living in Canada with diverse L1s. They completed an English story-telling task. Their parents also answered detailed questions about L1 development, as well as demographic and linguistic input information. Regression modelling revealed that relative quantity of language use by the mother (input), the siblings (input) and the child (output) positively influenced children's L1 and L2 development. Additionally, maternal L2 fluency and months of exposure to English at school (a cumulative input variable) had a positive impact on L2 scores. Maternal education was related to children's input but the direction of the relationship depended on immigration status. For immigrant families, higher levels of education were associated with less English use. In the refugee group, higher levels of education were associated with more English use. Thus, as one example of interdependencies in bilingual acquisition, this study revealed a complex relationship between immigration status, maternal education, linguistic input and children's bilingual development.

Such interdependencies highlight the fact that children's language development must be considered within the complex system of children's specific circumstances. For each child, environment- and input-level variables are interwoven to produce an individualized learning context. As a consequence, it is not simply variation in individual variables that underlies individual differences in bilingual children's emerging abilities; variation in the interdependencies between variables is also fundamental to the process of acquisition.

Preface

This thesis is an original work by Tamara Sorenson Duncan. The research project, of which this thesis is a part, received three ethics approvals. Ethics approval for the immigrant data (the Edmonton English Language Learners Corpus) was granted to Dr. Johanne Paradis by the Arts, Science, Law Research Ethics Board in 2005. For the purposes of this dissertation, only the anonymized data were accessed, and ethics approval was granted to me by the University of Alberta's Research Ethics Board 2 (Pro00068439 "Maternal Education and Children's Second Language Acquisition," Oct. 26, 2016). For the data from Somali-Refugee children, ethics approval was also granted by the University of Alberta's Research Ethics Board 2 (Pro00025666, with one renewal granted, "An Examination of Language Learning Success in an Intercultural Classroom," Nov. 4, 2011). I was the principal investigator on this application.

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The families who participated in this study were incredibly generous. I am grateful for the time they took to participate in the study and especially for their openness. These families are among some of my greatest teachers. They welcomed me into their homes, shared their culture, their fears and their aspirations with me and opened my eyes to varied perspectives. Their children were fantastic participants and I am grateful for the numerous hours I was allowed to "play" with these children, while collecting language samples.

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1. Introduction

The linguistic input children receive through social interactions with other speakers is fundamental to language acquisition (e.g., Behrens, 2009; Hammer et al., 2012; Hoff, Rumiche, Burridge, Ribot, & Welsh, 2014; Lieven, 2010; Paradis, 2017; Tomasello, 2003). Crucially, this input is shaped by the environment – the social context – in which it occurs (e.g., Hart & Risley, 1995; Hoff, 2006). As a consequence, all language learners benefit from rich linguistic input in supportive environments. In the particular case of child second language (L2) learners, who comprise the focus of this dissertation, researchers have consistently found that variation in input factors, such as the frequency and amount of exposure, is related to differences in children's rate of acquisition (e.g., Blom, Paradis, & Sorenson Duncan, 2012; Paradis, 2011). Likewise, children's emerging language abilities are influenced by environment-level factors, such as maternal education, which is the most studied of environment-level variables (e.g., Hoff, 2006; Rojas, Iglesias, Bunta, Goldstein, Goldenberg & Reese, 2016).

While researchers who investigate bilingual acquisition are in broad agreement about the importance of these factors, they have tended to consider each input and environment factor in relative isolation from each other. That is, few empirical studies have investigated these determinants through the lens of a multi-level approach, where, for example, consideration is given to the extent to which environment-level factors influence the linguistic input that bilingual children receive. Such interdependencies between these factors tend to be discussed only in order to explain unexpected results (e.g., Golberg, Paradis, & Crago, 2008), which leads to a number of hypotheses that still require systematic investigation. In contrast, these interdependencies are the focus of this dissertation, including an emphasis on the empirical evaluation of the relationships between interwoven factors.

To test for such interdependencies, this dissertation focuses on the relationship between maternal education, linguistic input and language acquisition among child L2 learners. In so doing, it follows the lead of researchers examining monolingual acquisition, who, in addition to extensively studying maternal education and linguistic input, have considered interdependencies between these levels (e.g., Hart & Risley, 1995; Hoff, 2006; Hoff-Ginsberg, 1998). In their seminal study, Hart and Risley (1995) reported that the more input children heard (quantity) and the more diversity of words contained within that input (quality), the larger children's vocabularies. They also noted a connection between these input factors and differences in maternal level of education; higher levels of education were associated with greater quantity and quality of linguistic input. Such findings highlight interdependencies between factors.

For bilingual children, a similar relationship between maternal education and linguistic input is also predicted. It is important to note, however, that the context of monolingual acquisition is more straightforward than that of bilingual acquisition and this added complexity may impact the relationship between variables in bilingual acquisition. Bilingual children can experience differences not only in how much language they hear but also differences in what language is used. For example, Golberg et al. (2008) reported that maternal education impacted maternal language choice; more highly-educated mothers used more of the first language (L1), thus reducing the relative amount of L2 spoken in high-education households. Yet, the children with more highly-educated mothers had larger L2 vocabularies, despite receiving less L2 input at home. This apparent conflict between results raises the question of how maternal education influenced L2 development for these children. The authors hypothesize that higher quality L1 input might have been provided by more highly educated mothers, and that this in turn led to greater L1 vocabulary development. This might have served as a springboard for more rapid L2

vocabulary development. However, these interdependencies were not explicitly tested in this study.

A further complication lies in the fact that there are conflicting results as to the connection between maternal education and language use within bilingual households. Some researchers have reported findings comparable to those of Golberg et al. (2008); that is, higher levels of education are associated with greater relative frequency of L1 use (e.g., Hammer et al., 2012; R. Jia & Paradis, 2015; Mueller Gathercole, Kennedy, & Thomas, 2015). However, other researchers have reported the opposite relationship; that is, higher levels of education are associated with increased L2 use (e.g., Bohman, Bedore, Peña, Mendez-Perez, & Gillam, 2010; Prevoo, Malda, Mesman, Emmen, Yeniad, van Ijzendoorn & Linting, 2014). As such, these conflicting findings highlight the need to further investigate the precise relationship between maternal education and linguistic input.

This relationship appears to be a surprisingly nuanced one, as evidenced by the fact that a significant relationship between maternal education and language development has been reported in instances where maternal input was not a significant determinant of language scores (e.g., Rojas et al., 2016). These results suggest that other variables (in addition to maternal input) may also mediate the relationship between maternal education and children's language development. Thus, in bilingual acquisition, the interdependencies between maternal education, the input children receive and their emerging L2 abilities are not straightforward and warrant further investigation. As such, this dissertation addresses the main research question: What are the interdependencies between maternal education, linguistic input and bilingual development within a diverse group of child L2 learners? A breakdown of specific research questions is provided in Section 2.3.

1.1. Types of Dual Language Learners

This dissertation focuses on child L2 learners who come from immigrant and refugee backgrounds. These children represent a unique group of L2 learners, distinguishable from other dual language learning children. The umbrella term, *dual language learners*, refers to a diverse group of children who speak more than one language (i.e., not monolinguals). One group of dual language learners, termed *simultaneous bilinguals,* is comprised of children who have been learning two languages since birth. Simultaneous bilinguals build two linguistic systems in tandem. In contrast, children who have an established L1 when an L2 is introduced are referred to as *child L2 learners*. It is worth-noting that there are alternative terms in the literature for child L2 learners, including: sequential bilinguals, successive bilinguals or English language learners (ELLs). The term child L2 learner is used instead of sequential or successive bilingual to highlight that this dissertation is about children who are in the process of acquiring proficiency, whereas bilingualism is often associated with proficient language use. I have not used the term ELL because it is too restrictive to encompass the literature that I have drawn upon. This literature includes child L2 learners from diverse backgrounds, not just English language learners (e.g., children learning Dutch as an L2 in the Netherlands). Thus, child L2 learner is the most appropriate term in this context.

Generally, children are considered L2 learners if the L2 was introduced after age three (e.g., Paradis, Genesee, & Crago, 2011). In addition to an established L1, child L2 learners are more cognitively mature than simultaneous bilinguals when the L2 is introduced; consequently, they are a separate populations of language learners (e.g., Kohnert, Kan, & Conboy, 2010; Paradis, 2007). Children from immigrant and refugee backgrounds are a subset of child L2

learners, and their situation is distinct from those of children who are, for example, L1-majority speakers learning a foreign language (e.g., Mandarin-speaking children in English-immersion in Taiwan) (Montrul, 2015). One unique aspect of migrant children's bilingual development is that they must learn the L2 to function in broader society; it is not the case that L2 acquisition is an elective choice of the family (e.g., Genesee, 1994; Genesee, Lindholm-leary, Saunders, & Christian, 2005; Kirova, 2016).

It is important to note that child L2 learners themselves do not constitute a homogenous group. In fact, there is a great deal of variation within their early linguistic experiences (e.g., Paradis & Grüter, 2014). One potentially relevant point of variation is the driving force behind families' decisions to migrate. For example, Immigration, Refugees and Citizenship Canada makes a broad distinction between immigrants and refugees (Government of Canada, 2016). Immigrants are people who choose to settle in a new country, although this choice is often made in response to negative circumstances (e.g., economic hardship, Schoorl et al., 2000). Refugees are people who have been forced from their homes because of "unimaginable hardship." Newcomers to Canada, regardless of their immigration status, often face many challenges. However, scenarios confronted by immigrant families are different from those of refugee families who have, for example, fled war.

This terminology is specific to the Canadian context. Previous research has frequently been conducted in other countries (e.g., United States, Israel and England), which have different immigration systems. Consequently, terminology which is appropriate in the Canadian context may not apply to migrant children in other parts of the world. Nevertheless, the children who have been included in previous research tend to come from highly educated families (see Section 2.2.1). Studies with children from families with lower levels of education and refugee

backgrounds are far less common, but are beginning to emerge in the literature (e.g., Chondrogianni & Marinis, 2011; Paradis & Kirova, 2014; Rojas et al., 2016). This dissertation includes children from both immigrant and refugee backgrounds (see Section 3.1.1); the children in the refugee group were all of Somali heritage.

Somalia has been in turmoil for many decades. One consequence of this turmoil, which has direct relevance to this dissertation, is that war has severely limited people's access to education (Multicultural Family Connections Program, 2004). As such, the Somali-refugee group in this dissertation is distinct from those of past research because this group is comprised of mothers with education levels not typically found in acquisition studies (as exemplified in Sections 2.2.1 and 3.1.1, particularly Figure 2.1). Through this focus on a particular group of child L2 learners (i.e., migrant children) and with careful consideration to details about their environment, linguistic input and bilingual development, this dissertation is well positioned to empirically evaluate the relationship between maternal education and language development. In order to do this, the multi-level approach of the social interactionist framework is applied to understand interdependencies between input and environment.

1.2. Conceptual Framework: Social Interactionism

Proponents of the *bioecological model* of human development contend that determinants of acquisition can be organized into multi-level systems, and that interdependencies amongst these systems are fundamental to understanding development (Bronfenbrenner & Morris, 2006). Proximal variables, which are part of a child's microsystem, include the people that children interact with regularly, such as their parents or teachers. Distal variables are those factors which influence the people within the child's microsystem and may include such determinants as socio-

economic status and culture. This multi-level approach of development provided the theoretical basis for the social interationist framework that applies to language development specifically (e.g., Dickinson & McCabe, 1991; Hoff, 2006).

Within the specific context of acquisition, the microsystem (proximal-level) is comprised of linguistic input. *Input* refers to the language children hear in their daily interactions (e.g., Mueller Gathercole & Hoff, 2006). It is the language children directly experience and includes, for example, conversations between the child and their family members and language-based activities such as shared book reading. The distal-level factors, termed *environment*-level here, influence the context in which that input is given (e.g., Paradis & Grüter, 2014). That is, they represent the situation in which children live and include such factors as maternal education and family size. In summary, within the social interationist framework, environment-level factors are predicted to influence input factors, which are, in turn, predicted to influence language acquisition. Child-level (internal) variables, such as age and phonological short-term memory, are also expected to influence acquisition (e.g., Chondrogianni & Marinis, 2011; Paradis, 2011). However, in this dissertation the emphasis is placed on the relationship between environment and input levels.

A clear illustration of the interdependencies between socio-economic status (SES), children's input and their emerging language abilities is found in Hart and Risley's famous (1995) study. They examined the parental input provided to monolingual children in high socio-economic status (SES) situations, mid-SES situations and low-SES situations (termed professional, working-class and welfare in their book). It is important to note that parental levels of education were intricately connected with SES in this study. There were notable differences in the quantity and quality of linguistic input that children in the different groups received. For

example, they extrapolated the number of words that children in each group would have heard by the age of three. Their estimates suggest that children in the high-SES group would have heard as many as 20 million more words than children in the low-SES group. In terms of quality of input, children in the high-SES group also heard more varied vocabulary and more diversity of syntactic structures. These differences in input were highly related to children's vocabulary abilities after age three. Thus, this study demonstrated a clear link between language acquisition, linguistic input and the broader social context. Furthermore, it highlighted the need to consider language acquisition within the complex reality of children's lives. It is not the effect of a single variable that leads to language acquisition but the interdependencies between variables.

Among child L2 learners, as discussed above, both input and environment are more varied than is the case for monolingual learners. This greater variation offers more opportunities to investigate interdependencies between variables from multiple levels, making bilingual development an ideal situation to investigate the extent to which input and environment are interconnected in acquisition. A sample of relevant factors is provided in Figure 1.1. This style of visualization was loosely adapted from Santrock (2001, p.46) to correspond specifically with language acquisition. The specific details related to the factors listed in this figure are provided in Chapter 2.

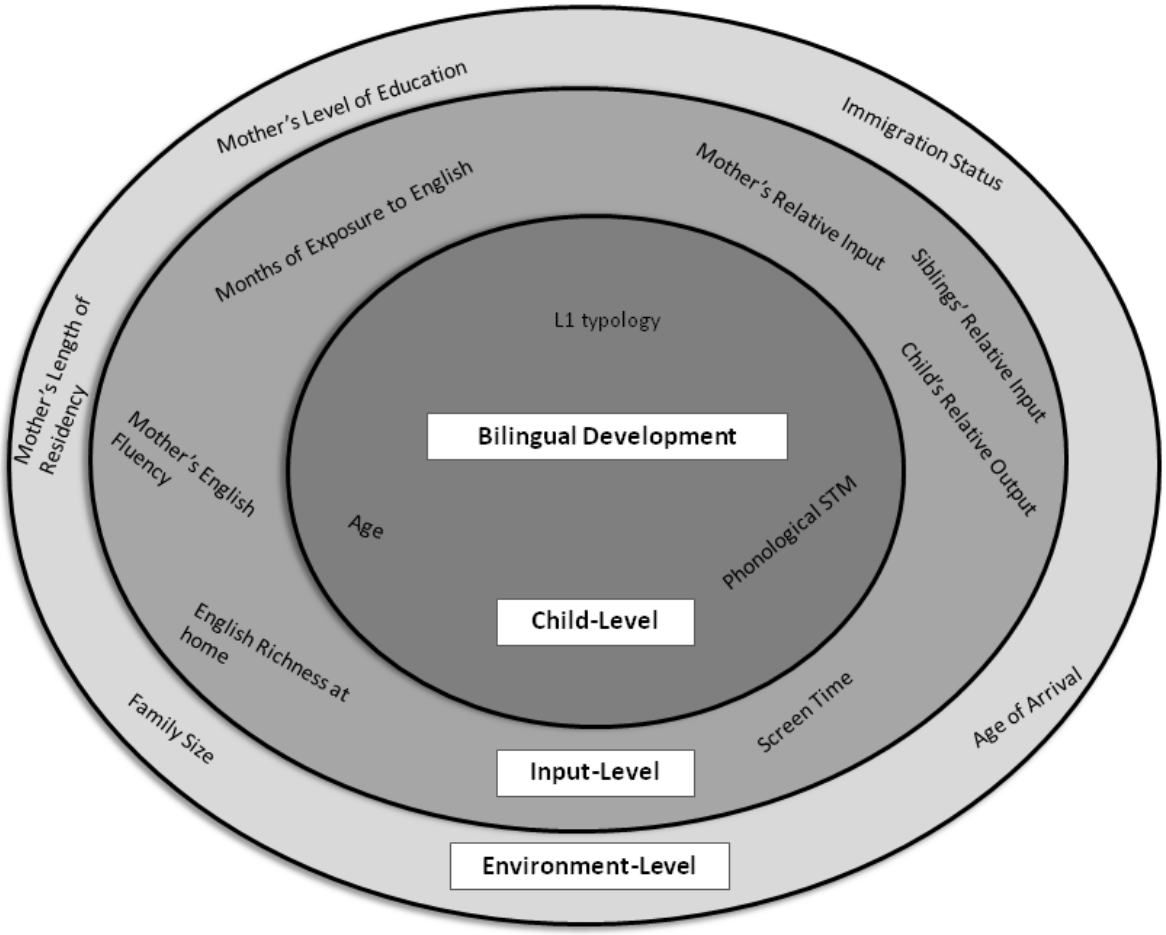

Figure 1.1 Bioecological Model (Social Interactionist) Approach to Bilingual Acquisition

2. Literature Review

Maternal education has been commonly cited as a determinant of monolingual, simultaneous bilingual and child L2 learners' language development (e.g., Calvo & Bialystok, 2014; Hoff, Welsh, Place, & Ribot, 2014; Hoff, 2003, 2006; Mueller Gathercole, Kennedy, & Thomas, 2015; Oller & Eilers, 2002; Scheele, Leseman, & Mayo, 2010; Vasilyeva & Waterfall, 2011; Winsler, Kim, & Richard, 2014). However, to date, few empirical studies have investigated the intermediary variables that mediate the relationship between maternal education and child L2 learners' acquisition. This dissertation investigates these interdependencies. In providing the context for this study, this chapter reviews literature about children's L1 and L2 development in contexts where the majority language of the society is the child's L2. This literature review provides known patterns of L1 and L2 development and details environment- and input-level determinants of bilingual acquisition for child L2 learners. Many determinants of acquisition have previously been indentified but determinants are often investigated individually. This dissertation is novel in the simultaneous consideration of multiple variables and in testing the interdependencies between variables. Through the study of interdependencies, this dissertation offers novel insights about how maternal education influences language development within this population of learners.

2.1. Introduction to Language Acquisition in Immigrant and Refugee Children

2.1.1. First Language Development

Young child L2 learners are bilingual and, prior to schooling, these children often receive language input primarily in their L1, a minority language (heritage language). Few studies exist about heritage language maintenance and development at the onset of schooling, especially in the

Canadian context. However, these children's L1s are likely vulnerable to divergent attainment and attrition, as has been the case for other groups of heritage learners (e.g., Montrul, 2005; Scontras, Fuchs, & Polinsky, 2015).

Studies on heritage language development are comprised of varied samples of participants and this can make it challenging to draw detailed conclusions regarding L1 development in young immigrant and refugee children. For example, some studies focus on young simultaneous bilingual children (e.g., Hoff, Rumiche, Burridge, Ribot, & Welsh, 2014). Other studies focus on child L2 learners (e.g., Kohnert, Kan, & Conboy, 2010; R. Jia & Paradis, 2015). Finally, other relevant studies look at L1-abilities in adults and retrospectively try to understand L1 acquisition (e.g., Valdés, 2001; Montrul, 2005). A further complication exists because participants in these studies have had a mix of schooling; some children attended bilingual programs and some attended English-only programs (e.g., Collins, O'Connor, Suárez-Orozco, Nieto-Castañon, & Toppelberg, 2014; R. Jia & Paradis, 2015). Research from these varied studies suggests that the general trend for heritage language development is for young children to have strong L1 abilities in their early years (e.g., Hoff, Rumiche, et al., 2014; Kohnert et al., 2010). However, this language is likely to become their weaker language (e.g., Montrul, 2015), with some speakers only retaining receptive language skills (e.g., Li & Duff, 2008; Montrul, 2015; Valdés, 2005).

Prior to schooling, many children spend substantial time in an environment that fosters L1 development (e.g., their main caregivers are speakers of this language). Consequently, L1-minority development is likely to flourish at this time for these children. For example, Hoff, Rumiche, et al.(2014) conducted a longitudinal study of Spanish-English bilingual toddlers in the United States. For those toddlers (two and three-year olds) whose parents were both native

speakers of Spanish, children had larger expressive vocabularies in Spanish than English. Similarly, Kohnert et al. (2010), who studied the bilingual acquisition of Hmong-English preschoolers, reported that these children had stronger L1 (Hmong) skills compared to their English skills; that is, children produced longer sentences in Hmong and had greater lexical diversity within these Hmong utterances. Thus, it seems that prior to schooling these children were likely to favor their L1 over the majority language (at least as in indexed by their abilities). However, it is crucial to note that they were either in the primary care of native-speakers of the L1 (Hoff, Rumiche, et al., 2014) or were receiving L1 support through bilingual schooling (Kohnert et al., 2010).

The advantaged status of the L1 compared to the L2 may not, however, persist beyond the preschool years (e.g., Anderson, 2001; Collins, et al., 2014; Hoff, Rumiche, et al., 2014; Kaufman, 2005; Murphy, 2014). For example, Hoff, Rumiche, et al (2014) reported that despite the strength of children's early L1 (Spanish) skills, by four years of age, these children had greater English expressive vocabularies compared to their Spanish vocabularies, suggesting that these children were already showing signs of *majority-language shift* (also termed dominant-language shift, e.g., Jia & Aaronson, 2003). Notably, by four years of age, many of these children had begun preschool in English, were attending English daycares or had siblings who had begun school. As such, the onset of schooling may represent a turning point in which the L1 becomes more vulnerable, especially if children do not continue to receive L1 support.

Further evidence that the onset of English-only schooling appear to correspond with L1-vulnerability can be found in Collins et al. (2014). They examined the "dual language profiles" of 228 Spanish-English bilingual children in the Boston area. The children in this study attended either English-only programs or Spanish-English bilingual programs. The children in the

English-only programs were unlikely to maintain Spanish proficiency into the second grade. In contrast, children, who were enrolled in bilingual programs, were more likely to maintain proficiency in both languages.

The relationship between L1-vulnerability and English language exposure at school, however, may not exist in all contexts. R. Jia and Paradis (2015) reported on the use of referring expressions in Mandarin by heritage speakers at age 8;7 (years;months). The heritage language speakers in this study had lower performance than the children in the monolingual comparison group, revealing that heritage language acquisition was distinct from monolingual acquisition of the same language. However, there was no link between these children's length of English schooling and their current L1 abilities. As such, increased English-schooling may not result in continued L1-vulnerabilty for all heritage language learners. It is important to note, however, that this study examined children who were age 8;7 and who had several years of exposure to English in school. Consequently, it is possible that these children experienced a majority-language shift when they began school but not to the extent of fully abandoning their L1s. Such a shift could partially account for the differences reported between monolingual and heritage language speakers in this study.

In summary, studies of heritage speakers suggest that the L1 is vulnerable to majority-language shift and will likely be the weaker language for migrant children. However, it is important to note that many of these studies examine the language abilities of Spanish-English bilinguals in the United States. The extent to which these findings extend to other bilingual children in other countries is unclear. For example, R. Jia and Paradis (2015) suggest that immigrant children in Canada may have more favorable L1 outcomes than their American peers. This dissertation offers further discussion of L1-minority (heritage) language acquisition through

the study of L1-vulnerability and majority-language shift in children who are from diverse L1 backgrounds and who are living in Canada.

2.1.2. Second Language Development

When children from immigrant and refugee backgrounds enter school, they often have limited English abilities. They must, however, quickly learn functional English skills in order to communicate with their teachers and peers at school; that is, oral language is essential to daily participation in society (e.g., Genesee, 1994; Genesee, Lindholm-leary, Saunders, & Christian, 2005; Kirova, 2016). Oral language also provides the foundation for literacy development and underlies many clinical assessments for language impairment (e.g., Chen, Geva, & Schwartz, 2012; Davison, Hammer, & Lawrence, 2011; Deacon, Wade-Woolley, & Kirby, 2007; Deacon & Cain, 2011; Paradis, Schneider, & Sorenson Duncan, 2013; Paradis, 2007; Saunders & O'Brien, 2006; Vasilyeva & Waterfall, 2011).

This subsection reviews findings about English-L2 acquisition in children and highlights the fact that children's L2 acquisition is a gradual process that occurs throughout the elementary school years. Comparisons to monolingual norms, as detailed in the first subsection below, tend to illustrate this protracted development. However, discussing children's L2 abilities solely in terms of monolingual expectations may not illustrate the wide range of L2 skills that children have acquired. As was alluded to above, children acquire a number of skills shortly after beginning school. Accordingly, as the second and third subsections reveal, language sampling affords the opportunity to observe these emerging L2 skills across a number of linguistic sub-domains (e.g., vocabulary and grammar), which may develop at differential rates (profile effects).

Comparison to monolingual norms. One common theme in research with child L2 learners is questions about the extent to which they have comparable performance to their monolingual peers. To address these questions, standardized language measures, which have been normed on monolingual children, are frequently used. These measures are often omnibus tests that include a survey of a number of linguistic sub-domains and result in one cumulative language score. This research suggests that L2 children are generally proficient in English by grade three, but do not reach native-like performance until grade five (i.e., after six years of schooling in English) (e.g., Hakuta et al., 2000; Saunders & O'Brien, 2006).

As an alternative to omnibus tests, other researchers have used standardized tests to evaluate individual language abilities, such as vocabulary or morphology. These tasks often require knowledge of specific lexical items or constructions. For example, the Test of Early Grammatical Impairment (a measure of morphosyntactic development) elicits inflected forms of verbs (e.g. she skated). In the early stages of acquisition, typically-developing child L2 learners often obtain scores on this task more similar to monolingual English-speaking children with language impairment than to those of typically-developing monolinguals (Paradis, 2005). With time, child L2 learners' abilities begin to converge on native-speaker norms. The general trend is similar to that of the omnibus results: children need at least three years to reach native-speaker norms (e.g., Chen, Ramirez, Luo, & Ku, 2012; Golberg, Paradis, & Crago, 2008; G. Jia & Fuse, 2007; Oller & Eilers, 2002; Paradis et al., 2013; Paradis, 2011; Ramirez, Chen, Geva, & Luo, 2011).

Unlike other standardized measures, narrative tasks do not focus on specific lexical items or constructions. That is, children are able to use whatever items they have acquired in order to convey information about the story to their interlocutor. Nevertheless, even with this leeway,

previous research using narrative tasks has demonstrated that child L2 learners do not have English language abilities comparable to those of their monolingual peers. It is, however, important to note that these children's scores are more favorable on narrative tasks than other elicitation tasks, because, on narratives, their scores often fall within the normal range for monolingual children (as opposed to the range expected for children with language impairment; for example, on all measures, except MLU, the children in Paradis & Kirova, 2014 scored within one standard deviation of the expected mean for typically-developing monolingual children) (e.g., Hammer et al., 2012; Kunnari, Välimaa, & Laukkanen-Nevala, 2016; Paradis, Genesee, & Crago, 2011; Paradis & Kirova, 2014). This suggests that children may have capitalized on the added "leeway" that is generated from being less restricted to particular constructions. For example, on a narrative task, Paradis and Kirova (2014) reported that child L2 received an average standard score for complex syntax of 8.14 (see Table 1, p. 345). As such, as a group, the child L2 learners were performing at the lower end of the typically-developing range, after only one year of exposure. It is important to note, however, that their performance was not parallel to monolinguals; parallel performance would require a mean score of 10 (not 8).

The expectation that child L2 learners have L2 abilities comparable to those of their monolingual peers is unrealistic given the limited amount of experience these children have had with the L2. The emphasis on monolingual norms reflects a monolingual bias and risks the perception of bilingualism as a deficit (e.g., Birdsong & Vanhove, 2016). As Cook (1997, p. 16) writes, "Why then should L2 users alone be singled out as deficient for being what they are, bilinguals, and not what they are not, monolinguals?" Through the use of language sampling, it is possible to adjust the dialogue and concentrate on what children can do, instead of what they cannot. Accordingly, this dissertation uses a narrative task to sample children's L2 abilities.

Language sampling and narrative tasks. Child L2 learners have been shown to communicate effectively, even in the early stages of acquisition (e.g., Genesee et al., 2005; Hammer et al., 2012; Kunnari, Välimaa, & Laukkanen-Nevala, 2016; Paradis, Genesee, & Crago, 2011; Paradis & Kirova, 2014; Tabors, 1997). Language sampling, which includes narrative tasks, provides a window to these emerging L2 abilities within a relatively naturalistic context (e.g., Gagarina, Klop, Tsimpli, & Walters, 2016; Schneider, Hayward, & Dubé, 2006; Schneider & Hayward, 2010). That is, as is noted above, narrative tasks provide children with the opportunity to use the lexical items and constructions that they have acquired. If a child, for example, does not know the word *canoe*, they will not automatically receive a lower score, as is the case on other standardized language assessments; they can, as they can in real communication, use an alternative word (or phrase) to convey the necessary meaning. In fact, the inclusion of meaning (or a communicative purpose) is another aspect that makes narrative tasks more natural than some other language measures. On a narrative task children are asked to tell an interlocutor a story, which is something that they do in their daily lives. This is distinct from other measures, where, for example, children are asked to play "language games" that involve conjugating verbs. In the case of this dissertation, an elicited fictional narrative task was used as the language sampling technique (an example of this type of narrative is provided in Section 3.2.3, Table 3.5).

Elicited fictional narratives require children to create a story about a set of pictures (e.g., Schneider, Dubé, & Hayward, 2005). These narratives are distinct from story-retell tasks where children are first told the story and then asked to retell it (e.g., Hammer et al., 2012). Fictional narratives are also distinct from personal narratives, which require children to recount an autobiographical moment or life event (e.g., Haden & Hoffman, 2013; Scheele, Leseman, Mayo,

& Elbers, 2012). Through the use of elicited fictional narratives, rich data are generated. These data can be used to investigate a diverse set of skills, including story-specific abilities and language-specific skills (e.g., Gagarina, Klop, Tsimpli, & Walters, 2016; Roch, Florit, & Levorato, 2016; Schneider & Hayward, 2010). Story grammar, a story-specific ability, is generally considered to be based in cognitive development because a story has a plot in any language. In contrast, the vocabulary items that are necessary to tell a story are language-specific because every language has its own words that must be acquired. The remainder of this section details the development of story-specific and language-specific abilities and focuses on findings from elicited fictional narratives.

Story grammar. Stories are made up of series of information units that convey details about who is involved, what happens, and the location of a story. Each of these components is part of story grammar (sometimes called macrostructure or story structure), and each information unit is referred to as a story grammar unit (e.g., Altman, Armon-lotem, Fichman, & Walters, 2016; Bohnacker, 2016; Gagarina, 2016; Kunnari et al., 2016; Mavis, Uge, & Gagarina, 2016; Schneider et al., 2006; Tsimpli, Peristeri, & Andreou, 2016).

The development of story grammar is assumed to reflect more general cognitive development. This assumption is supported by the finding that older children include more story grammar units compared to younger children (e.g., Mäkinen, Loukusa, Nieminen, Leinonen, & Kunnari, 2014; Mavis et al., 2016). The reported cognitive nature of story grammar leads to the hypothesis that children should be able to employ their story grammars to any language they speak (e.g., Gagarina, 2016). However, conflicting findings exist about this hypothesis. Some researchers have reported that children have comparable story grammar abilities regardless of the language they are speaking. For example, simultaneous bilingual children have been shown to

provide similar story grammar units in each of their languages (Bohnacker, 2016; Kunnari et al., 2016; Rodina, 2016). Similarly, Fiestas and Peña (2004) reported that child L2 learners of English (Spanish L1) produced stories with comparable numbers of story grammar units across their two languages, although the specific units that were included did vary across the two languages. As another example, Paradis and Kirova (2014) found that child L2 learners provided a comparable number of story grammar units as their monolingual peers (standard score = 9.76 for child L2 learners; expected monolingual mean = 10). Such findings provide the basis for the claim that story grammar is a language-general skill (cognitive ability or story-based skill) that children can employ in any language that they speak (e.g., Bohnacker, 2016; Gagarina, 2016; Karlsen, Geva, & Lyster, 2016; Kunnari et al., 2016; Paradis & Kirova, 2014; Roch et al., 2016).

Other researchers, however, have reported differences in story grammar score based on children's language proficiency. For example, simultaneous bilingual children have been shown to provide more story grammar units in their stronger language than in their weaker language (e.g., Gutiérrez-Clellen, 2002; Roch et al., 2016; Uccelli & Páez, 2007). Montanari (2004) also reported that child L2 learners in kindergarten provided twice as many story grammar units in Spanish (L1) compared to English (L2). Differential performance has also been reported across groups of children. For example, monolingual children have been shown to provide more story grammar units compared simultaneous bilinguals and child L2 learners (Hipfner-Boucher et al., 2015; Kunnari et al., 2016). Gagarina (2016) also reported that simultaneous bilinguals provided a significantly greater number of story grammar units compared to child L2 learners (in their L2: German).

The source of such differences between children's languages and between groups of children is debated. Some researchers have argued that differences stem from an inability to

transfer cognitive skills between languages (e.g., Gagarina, 2016; Roch et al., 2016). For example, Roch et al.(2016) argue that young children do not have the cognitive skill to utilize knowledge about narrative structure in both languages. This seems unlikely, however, given that Paradis and Kirova's (2014) study included preschool-aged children who had strong L2 story grammar skills. As such, it seems more plausible that unbalanced linguistic abilities can lead to unbalanced story grammar performance (e.g., Hipfner-boucher et al., 2015; Kunnari et al., 2016; Montanari, 2004). That is, children need a certain level of linguistic ability in order to convey story grammar units to their interlocutor. Weaker language abilities could lead to the omission of story grammar units; even if the children know the story grammar unit is required.

Referring expressions (character introductions). While story grammar includes who and what is involved in the story, it largely focuses on children's ability to include relevant plot details. The participants in a story are noteworthy in their own right. As such, researchers often consider character introductions (sometimes called first mentions) as a separate measure from story grammar (e.g., Paradis & Kirova, 2014; Schneider & Hayward, 2010). There are two important aspects to character introductions. First, there are macrostructure (story-specific) abilities that pertain to knowing who and what needs to be introduced to the listener. As is explained in the previous subsection, macrostructure skills are generally conceptualized as cognitive, rather than linguistic skills (e.g., Bohnacker, 2016; Gagarina, 2016; Karlsen, Geva, & Lyster, 2016; Kunnari et al., 2016; Paradis & Kirova, 2014; Roch et al., 2016). Second, children must also learn the linguistic details about the appropriate language-specific referring expressions for introducing characters.

A referring expression is a particular construction (e.g., noun phrase) that is used to introduce or maintain reference to participants (note that in this dissertation, only referring

expressions used to introduce characters are investigated; see Section 3.2.3). English introductions require referring expressions containing indefinite articles (e.g., an airplane). If children use a definite article (e.g., the airplane), this assumes prior knowledge on the part of the listener, which the listener obviously does not have at the time a character is introduced. However, using a definite construction (e.g., the airplane) is more appropriate than a pronoun (e.g., it); pronouns do not provide the listener with information about who or what is involved in the story, only that someone or something took part. As such, pronouns are only appropriate for previously mentioned participants, as can be seen in the following example: "*An elephant was bouncing a ball. She accidentally dropped it* (Schneider & Hayward, 2010, p. 460)".

In character introductions, story-specific and linguistic-specific abilities are intricately connected because the most appropriate linguistic devices (i.e., referring expressions) are based on what is shared knowledge (e.g., who do I need to tell you about and who have I already told you about). Monitoring shared knowledge is a cognitive ability, which can be difficult for young children, especially in the context of extended narratives (e.g., Chen & Pan, 2009; Schneider & Hayward, 2010).

Given how the narrative and linguistic abilities are interwoven for character introductions, it is not surprising that scoring protocols do not always disentangle them (e.g., Schneider & Hayward, 2010). For example, Paradis and Kirova (2014) gave children a single score for their overall referring expression abilities. These scores were based on full points for introductions with an indefinite article, partial points for inappropriate referring expressions and no points for the exclusion of characters (see the scoring guidelines detailed in Section 3.2.3). In this way, the cognitive-ability is included in the score because children receive lower scores for omitting participants. The language-specific skills are also included because children obtain

higher scores for more appropriate referring expression. As such, Paradis and Kirova (2014) provided insights into children's emerging referring expression abilities; they reported that preschool-aged children obtained lower scores for referring expressions compared to monolingual, age-matched norms. Their study, however does not present information on the subcomponents of character introductions, as children only received a single score for this skill.

Research that has examined the linguistic dimension of character introductions has largely focused on children's use of indefinite (as opposed to definite) articles. These studies have found that child L2 learners overwhelming use "the" in contexts where "a" is more appropriate (e.g., Chen & Pan, 2009; Mede & Gürel, 2010; Zdorenko & Paradis, 2008, 2011). For example, Zdorenko and Paradis (2011) examined child L2 learners at the onset of their English schooling. They found that children only appropriately used indefinite constructions in half of their character introductions.

The focus on indefinite and definite articles assumes that children have the necessary vocabulary (nouns) to refer to the people and objects in an elicited narrative task. However, child L2 learners often have more reduced L2 vocabularies than their monolingual peers (e.g., Golberg et al., 2008; Hammer et al., 2011; Oller & Eilers, 2002; Paradis, 2011), and when children have limited vocabulary, one might expect them to use pronouns to introduce characters. Nevertheless, pronouns are not common in child L2 learner's character introductions. For example, Chen and Pan (2009) found that 5-year-old child L2 learners only introduced 13% of the main characters in an elicited narrative using pronouns. As such, these children appear to recognize that pronouns are an inappropriate way to introduce characters to an interlocutor.

Syntactic complexity: complex clauses. The language-specific constructions that are necessary to complete a narrative task require that children have an understanding of how words

are grouped together to form constructions. For narratives in particular, utterances tend to be longer and more complex than in daily conversation (e.g., Karlsen et al., 2016). Complex clauses are those constructions which relate two or more situations within a single utterance (Diessel, 2004). This is typically operationalized as clauses which contain more than one verb, as opposed to simple constructions which only have one verb (e.g., Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Paradis, Rusk, Sorenson Duncan, & Govindarajan, 2016; Schneider et al., 2005). Example (1a) below provides an example of a simple utterance and (1b) illustrates a complex utterance. These utterances were extracted from a narrative produced by a child L2 learner of English who spoke Somali at home. The dependent clause is underlined in (1b). The verbs appear in bold in both utterances.

(1a) Simple Clause (one situation) from child 010SOF, ENNI, Story A2
*she **sit** in the bench.*

(1b) Complex Clause (two related situations) from child 010SOF, ENNI, Story A2
*<u>when she **slipped** out of the pot</u>, she **hit** her own knees.*

Monolingual English speaking children show a slow trajectory from simple clauses to complex clauses (Huttenlocher et al., 2010). Simultaneous bilinguals appear to be on par with their monolingual peers in terms of the proportion of complex utterances in their speech. For example, Rodina (2016) reported that Norwegian-Russian bilinguals used a comparable number of complex clauses compared to monolingual children in both languages, suggesting similarly protracted development in this domain. In contrast, child L2 learners of English appear to have precocious acquisition of complex clauses and incorporate them into their English narratives very early in development (within the first year of exposure) (e.g., Paradis & Kirova, 2014; Paradis et al., 2016). However, even with the early inclusion of complex clauses, the proportion

of complex clauses may not be equivalent between child L2 learners and monolingual speakers of the same age. For example, Wiechmann, Kerz, & Steinfeld (2016) reported that monolingual German-speaking children used a higher proportion of complex clauses compared to child L2 learners of German.

Morphosyntactic development: MLU. Within utterances, children employ a number of grammatical morphemes. Children's mean length of utterance (MLU) is a well accepted measure of general morphosytnactic development because it has been shown to significantly correlate with other standardized measures of language development, among both monolingual and bilingual children (e.g., Bedore, Peña, Gillam, & Ho, 2010; Blom, 2010; Brown, 1973; Kohnert et al., 2010). MLU is calculated as the average number of words or morphemes per utterance, although in the case of relatively isolating languages like English or Dutch, it is most often counted by words and not morphemes (e.g., Blom, 2010). This measure is considered a general measure of morphosyntax because many aspects of syntax and morphology can influence MLU. For example, as is illustrated above in (1), complex utterances are often longer than simple utterances. MLU is also influenced by children's morphological development because proficiency with free (unbound) grammatical morphemes will also increase children's MLU scores (e.g., *in, on, the, a*, Brown, 1973). This connection between greater morphosyntactic abilities and greater MLU is illustrated across the sample utterances provided in (2). Again, these utterances were taken from the narratives of child L2 learners who speak Somali at home.

(2a) Sample utterance from a child whose MLU (in words) was 1.836
(019SOM, ENNI, Story A1)
**EXP:* *how does the story go?*
**CHI:* *elephant.*

(2b) Sample utterance from a child whose MLU (in words) was 3.456
(008SOF, ENNI, Story A1)
**CHI:* *elephant funny.*

(2c) Sample utterance from a child whose MLU (in words) was 6.109
(001SOF, ENNI, Story A1)
**CHI:* *the elephant is basketball.*

(2d) Sample utterance from a child whose MLU (in words) was 7.715
(010SOF, ENNI, Story A1)
**CHI:* *once upon a time there's a giraffe called Giraffe.*

Given that MLU indexes language development, it can be used to identify children's dominant language. For example, Kohnert et al. (2010) found that Hmong-L1, English-L2 preschoolers in the United States produced longer utterances in Hmong than in English on a narrative retell task. These children had an average of one year of exposure to English. In contrast, Bedore et al. (2010) reported on children in kindergarten also living in the United States, who spoke L1-Spanish and L2-English. They found that children had longer MLUs in English than in Spanish on a narrative retell task. These children were also child L2 learners but had been exposed to English for an average of two years at the time of data collection. Based on these studies, however, it is not possible to determine if these results suggest that children's L2 morphosyntactic skills are rapidly developing and thus surpassing their L1 skills, whether children's L1s are rapidly undergoing attrition making their L2 skills look strong in comparison or both.

More insights about children's L2 development may, thus, be gained by comparing their MLUs with those of monolingual speakers. Studies have found that child L2 learners of both Dutch and English use shorter utterances than monolinguals (e.g., Blom, 2010; Hipfner-Boucher et al., 2015; Paradis & Kirova, 2014), suggesting that the child L2 learners have less developed

morphosyntactic abilities. This finding is expected because morphosyntax is known to be a particularly challenging aspect for child L2 learners (e.g., Blom, Paradis, & Sorenson Duncan, 2012; Chondrogianni & Marinis, 2011; Jia & Aaronson, 2003; Unsworth, 2013). However, other studies of MLU have suggested that children have comparable morphosyntactic development compared to their monolingual peers. For example, studies of child L2 learners of German, Norwegian and Hebrew have reported comparable MLUs between child L2 learners and monolinguals, suggesting unexpected and advanced L2 morphosyntactic development (e.g., Altman et al., 2016; Rodina, 2016; Wiechmann et al., 2016). As such, although MLU correlates with other measures of language development, it may be a more generous measure of development compared to, for example, elicitation tasks.

Productive vocabulary. Establishing L2 vocabulary is a daunting task for child L2 learners, because with every year of school, monolingual children develop more sophisticated vocabularies, and consequently child L2 learners "must catch up with a moving target" (Cummins, 2000, p. 36). To date, the majority of studies of L2 vocabulary development have focused on children's receptive skills (i.e., comprehension), as measured through standardized language measures (e.g., Golberg et al., 2008; Hammer et al., 2011; Hammer et al., 2012; Oller & Eilers, 2002; Paradis, 2011). Language sampling affords the opportunity to investigate children's productive L2 vocabulary abilities.

Three main measures are used to estimate children's productive vocabulary size from a language sample: total number of words (tokens), total number of unique words (types) and lexical diversity (e.g., type:token ratio). The number of tokens in a language sample is a raw count of the total number of words used by a child during the task. Reoccurrences of words count as additional tokens. Using this measure to compare groups of children reveals no differences

between monolingual children, simultaneous bilinguals and child L2 learners in the number of words used to complete a narrative task (e.g., Gagarina, 2016; Kunnari et al., 2016; Paradis & Kirova, 2014; Rodina, 2016; Uccelli & Páez, 2007). These findings may be interpreted as indicating very rapid L2 vocabulary acquisition by child L2 learners. However, the extent that longer stories reflect greater language abilities generally and larger vocabularies specifically is questionable (e.g., Muñoz, Gillam, Peña, & Gulley-faehnle, 2003; Uccelli & Páez, 2007). That is, the total number of words represents a measure of story length and there are many reasons, besides increased vocabulary size, that a story could be long.

A more sensitive measure of vocabulary development appears to be the number of unique words a child produces while telling a story (Uccelli & Páez, 2007). Some researchers have reported that bilingual children, both simultaneous bilinguals and child L2 learners, use a comparable number of unique words to their monolingual peers (e.g., Bedore et al., 2010; Rodina, 2016; Uccelli & Páez, 2007). Other research with child L2 learners suggests that these children use fewer unique words than their monolingual peers (e.g., Altman et al., 2016; Hipfner-Boucher et al., 2015; Paradis & Kirova, 2014; Wiechmann et al., 2016).

The number of different words produced by a child, however, is itself a raw count; consequently, it can also vary drastically on the basis of a child's verbosity (e.g., Mäkinen, Loukusa, Nieminen, Leinonen, & Kunnari, 2014; Ukrainetz & Blomquist, 2002; Wagner, Sahlén, & Nettlebladt, 1999). More talkative children will produce more types and tokens. For example, Bedore et al. (2010) reported a strong correlation between the number of different words children produced on a narrative re-tell task and the number of utterances they produced. As such, raw counts are biased in favor of verbose children, who may not actually have larger vocabularies. In place of these raw counts, a type:token ratio is often recommended as a lexical

diversity measure indexing vocabulary development (e.g., Malvern, Richards, Chipere, & Durán, 2004; Roy, Frank, & Roy, 2009). However, few researchers have employed such ratios in their estimations of child L2 learners' vocabulary sizes. One exception is Wiechmann et al. (2016), who examined the narratives of German L2 learners. They reported that German L2 learners, from diverse L1 backgrounds, had a significantly lower lexical diversity score compared to monolingual German-speaking children.

In summary, child L2 learners' vocabulary sizes, as estimated through narrative tasks, appear to vary drastically depending on the technique employed. In terms of story length (or total number of words), child L2 learners look as though they are precocious learners who have quickly "caught up" to their monolingual peers. When considering the number of unique words a child L2 learner employs, however, researchers have found their vocabularies may not be as advanced as the story length measure may suggest. Finally, when story length is taken into consideration through a lexical diversity measure (e.g., Wiechmann et al., 2016), child L2 learners productive vocabularies lag behind their monolingual peers. This latter finding is expected from studies of lexical acquisition that employ standardized tests of receptive vocabulary. As noted above, results from these tasks suggest that child L2 learners may need between three and five years of English input (at school) to reach native-speaker expectations (e.g., Golberg et al., 2008; Oller & Eilers, 2002).

Profile effects. Each of the above language abilities is necessary for children to tell an interlocutor a story. However, individual abilities may develop at different rates of acquisition. This differential rate has been referred to as profile effects and is often measured by a comparison to monolingual norms. That is, child L2 learners obtain high standard scores on some measures but low standard scores on others (e.g., Oller, Pearson, & Cobo-lewis, 2007;

Paradis & Kirova, 2014). Profile effects can be found across a variety of measures, including the linguistic sub-domains sampled through narratives. Within narratives, story grammar is often found to develop in advance of other abilities (e.g., Bedore et al., 2012; Gibson, Oller, Jarmulowicz, & Ethington, 2012; Gutiérrez-Clellen, 2002; Oller et al., 2007; Paradis et al., 2011; Paradis & Kirova, 2014; Pearson, 2002; Yan & Nicoladis, 2009).

A study by Paradis and Kirova (2014) illustrates the expected pattern of profile effects. They present data from several measures generated from a narrative task. The children in their study were child L2 learners who were enrolled in an English preschool program. These children had performance on par with native-speakers for story grammar (mean standard score = 9.76, expected mean for monolinguals = 10). In contrast, for MLU, these child L2 learners performed below what would be expected for monolingual children (mean standard score = 6.76, expected mean for monolinguals 10, range: 7-13). Similarly, Pearson (2002) reported that child L2 learners in the second grade had story grammars comparable to those of their monolingual peers, while their MLU and vocabulary acquisition lagged behind.

These studies exemplify instances in which L2 story grammar abilities developed in advance of L2-specific skills (e.g., Bohnacker, 2016; Schwartz & Shaul, 2013). Story grammar is widely considered to be a cognitive skill (e.g., a story has a plot in any language). This emphasis on cognitive abilities is important for understanding profile effects in child L2 learners. This is because child L2 learners are not the same as monolingual children. They are older, more cognitively mature, and have already acquired their L1 (e.g., Kohnert et al., 2010; Paradis, 2007). As such, child L2 learners have more extensive knowledge to draw on to assist them in acquiring the L2. Researchers have thus proposed that L2 skills that are based in real-world knowledge or that are highly related to cognitive-skills can be acquired more quickly in the L2 (e.g., Gutiérrez-

Clellen, 2002; Oller et al., 2007; Paradis et al., 2011). This advantage leads to, for example, higher-than-expected reading skills (e.g., Oller et al., 2007) or advanced story grammar (e.g., Paradis & Kirova, 2014).

Further evidence of the separation between cognitive abilities and language-specific skills can be found in Iluz-Cohen and Walters (2012). They reported on the narrative re-tell abilities of L1-English, L2-Hebrew children and found that language-specific abilities were correlated with each other (e.g., number of different words and MLU), but that story grammar did not correlate with these abilities in the children's L1 (English). That is, their results further illustrate that story grammar is distinct from language-specific abilities. However, Iluz-Cohen and Walters (2012) also reported that in the L2 (Hebrew) there were some correlations, which were not present in the L1 data, between story grammar and language development. As such, these results call into question the extent to which story grammar is independent of language development in the early stages of L2 acquisition.

Montanari (2004) also offers evidence that story grammar and language development may be more connected in the early stages of L2 acquisition. Her case study of three child L2 learners of English (L1-Spanish) revealed that children had high story grammar scores in their L1 at all testing periods, but that English story grammar skills appeared more gradually over the course of children's first year in preschool. That is, children demonstrated story grammar in their L1 but they could not demonstrate this same knowledge in their L2, until, as Montanari (2004) agues, they had sufficient L2 abilities. As discussed in the section on story grammar above, similar findings have been reported in larger scale studies of narrative development in child L2 learners (e.g., Gagarina, 2016; Gutiérrez-Clellen, 2002; Hipfner-boucher et al., 2015; Kunnari et al., 2016; Roch et al., 2016; Uccelli & Páez, 2007). Taken together, these findings suggest that

weaker language skills could limit children's abilities to demonstrate their cognitive abilities (like story grammar).

2.2. Determinants of Language Acquisition in Immigrant and Refugee Children.

As the previous section details, it is broadly the case that child L2 learners make rapid L2 gains in the first year of school, even if native-like attainment will take many more years (e.g., Paradis & Kirova, 2014; Saunders & O'Brien, 2006). However, at the individual level children vary in their L1 and L2 abilities. Bilingual children, and child L2 learners in particular, are also known to have more varied environments and input than their monolingual peers, and this variation has been shown to influence language acquisition (e.g., Gatt, 2016; Kohnert, 2010; Paradis & Grüter, 2014). In the case of this dissertation, the main aim is to understand how this variation influences acquisition. Specifically, the focus of inquiry is the relationship between maternal education, intermediary input variables and language development for this population of children.

Previous research has suggested that several environment-level variables are determinants of bilingual acquisition; they include (a) maternal education (e.g., Bohman, Bedore, Peña, Mendez-Perez, & Gillam, 2010; Hammer et al., 2012; Winsler, Burchinal, et al., 2014), (b) family size (e.g., Armon-Lotem, Joffe, Abutbul-Oz, Altman, & Walters, 2014) and (c) age of arrival in the host country (e.g., Blom & Bosma, 2016; Roesch & Chondrogianni, 2016). In addition, several input variables have also been reported to be determinants of acquisition. They include quantity of input variables, such as (d) months of exposure (MOE) (e.g., Paradis, 2011; Unsworth, 2013), (e) child's relative English output at home (e.g., Hammer et al., 2012; Paradis, 2011), (f) relative amount of English input from siblings (e.g., Bridges & Hoff, 2014), and (g)

relative amount of English input from the mother (e.g., G. Jia & Fuse, 2007; Unsworth, 2013). Finally, the quality of input children receive has also been shown to influence their development. These predictors include (g) mother's English fluency (e.g., Blom, 2010; Place & Hoff, 2011), (i) English richness at home (G. Jia & Aaronson, 2003; Paradis, 2011; Scheele et al., 2012) and (j) amount of screen time (e.g., Close, 2004; Uchikoshi, 2006).

This section reviews findings about the effects of the above listed determinants on acquisition and considers potential interdependencies between these factors. To date, research into the environment and input determinants of language acquisition has largely focused on one or two variables within a single study. For example, studies have often examined the quantity of input provided to children and the amount of linguistic output from children (e.g., Hammer et al., 2012; Unsworth, 2013). Previous studies have also been limited to examining a single language measure, often vocabulary (e.g., Hoff, Rumiche, et al., 2014) or omnibus tasks (e.g., Winsler, Burchinal, et al., 2014). This dissertation is unique in that it investigates multiple environment and input factors, considers the interdependencies between factors and examines multiple linguistic sub-domains.

2.2.1. Environment-Level Determinants of Language Acquisition

As Section 1.2 details, *environment* is used as an alternate term for *distal variables*. Environment refers to the situation in which children live and includes such factors as maternal level of education, immigration status, family size and age of arrival. The inclusion of age of arrival as an environment-level variable may at first seem surprising, given that age is often considered a child-internal variable related to cognitive maturity. However, as the subsequent section details, age of arrival is a variable which indexes a number of aspects of children's early

language experiences (i.e., the environment in which they live). As distal variables, environment-level determinants are assumed to influence acquisition through intermediary input variables (e.g., Hoff, 2006). However, to date, the majority of research on bilingual development has not considered the effect of environment within a multi-level approach. Consequently, as the following section shows, research has looked directly at the effect of environment on bilingual acquisition, without empirically investigating the intermediary input variables.

Maternal education. It is generally assumed that higher levels of maternal education will be associated with increased language abilities in children. This assumption, however, is based largely on studies of monolingual children (see Chapter 1). Existing research suggests that the relationship between maternal education and language development is more complicated for child L2 learners. That is, empirical evidence regarding how maternal education impacts acquisition for these children is varied. Some studies find the expected positive relationship between maternal education and bilingual development, i.e., children whose mothers have higher levels of education obtain higher scores on language measures (e.g., Golberg et al., 2008; R. Jia & Paradis, 2015; Winsler, Kim, et al., 2014). However, other studies report that children's language (especially L1) abilities decreased with increased maternal education (e.g., Bohman, Bedore, Peña, Mendez-Perez, & Gillam, 2010; Oller & Eilers, 2002). Furthermore, the impact of maternal education on children's emerging language skills varies depending on which of language is being studied (e.g., Gatt, 2016; Oller & Eilers, 2002; Rojas et al., 2016).

Maternal education and L1 acquisition in child L2 learners. The effect of maternal education on children's L1 maintenance and acquisition varies across studies. Some researchers in the United States, Europe and Canada have reported higher L1 abilities amongst children whose mothers had high levels of educations (e.g., Gatt, 2016; Hammer et al., 2012; R. Jia &

Paradis, 2015). For example, Hammer et al. (2012) reported that Spanish-English bilingual children with more highly educated mothers had higher Spanish story grammar scores on a narrative retell task. Other researchers in the United States have found that high levels of maternal education are associated with lower L1 proficiency in children, although notably in these studies maternal education was tested as a component of a socio-economic score and not as an individual factor (e.g., Bohman et al., 2010; Oller & Eilers, 2002). For example, Bohman et al. (2010) reported that children from lower socio-economic backgrounds had better Spanish morphosyntactic skills as indexed by an omnibus assessment. Finally, other researchers in the United States and Europe have reported null results for the effect of maternal education on children's L1 development (e.g., Alt, Arizmendi, & DiLallo, 2016; Hammer et al., 2012; Prevoo et al., 2014; Rojas et al., 2016). For example, Alt et al. (2016) found no significant relationship between maternal education and children's L1-Spanish skills (lexical diversity, MLU, syntactic complexity and story grammar) on a narrative re-tell task.

To explain their varied findings, researchers have offered several explanations. Some researchers have suggested that the particular social context in different geographic regions leads to differences in results (e.g., Eilers, Pearson, & Cobo-Lewis, 2006; Golberg et al., 2008; Hoff, 2013; R. Jia & Paradis, 2015). Researchers have also posited varied relationships between maternal education, linguistic input and children's L1 abilities, depending on their results. For example, R. Jia and Paradis (2015) found that maternal education was positively associated with L1 development. They proposed that mothers with higher levels of education are more likely to value their L1 and are thus more likely to speak this language with their children. Increased exposure supports children's continued L1 maintenance and acquisition (e.g., Hoff, Rumiche, et al., 2014). In contrast, Bohman et al (2010) found that maternal education was negatively

associated with L1 development. They posited that higher levels of education lead to greater integration into the L2 society, and that this leads to greater L2 use between mothers and children. Increased L2 exposure conversely means more limited L1 input and this leads to decreased L1 abilities among the children in their studies. These proposals highlight the need to better understand the interdependencies between maternal education and linguistic input. Further details on potential interdependencies are provided in Section 2.2.4.

Maternal education and L2 acquisition in child L2 learners. Studies of children's L2 development have reached more consistent findings than L1 studies. Children whose mothers are more highly educated tend to obtain higher L2 scores across a variety of measures, including vocabulary, morphosytnax, syntax, story-telling and omnibus measures of language development (e.g., Alt et al., 2016; Golberg et al., 2008; Hammer et al., 2012; Oller & Eilers, 2002; Rojas et al., 2016; Winsler, Kim, et al., 2014; Winsler, Burchinal, et al., 2014). This finding aligns with research with monolingual children that suggests that the effect of maternal education is a robust predictor of development (e.g., Hoff, Laursen, & Bridges, 2012; Hoff, 2006). It is important to note, however, that this effect may be less robust for child L2 learners because some researchers have not found a statistical relationship between maternal education and L2 development (e.g., Chondrogianni & Marinis, 2011; Gatt, 2016).

In summary, the relationship between education and bilingual development is more nuanced than it is for monolingual acquisition. This is further evidenced by the fact that some of the above-mentioned studies examined both of a child's languages and found that the effect of maternal education differed, depending on the language being studied (e.g., Alt et al., 2016; Gatt, 2016; Oller & Eilers, 2002; Prevoo et al., 2014; Rojas et al., 2016). For example, Rojas et al. (2016) reported that higher levels of maternal education were associated with children producing

longer English MLUs and a greater number of different English words (types) on a story-telling task. However, they found no relationship between maternal education and levels of Spanish-proficiency on the same task. Similarly, Oller and Eilers (2002) reported that children from higher socio-economic backgrounds (which included greater levels of maternal education) obtained higher English vocabulary scores but lower Spanish scores. These studies further illustrate that the relationship between maternal education and language development is not straightforward. In order to understand this relationship, other factors must also be taken into consideration, for example, as discussed in Section 2.2.4, the interdependencies between maternal education, children's linguistic input and their development are important for understanding the influence of maternal education on development.

A sampling bias for high levels of maternal education. Just as previous research often overlooked intermediary variables, it has also overlooked children whose mothers have low levels of education. Previous research has focused on children from highly educated families (e.g., Armon-Lotem et al., 2014; Blom, Paradis, & Sorenson Duncan, 2012; de Houwer, 2014; Hoff, Rumiche, et al., 2014; G. Jia, Chen, Kim, & Chan, 2014; R. Jia & Paradis, 2015; Oller & Eilers, 2002; Smyk, 2012). Furthermore, even when studies have included families with lower levels of education, they have defined *low* as any level below post-secondary education (i.e., high school or less) (e.g., Gatt, 2016; Hoff, 2006; Oller & Eilers, 2002; Paradis, 2011; Uccelli & Páez, 2007). For refugees from countries with prolonged conflict, such as Somalia, however, a high school education may be at the high end of the educational continuum (see Section 1.1).

A comparative summary of maternal education levels, presented in Figure 2.1, demonstrates the general skew in research sampling towards higher levels of maternal education in bilingual acquisition studies. This figure is based on the mean level of education in each study,

although in some cases the means were extrapolated from available details. It is meant to be representative of the sampling bias in acquisition research; however it is not a comprehensive illustration. Some studies had to be excluded from this visualization because, although their participant details are sufficient to illustrate the sample of children that they included, they do not provide sufficient details for inclusion in such a figure. For example, Bohman et al. (2010) report maternal education levels in terms of the percentage of mothers who did not completed high school, who completed high school and who attended post-secondary institutions. From this information, they provide a clear description of maternal education levels in their sample but it is not possible to extract a numeric average to plot in Figure 2.1.

It is important to note that not all of the studies presented in Figure 2.1 examined the effect of maternal education on children's language development. The included studies were specifically selected for the purposes of visualization because they provided sufficient participant information to plot in this figure. Crucially, they are representative of the populations of children typically studied. The grey bars represent previous research and the black bars indicate the mean level of education for the two groups included in this dissertation. As can be seen in this figure, there is a skew across the literature towards highly educated families. As such, it is necessary to empirically evaluate whether trends reported in research with high levels of maternal education extend to families who have lower education levels.

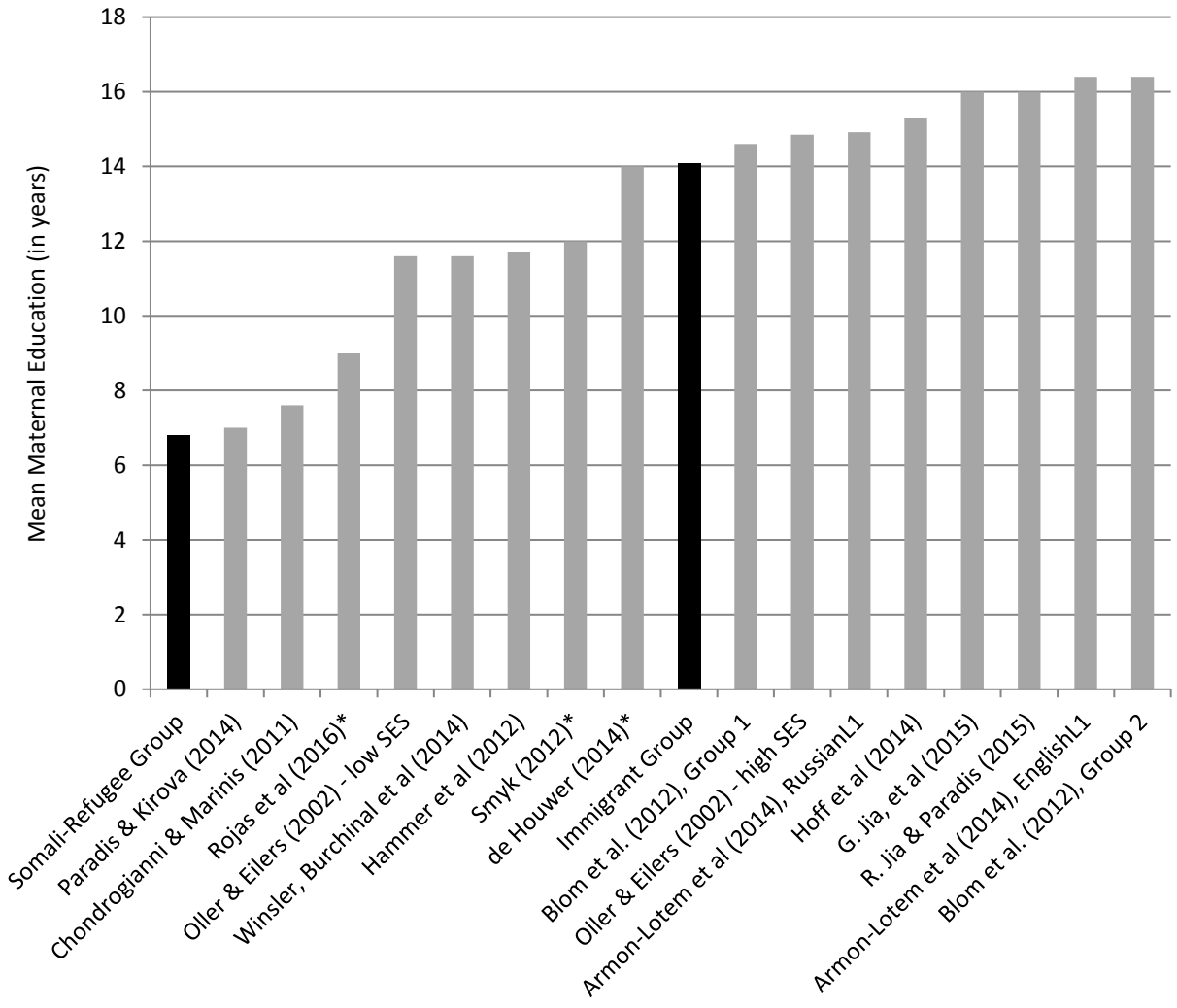

Figure 2.1 Comparison to Maternal Education across Studies
Grey bars represent past research and black bars represent this dissertation.
*Values provided for these studies are estimates based on the descriptions provided.

Immigration Status. As discussed in Section 1.1, one reason that most mothers in the Somali-refugee group have lower levels of education is that their access to education has been impacted by political unrest. As such, immigration status is an example of an environment-level variable that could indirectly influence language acquisition vis-à-vis its effect on maternal education. However, few studies have considered the impact of immigration status on bilingual acquisition.

Those researchers who have examined this variable have defined immigration status by generation (i.e., first or second generation). They have not considered whether families migrated as immigrants or refugees. Individuals who were born in the United States are more likely to use English with their children than those who were born abroad. This increased English language use translated into more advanced English skills for children whose parents were born in the United States (Hammer et al., 2012; Winsler, Burchinal, et al., 2014). While these generational differences reveal that there can be differences based on immigration status, it is also important to consider more details of families' migration backgrounds. Accordingly, in this dissertation, immigration status is defined broadly as whether the family migrated as immigrants or refugees.

A limited number of studies have examined language development in children from refugee backgrounds. Furthermore, surveying existing studies on this point is difficult because each country employs its own terminology for migrant families (see Section 1.1). It appears that, in general, children from refugee backgrounds learn the L2 quickly and that they are comparable in their language development to their peers from immigrant backgrounds. In terms of rapid acquisition, Paradis and Kirova's (2014) study included children whose L1s suggest that their families came from conflict-ridden regions (e.g., Sudan). The children in this study were in their first year of school, but nevertheless they had strong English skills, as indicated by the proximity of their English (L2) scores to native-speaker expectations.

A comparison across studies is necessary in order to highlight similarities between children from immigrant and refugee backgrounds. For an example of refugee-children's development, I use a study by Chondrogianni and Marinis (2011), who investigated the English tense inflection abilities of Turkish-speaking children in London. While Chondrogianni and Marinis (2011) do not describe their participants as being from a refugee background, the

Canadian government excludes Turkey from its list of safe countries (that is, places that do not normally produce refugees and that generally respect human rights) (Government of Canada, 2015). Furthermore, the maternal levels of education in Chondrogianni and Marinis' (2011) study are commensurate with those of the Somali-refugee group examined in this dissertation (see Figure 2.1). As such, the results from this study are taken as a potential example of language development in a refugee context. For an example in an immigrant context, I use Paradis, Tulpar and Arppe (2016) because the children in their study were of comparable age and had lengths of L2 exposure similar to those of the children in Chondrogianni and Marinis' (2011) study. Furthermore, these researchers used the same standardized language measure.

The children in Chondrogianni and Marinis' (2011) study were 7;8 years old and had been learning English for an average of 4;3. These children produced an average of 78.5% of third person singular forms correctly (on the Test of Early Grammatical Impairment). Paradis, Tulpar and Arppe (2016) studied Chinese-speaking children whose families came to Canada as immigrants. At 8;5 years of age and with 4;3 years of exposure to English, the children in this study produced a parallel percentage (80%) of third person singular forms correctly. In comparing these results, however, it is important to note some differences between participants in these studies. First, Turkish has tense inflections and Mandarin does not (Lin, 2001; Sezer, 2001). This difference in L1 typology should provide Turkish-speaking children with an advantage when learning English tense inflections (e.g., Blom et al., 2012). Second, the Mandarin-speaking mothers had a mean level of education of 14.6 years and the Turkish-speaking mothers had 7.6 years of schooling. The increased level of maternal education in the Mandarin-speaking group may have provided these children with language learning advantages (see the previous section). Even with these limitations in mind, however, the comparison of these

two studies suggests parallel performance across these two groups of child L2 learners, suggesting that it is appropriate to group immigrant and refugee children together, as has been done in this dissertation.

Family Size. Family size, which refers to the number of children in a family, is an often overlooked determinant of acquisition. Research has largely focused on the role of the mother in children's language development. For example, an academic database search retrieved 17 studies pertaining to language acquisition and input from siblings. Employing the same search criteria in the same database, except with the term "mother" replacing "sibling", generates fifteen times as many studies (262) (Linguistics and Language Behavior Abstracts, 2015). This bias may be problematic because children's early linguistic experiences are not comprised solely of interactions with their mothers. In many cases, siblings are children's first playmates and thus interactions with siblings form a substantial part of children's daily lives (Kramer & Kowal, 2005).

Presumably, the limited number of studies pertaining to siblings is a by-product of the type of families who are typically included in research samples. To date, the majority of children studied have been first-borns and, consequently, the number of siblings could not have been evaluated as an important factor in language learning. For example, in Place and Hoff's (2011) sample, 66% (19/29) of the children were first-borns or only children. Research with more varied samples, in terms of family size, is thus necessary to empirically investigate the role of siblings in children's language development. This research is especially necessary because existing studies suggest that siblings play an important role in language development (e.g., Bridges & Hoff, 2014; Hoff, Welsh et al., 2014; Hoff-Ginsberg & Krueger, 1991; Hoff-Ginsberg, 1998; Wong-Fillmore, 1991).

The presence of older siblings in particular has been reported to influence children's bilingual abilities. For example, Wong-Fillmore (1991) reported that the presence of school-aged siblings led to less L1 use, which had devastating effects on children's L1 skills. In line with this study, although possibly not as extreme in their conclusions, Hoff, Welsh, et al. (2014) reported that when siblings used more English, the target child experienced a decline in L1 (Spanish) abilities. As such, the presence of siblings appears to hinder L1 development for this population of children. In contrast, school-aged children speak more of the L2 (the language of their schooling) with their younger siblings compared to other members of the family, and this sibling input has been shown to positively impact toddlers' emerging L2 abilities (Bridges & Hoff, 2014; Hoff, Welsh, et al., 2014; Wong-Fillmore, 1991).

The finding that siblings play an important role in L2 development, however, is contested. Armon-Lotem et al. (2014) studied two groups of children learning Hebrew as an L2 (aged 4;4-6;1). For the Russian-Hebrew group, the number of siblings was found to negatively impact children's (L2) Hebrew abilities. For the English-Hebrew group, the number of siblings had no significant effect on children's (L2) Hebrew abilities. These two studies, therefore, produced three divergent findings. These discrepancies call for further explanation. One potential reason is that the type of analyses differed between these studies. Hoff, Welsh, et al. (2014) considered the effect of siblings on the relative language use of the family as well as on children's emerging L2 skills. Armon-Lotem et al. (2014), however, were interested in environment-level factors in language acquisition and consequently they considered the effect of the number siblings on children's emerging L2 skills, but did not consider the effect of siblings on language use in the family.

Other notable differences may also be important for interpreting the divergence between these studies. Most notably, Hoff, Welsh, et al. (2014) reported on language acquisition in toddlers (30 months of age or less); whereas Armon-Lotem et al. (2014) reported on preschoolers (aged: 4;4-6;1). Thus, it is possible that siblings are more crucial sources of input for younger L2 learners. In the case of this dissertation, the children are more comparable in terms of age to the youngest children in Armon-Lotem et al. (2014).

The social context in which the children in these studies live also differed. Not only were different languages spoken in each of these contexts, but the families came from different socio-economic backgrounds. Hoff, Welsh, et al. (2014) describe the Spanish-English participants in their sample as "advantaged bilinguals," in part because of the high education level of parents. The English-Hebrew families were also reported as being advantaged (in this case because migration was by choice and because families already had a shared identity with the new country [Armon-Lotem et al., 2014]). The Russian-Hebrew families described in Armon-Lotem et al. (2014) appear to have been more disadvantaged than the other bilingual families. However, given that across these three samples, three different results were found (i.e., one with a positive impact of siblings on L2 development [Spanish-English, Hoff, Welsh, et al., 2014]), one with null results on this point [English-Hebrew, Armon-Lotem et al., 2014]) and one with negative results [Russian-Hebrew, Armon-Lotem et al., 2014]), it is unclear what relationship might exists between socio-economic status and the number of siblings in L2 acquisition. In summary, these conflicting findings, paired with the diversity in children sampled, emphasize the need to investigate family size within a multi-level framework where information about the families' backgrounds can also be considered.

Age of Arrival. In this dissertation, age of arrival is operationalized as a categorical variable: participants were labelled as Canadian born or foreign born. Importantly, children's age of arrival may not correspond with their age of onset of L2 acquisition, because even Canadian-born children can receive limited English input prior to schooling. As such, the age of arrival is not an index of children's cognitive maturity at the onset of L2 acquisition. Instead, age of arrival provides insights into the broader communities in which children spent their early years and context is important for understanding acquisition (e.g., Hoff et al., 2012; Marinova-Todd, Marshall, & Snow, 2000).

The early language learning context in which Canadian-born and foreign-born children began acquisition is very different. Canadian-born child L2 learners' early experiences consist mainly of L1 input and primarily from their parents. These children may receive some sporadic English exposure through the larger community or television, although this exposure seems to be of trivial importance. In fact, past research suggests that such sporadic exposure is unlikely to influence children's L2 acquisition (e.g., Paradis & Kirova, 2014; Paradis et al., 2016; Unsworth, 2013; Unsworth, et al., 2014). For example, Paradis and Kirova (2014) found no differences between Canadian-born and foreign-born preschool children's L2 narrative scores, suggesting that the Canadian-born children did not benefit from any sporadic English input that they received prior to starting school.

Foreign-born children spend their early years in an environment where their L1 is the majority language. Consequently, their linguistic experiences are more diverse. For example, they are likely to have heard the L1 spoken by more people in more contexts and previous research has shown that input from multiple sources is an important predictor of children's L1 development (e.g., Hammer et al., 2012; Hoff, Welsh, et al., 2014; Place & Hoff, 2011). In

summary, although no differences are predicted between Canadian-born and foreign-born children in their L2 development, children who are foreign-born are predicted to have advantages in L1 abilities because their early experiences have included greater opportunities to learn the language (G. Jia, Aaronson, Young, Chen, & Wagner, 2005; G. Jia & Aaronson, 2003; R. Jia & Paradis, 2015; Montrul, 2008).

2.2.2. Quantity of Input as a Determinant of Language Acquisition

Quantity of input, which refers to the amount of language children hear, has been related to children's emerging linguistic abilities. The more language children hear, the more developed their language skills will be (e.g., Bates, Dale, & Thal, 1995; Hart & Risley, 1995). In bilingual and child L2 studies, quantity of input has been measured in several ways. For example, the length of time children have been in school provides an index of cumulative L2 exposure. Not surprisingly, children with longer L2 exposure have higher L2 vocabulary scores and greater L2 morphosyntactic abilities (e.g., Paradis, 2011). Another measurement is relative quantity of input. Bilingual children's input is divided between their two languages; *relative input* refers to the proportion that each language is used. Differences in these relative amounts have been related to children's performance on aggregate measures of L2 development (e.g., Collins et al., 2014) and in some cases to children's emerging L2 tense morphology (e.g., G. Jia & Aaronson, 2003; G. Jia & Fuse, 2007; Unsworth, 2013). However, such variation in relative language use at home has been reported as non-significant in other studies of children's emerging L2 vocabulary and tense morpheme abilities (e.g., Chondrogianni & Marinis, 2011; Golberg et al., 2008; Paradis, 2011).

In considering the above mentioned studies, however, it is important to note that each study aggregates information about quantity of input in its own way. Differences in the components measured could underlie the differences in results (i.e., positive or null results). For example, G. Jia and Fuse (2007) used an aggregate measure that included both quantity- and quality-based measures of input. In contrast, Golberg et al. (2008) and Paradis (2011) used a tabulation based strictly on the relative quantity of language use within the family. Based on this comparison, it seems that quality of input may be of greater importance for child L2 learners' acquisition than quantity of input because G. Jia and Fuse (2007) found a significant relationship between their measure and children's language development, while Golberg et al. (2008) and Paradis (2011) did not. Further details about quality of input are provided in Section 2.2.3. At the moment, it is important to consider the components of aggregate measures so as to determine how input facilitates language acquisition for child L2 learners and what role quantity of input has in this process.

Another example of aggregation is the common practice of averaging language use across all speakers, including the child, in the household to generate a single relative use measure (e.g., Blom et al., 2012; Chondrogianni & Marinis, 2011; Golberg et al., 2008; G. Jia & Fuse, 2007; R. Jia & Paradis, 2015; Unsworth, 2013). A potential problem with this approach is that different family members may have different impacts on children's language development. In particular, the proportion that the target child uses the L2 at home seems to be more important than the proportion the child hears the L2 at home (e.g., Hammer et al., 2012; Paradis, 2011). To investigate the specific relationship between individual speakers and children's language development, this dissertation divides relative quantity of input into three components: (a) output from the child, (b) input from siblings and (c) input from the mother. Cumulative exposure is

considered separately and is estimated as the number of months that children have been in school.

Months of exposure to the L2. Months of exposure (MOE) to the L2 is a cumulative variable that provides an index for the amount of experience children have had with the language at school. In this dissertation, children's length of study corresponds with the length of time children have received consistent and significant exposure to the language (e.g., Paradis, 2011; also see Sections 2.2.1 and 3.1). Cumulative measures of input have been shown to influence individual differences in children's emerging language abilities, including their L2 (e.g., Unsworth, 2013). For example, bilingual children's input is divided between two languages and monolingual children's input is not. Therefore, monolingual children have had greater cumulative experience with their single language. This reduced input (i.e., less quantity) has been connected to lower language scores in simultaneous bilingual children (e.g., Nicoladis, Palmer, & Marentette, 2007; Paradis, Nicoladis, Crago, & Genesee, 2011; Unsworth, 2013; Wiechmann et al., 2016). For example, Wiechmann et al. (2016) reported that simultaneous bilingual children had lower complex syntax scores and smaller vocabularies compared to their monolingual German-speaking peers. Child L2 learners have also had less input compared to both their monolingual and simultaneous bilingual peers, resulting in L2 performance lower than that of both of these groups (e.g., Blom, 2010; Gagarina, 2016; Oller & Eilers, 2002; Paradis et al., 2013; Roesch & Chondrogianni, 2016; Wiechmann et al., 2016). As such, these group comparisons point to a robust effect of cumulative exposure.

Examining individual differences within a group of child L2 learners also demonstrates that children who have had longer L2 exposure demonstrated greater L2 abilities (e.g., Altman et al., 2016; Blom et al., 2012; Blom & Paradis, 2015; G. Jia & Fuse, 2007; Paradis, 2011;

Unsworth, 2013) For example, G. Jia and Fuse (2007) investigated children's use of inflectional morphemes. The children in their study were Mandarin-speaking children learning English as a L2 in the United States. Their longitudinal study demonstrated that children make steady gains in their accuracy with tense morphemes with increased exposure. To illustrate this point, consider Anna, the youngest participant in their study (five years old at the onset of the study). Despite obligatory contexts for the third person singular inflection, she did not produce this morpheme in her first session, at three months of exposure. However, by 39 months of exposure, Anna had mastered this morpheme (G. Jia & Fuse, 2007, see Figure 1, p. 1288 and Table 2, p. 1294). It is important to note that these researchers defined mastery as 80% correct in obligatory contexts, which is a slightly more liberal criteria than the typical 90% accurate established by Brown (1973). More relevant than the exact definition is the fact that with increased exposure, Anna and the other children in G. Jia and Fuse's (2007) study made substantial gains in their English (L2) development.

Relative quantity of L1/English output from the child at home. The relative amount of output from children is an often overlooked aspect of language use in the home. However, the amount a child speaks each language impacts both their L1 and L2 development, with more output being associated with more advanced language skills (Bedore et al., 2012; Bohman et al., 2010; Paradis, 2011; Rojas et al., 2016). In fact for L2 development, the relative amount of output in the L2 at home appears to be more important as a source of individual difference than the relative amount of input children receive. For example, Bohman et al. (2010) and Paradis (2011) reported null results for L2 input at home on children's semantic, morphosyntactic and lexical scores. However, they found that children's output was positively and significantly related to these L2 skills.

Relative quantity of L1/English input from siblings. As discussed in Section 2.2.1, linguistic input from siblings remains an understudied factor in bilingual language development. Yet, siblings are an integral part of children's daily lives, and their interactions with siblings have been reported as an important factor in language learning for both monolingual and bilingual children (e.g., Bridges & Hoff, 2014; Hoff, Welsh, et al., 2014; Hoff-Ginsberg & Krueger, 1991; Hoff-Ginsberg, 1998; Rojas et al., 2016; Wong-Fillmore, 1991). Older siblings, in particular, have been shown to influence children's language development because older siblings speak more of the L2 (the language of their schooling) with their younger siblings compared to other members of the family. This sibling input has been shown to impact children's emerging L2 abilities (Bridges & Hoff, 2014; Hoff, Welsh, et al., 2014) and their developing L1 skills (Rojas et al., 2016). In fact, for child L2 learners in kindergarten, Rojas et al. (2016) reported that input from older siblings was more important than maternal input as a source of individual differences in L1-Spanish and L2-English MLUs and L2-lexical scores on a fictional narrative elicitation task.

Relative quantity of L1/English input from the mother. Research with monolingual children has consistently shown that increased input from mothers has a positive impact on children's language acquisition (e.g., Hart & Risley, 1995; Hoff, 2006). The same relationship is expected for child L2 learners' acquisition; that is, increases in the quantity of L1 and L2 input will lead to increases in children's language abilities. However, research into the relationship between bilingual development and the relative quantity of input has not reached a consensus (e.g., Bohman et al., 2010; R. Jia & Paradis, 2015; Páez, Tabors, & López, 2007; Rojas et al., 2016).

It is difficult to determine the precise role of maternal input in L1 development of child L2 learners because, as noted above, it is common practice to aggregate relative input scores across all speakers in a family. As such, the impact of individual speakers, such as the mother, on children's L1 development is difficult to ascertain. Presumably, maternal input is an important part of aggregate scores, and consequently such studies are considered as evidence for the role of maternal input. Crucially, these studies have generated mixed results. The majority of researchers have reported that increases in the relative quantity of L1 input children receive corresponds with increases in their L1 morphosyntax abilities and L1 vocabularies (e.g., Bohman et al., 2010; Mueller Gathercole et al., 2015; Place & Hoff, 2011; Prevoo et al., 2014). However, R. Jia and Paradis (2015) reported null results for the relationship between the relative language input children received and their Mandarin development.

Mixed results have also been reported for the relationship between L2 maternal input and the emerging L2 skills of child L2 learners. However, once again, aggregate input scores make it difficult to ascertain the role of maternal input specifically. On one hand, several studies have demonstrated a positive relationship between relative L2 input and receptive vocabulary, productive vocabulary, morphosyntactic development and language comprehension (e.g., Blom, 2010; Collins et al., 2014; Dijkstra, Kuiken, Joran, & Klinkenberg, 2016; Hurtado, Grüter, Marchman, & Fernald, 2014; G. Jia & Aaronson, 2003; G. Jia & Fuse, 2007; Mueller Gathercole et al., 2015; Prevoo et al., 2014; Unsworth, 2013). On the other hand, several other studies have reported null results for the relationship between relative L2 use at home and children's emerging L2 skills (e.g., Chondrogianni & Marinis, 2011; Golberg et al., 2008; Páez et al., 2007; Paradis & Kirova, 2014; Paradis, 2011; Rojas et al., 2016). As such, further empirical studies, which in general investigate the circumstance under which relative language input supports

language development for child L2 learners and more specifically that consider the role of maternal input, are needed.

2.2.3. Quality of Input as a Determinant of Language Acquisition

Given the prevalence of findings that suggest maternal input is crucial to monolingual children's development, the conflicting results, noted above, about the role of relative quantity of input in bilingual development are surprising. One possible explanation is that the quality of linguistic input – the richness of the vocabulary and sentence structure – that children receive is as important, if not more so, than the quantity of input they receive (see Sections 1.2 and 2.2.2). R. Jia and Paradis (2015) found that the richness of the Mandarin input at home, defined as diversity in sources of input, was an important predictor for children's L1 development. In contrast, they found null results for the role of relative linguistic input. Similar suggestions have also been made for the role of quality of input in other studies of children's L2 development (e.g., Golberg et al., 2008; G. Jia & Fuse, 2007; Paradis, 2011; Prevoo et al., 2014). As such, consideration must be given to the quality of input children receive. In this dissertation, three *quality of input* variables are considered: (a) maternal L2 fluency, (b) language richness, and (c) screen time.

Mother's English fluency. Children from immigrant and refugee backgrounds often have mothers who are L2 learners of English. Adult L2 learners are known to vary greatly in their L2 proficiency, and this variation has been suggested as a possible determinant of children's L2 abilities (e.g., Golberg et al., 2008). For example, adult L2 speakers are known to omit grammatical morphemes (e.g., Larsen Freeman, 1975); as a consequence, parents with limited fluency in English may not be providing their children with sufficient exemplars of these

morphemes to support morphosyntactic development (e.g., Chondrogianni & Marinis, 2011; Hammer et al., 2012; Hoff et al., 2014; Paradis, 2011). The frequency with which child L2 learners hear articles, for instance, has been shown to influence their development of this system (e.g., Zdorenko, 2011), and adult L2 learners often struggle with the details of the article system in their L2 (e.g., Ionin, Zubizarreta, & Philippov, 2009). As such, mothers with lower fluency may not provide children with frequent and appropriate examples of English article use. English referring expressions for character introductions, as noted above, rely on the appropriate use of indefinite articles (see Section 2.1.2). Maternal fluency is, thus, predicted to be an important determinant of children's emerging L2 abilities, in particular in regards to morphosyntactic development.

Language richness at home. Without recordings of children's interactions at home, it can be difficult to ascertain the quality of input that children receive at home. One solution to this problem is to generate language richness scores, which estimate the amount of time children spend engaged in activities that are known to be associated with high quality input (e.g., reading) (e.g., G. Jia & Fuse, 2007; Karlsen et al., 2016; Paradis, 2011; Scheele et al., 2010, 2012). These scores are frequently aggregate measures of input quality that cover a wide range of experiences, including reading, screen time and extracurricular activities. These aggregate measures have been shown to predict children's emerging L2 abilities with tense morphology. For example, Paradis (2011) reported that a language richness score significantly predicted children's L2 production of grammatical morphemes. Similarly, G. Jia and Fuse (2007) reported that their cumulative language richness score predicted children's L2 accuracy with the third person singular and past tense inflections in English. Once again, however, further research is needed to

determine which components of these cumulative (or aggregate) language richness measures impact children's L2 morpheme acquisition.

In this dissertation, the language richness score was restricted to components that pertain to language-based activities at home. It did not include measures of screen time or language experiences outside the home; it considered only the amount of reading, story-telling and singing activities that the child engaged in each week in each language (see Section 3.2.1). Although each of these abilities has been positively associated with children's language development, the most significant attention has been given to the role of reading in oral language development, with a number of researchers reporting that increased reading (or being read to) is positively associated with children's emerging bilingual skills (e.g., Doughty & Williams, 1998; R. Jia & Paradis, 2015; Karlsen et al., 2016; Prevoo et al., 2014; Scheele et al., 2010, 2012). As such, language richness is predicted to be associated with children's bilingual development.

Screen Time. Viewing educational television programming has been associated with increases in language development (e.g., Close, 2004; Uchikoshi, 2006). For child L2 learners in particular, increasing screen time has been hypothesized as a means to boost the amount of native-speaker input children receive; thus, it has been included in language richness scores, as outlined in the previous sub-section (e.g., Paradis, 2011; Scheele et al., 2010). Although these aggregate scores have been shown to be positively related to children's language development (e.g., R. Jia & Paradis, 2015; Paradis, 2011), the specific role of screen time is unclear. For example, Scheele et al. (2010) did not find a relationship between children's L1 or L2 development and time spent watching television. Furthermore, high quantities of television watching have been associated with depressed expressive language scores and even language delays in monolingual children (e.g., Chonchaiya & Pruksananonda, 2008; Close, 2004).

Consequently, it is important to empirically investigate the precise role of television in bilingual children's development.

2.2.4. Interdependencies between Determinants

The previous section highlights a number of important determinants of bilingual acquisition. However, as Section 1.2 details, these factors do not exist in isolation from each other. In fact, from a social interactionist perspective, multi-level interdependencies between variables are expected (see Figure 1.1); that is, environment-level factors are predicted to influence more proximal input factors, which in turn are predicted to influence language acquisition. For example, in research on monolingual children, maternal level of education has been shown to influence both the quantity and quality of input children receive (e.g., Hart & Risley, 1995; Hoff-Ginsberg, 1998). The remainder of this section details possible interdependencies between determinants specifically related to bilingual children's acquisition, with a particular emphasis on the relationship between maternal education and linguistic input.

Maternal education and mother's relative language use. Existing studies provide conflicting evidence of the relationship between mother's education and her relative quantity of language use. For example, Prevoo et al. (2014) reported that higher levels of maternal education were associated with greater L2 (Dutch) and less L1 (Turkish) use among bilingual families in the Netherlands. This trend was also noted amongst Spanish-English bilingual families in the United States, where education was associated with higher proportions of English use (e.g., Bohman et al., 2010; Oller & Eilers, 2002; Winsler, Kim, & Richard, 2014). However, other studies have reported the opposite effect: more highly educated mothers were more likely to speak the L1 and not the L2 (e.g., Golberg et al., 2008; Hammer et al., 2012; R. Jia & Paradis,

2015; Mueller Gathercole, Kennedy, & Thomas, 2015). Thus, in child L2 acquisition, the interdependencies between maternal education, the input children receive and their emerging L2 abilities are not straightforward.

One potential reason for this complexity is mothers' previous experiences may differ in significant ways. For example, some research suggests that the language of mothers' education may have greater influence on children's emerging language abilities than her actual amount of education (e.g., Hoff & Giguere, 2015). As such, one potential explanation for the above noted discrepancies is that increased L2 use is related to increased education when mothers have had L2-medium education, as was the case for the mothers in Prevoo et al.'s (2014) study. In contrast, increased education levels are likely to be associated with increased L1 use when mothers were educated in the L1 prior to migration, as was the case for the first generation immigrants in Hammer et al.'s (2012) study. Such detailed information about parental background, however, is rarely included in the participant details of child acquisition research papers and consequently, it is not possible to fully evaluate whether such differences in the language of education might underlie conflicting results as to the relationship between maternal education and relative language use. Further empirical investigations are necessary to disentangle the relationship between amount of education, language of education and relative language use by mothers. These factors are also connected to maternal L2 fluency levels.

Maternal education and maternal English fluency. It would appear that the more education a parent has received in the L2, the better their L2 proficiency will be and hence the more effectively they can model the L2 for their children (see Section 2.2.3). However, this connection between education and fluency is largely taken for granted. Research explicitly testing this prediction is scarce. Existing research suggests that the fluency levels of Spanish-

English mothers is linked to the amount of education and the location of where that education was completed (e.g., Bohman et al., 2010; Hammer et al., 2012; Hoff & Giguere, 2015). Crucially, the location of education is synonymous in these cases for the language of that education. Bohman et al. (2010) found that parents who were more likely to have been educated in Spanish-speaking countries had children with higher Spanish language scores, presumably because these parents provided higher quality Spanish input to their children. In terms of L2 development, Hammer et al. (2012) reported that parents who were more likely to have been educated in the United States had children with higher English scores, presumably because the parents had more advanced English fluency and provided higher quality input. In summary, maternal fluency, like maternal relative language use, is predicted to be connected to both the amount of education and the language of that education.

Other influences on maternal language use. In addition to the influence of education on the relative proportion with which mothers use a language and on their L2 fluency, other influences are also expected. That is, a mother's language use patterns are predicted to develop within her own developmental contexts (i.e., "circles of environment and input"). In terms of mother's relative language use, mothers are influenced by the language use patterns of their interlocutors. For example, mothers and caregivers have been shown to speak more English with their children when their children speak more English, particularly once there are school-aged children in the home (e.g., Bridges & Hoff, 2014; Eilers et al., 2006; Shin, 2002). Mothers are also more likely to speak the L2 as their proficiency increases (Place & Hoff, 2011), and when they have lived in the host country longer (e.g., Chiswick & Miller, 1994; Chiswick, 2009), particularly if they have opportunities to use the language with native-speakers (e.g., through work or school) (Derwing, Munro, & Ron, 2008). As such, there are a number of other variables

that could simultaneously influence the relative language use of mothers, beyond her education levels.

In terms of mothers' L2 fluency, greater exposure, particularly in naturalistic settings (i.e., outside the classroom) has been associated with greater fluency for adult L2 learners (e.g., Chiswick & Miller, 1994; Chiswick, 2009; Collentine & Freed, 2004; Derwing, Munro, & Ron, 2008). One source of greater exposure for these mothers could come from the relative language use patterns of their children, particularly, school-aged children, who are the most likely family members to have more advanced English skills (Collentine & Freed, 2004; Tseng & Fuligni, 2000). Greater exposure could also arise from having lived in Canada for a longer period of time and from attending school or working in English. As such, as was the case for relative language use, L2 fluency is also predicted to vary based on the simultaneous influence of a number of factors, not just maternal education levels.

Influences on home activities. In addition to the linguistic input that comes from conversations with their mothers, children also receive linguistic input through other daily activities, including reading, story-telling and television viewing. These are all examples of home language actives that can enhance the quality of language input children receive (see Section 2.2.3). Existing research suggests that families' regular activity patterns can be influenced by maternal education levels and by the value that family members place on each language. In the case of maternal education levels, Prevoo et al. (2014) reported that mothers with higher levels of education read more frequently with their children than mothers with lower levels of education. In terms of the value of each language, it has been hypothesized that mothers who speak more of the L1 at home place a higher value on the L1 (Hammer et al., 2012; R. Jia & Paradis, 2015). As such, it is plausible that mothers who speak more of their L1 at home are also

likely to encourage a greater amount of L1 reading, story-telling, signing and screen time (and conversely less L2 activities). Similarly, children's relative language output may indicate more broadly their preferred language (Armon-Lotem et al., 2014), and this preference may be reflected in the amount that they engage in English-based language activities. In regard to screen time in particular, children may also be influenced by their siblings' preferences. For example, the presence of older siblings has been reported to affect the television programs watched by younger children (Zimmerman, Christakis, & Meltzoff, 2007). As such, older siblings who attend English-schooling may introduce more English television programs to the child. In summary, the language activities patterns of families are predicted to be simultaneously influenced by a number of factors.

Influences on the relative language use of children. Thus far, interdependencies have been considered in terms of the ways in which factors interact to influence the language input children receive. However, as noted above (see Section 2.2.2), children's language output may be a stronger determinant of their L2 abilities than the L2 input they receive at home (e.g., Bohman et al., 2010; Paradis, 2011). As such, in order to generate a comprehensive description of the interdependencies between environment, input and language acquisition, it is also necessary to consider the factors that influence the language use patterns of children. Previous research suggests that the language use patterns of family members influence each other (e.g., Ghimenton, Chevrot, & Billiez, 2013) and that even young children are known to adapt the frequency with which they use a particular language to match that of their interlocutors (e.g., Genesee, Boivin, & Nicoladis, 1996; Genesee, Nicoladis, & Paradis, 1995; Paradis & Nicoladis, 2007). In particular, older siblings are likely to increase the English language use of other family members, including other children (Bridges & Hoff, 2014; Wong-Fillmore, 1991). Additionally,

child L2 learners are influenced by the larger society around them (Paradis, 2017). For example, researchers have noted increased English (majority-language) use amongst children once they have started school in the majority language (e.g., Hoff, Rumiche, et al., 2014). Thus, children's language use patterns are the result of complex interactions between a number of factors.

Summary of Interdependencies. In taking a social interactionist approach to bilingual development, this dissertation emphasizes the need to consider interdependencies between variables. This section has highlighted the fact that maternal education is an environment-level variable which potentially influences the language use patterns of mothers and their L2 fluency. These determinants, in turn, influence the specific linguistic input children receive, leading to variation in children's emerging language abilities. Additionally, the language-enriching activities of families and the language use patterns of children also vary according to the specific social context of these families (i.e., environment- and input-level factors). Taken together, this section has highlighted that determinants of acquisition do not influence language acquisition in isolation of each other. Instead, these factors are part of an interwoven social system, which this dissertation seeks to detail.

2.3. Research Questions

A social interactionist perspective on language acquisition predicts interdependencies between maternal education, linguistic input and children's bilingual development. However, these predictions are largely based on studies of language acquisition in monolingual children (e.g., Hart & Risley, 1995). This dissertation examines these interdependencies in a group of child L2 learners who are learning English (the majority language) as a L2 (see Section 1.1).

The environment and input of child L2 learners is varied (Paradis & Grüter, 2014) and this diversity may underlie the mixed results for maternal education as a determinant of bilingual development (see Section 2.2.1). Some researchers have hypothesized that higher maternal education is linked to more L2 use and consequently lower L1 outcomes and higher L2 outcomes (e.g., Bohman, Bedore, Peña, Mendez-Perez, & Gillam, 2010; Oller & Eilers, 2002; Prevoo et al., 2014; Winsler, Kim, & Richard, 2014). Others have reported that higher maternal education is linked to greater L1 use, which supports the L1, but has marginal to negative impact on the L2 (e.g., Golberg et al., 2008; Hammer et al., 2012; R. Jia & Paradis, 2015; Mueller Gathercole, Kennedy, & Thomas, 2015). As such, the first research question addressed in this dissertation is: **(1) Is maternal education a determinant of children's L1 and L2 Development? If so, are higher levels of education associated with higher language scores?**

It is important to note that maternal education is an environment-level variable (see Figure 1.1). As such, the influence of maternal education on acquisition is predicted to be mediated through its influence on the linguistic input children receive (Hoff, 2006). The second research question, which speaks directly to this prediction, is as follows: **(2) Does maternal education impact the linguistic input migrant children receive at home? If so, does maternal education have the same effect on the linguistic input provided to immigrant compared to refugee children (see Section 1.1)?**

Maternal education is not expected to be the sole determinant of linguistic input. The bioecological model, which underlies the social interactionist framework, also predicts that multiple variables will interact to generate the specific linguistic input children receive (Bronfenbrenner & Morris, 2006; Hoff, 2006) (see Section 1.2). For example, the amount of English input mothers provide to their children could be influenced by a number of factors in the

mother's life, including: her L2 proficiency (Place & Hoff, 2011), the length of her residency in Canada (e.g., Chiswick & Miller, 1994; Chiswick, 2009), and whether she works or attends school in English (Derwing et al., 2008) (see Section 2.2.4). As such, as a follow up to Question 2, this dissertation also asks: **(3) Besides maternal education, what other variables influence the linguistic input children receive at home?**

Demonstrating a relationship between mother's level of education and other intermediary input variables provides only part of the picture as to how maternal education impacts acquisition. As discussed above, maternal education is predicted to influence acquisition through its impact on maternal input. That is, maternal input is hypothesized to be the intermediary variable between maternal education and bilingual development, as has been shown for monolingual children (e.g., Hart & Risley, 1995). However, previous research has suggested that maternal input may not influence L2 development to the same extent as for monolingual children (e.g., Golberg et al., 2008; Hammer et al., 2012; Paradis, 2011). Thus, the next research question asked is: **(4) Do these intermediary environment and input factors determine children's L1 and L2 development?**

The answers to the above research questions each provide one piece of the overall puzzle. However, the puzzle is not complete without demonstrating that each piece fits together into a plausible picture. As such, the final research question asks: **(5) Do the results presented to address Question 1 align with the results presented to address Questions 2, 3 and 4?** For, example, findings would be considered to align if maternal education positively influenced L1 scores (RQ1), maternal education positively influenced input from mothers (RQ2), and maternal input positively impacted L1 scores (RQ4). If these parallel patterns are found, then it is reasonable to conclude that maternal education influences children's development through this

intermediary variable. However, if the relationships do not align, then the effect of maternal education on acquisition cannot be mediated by that input variable. For example, findings would be considered misaligned if maternal education positively influenced L1 scores (RQ1), maternal education negatively influenced input from mothers (RQ2), and maternal input positively impacted L1 scores (RQ4).

3. Method

This dissertation is a cross-sectional study of 89 children from immigrant and refugee backgrounds. Data came from both parental interviews and a fictional narrative elicitation task; as detailed below, all were established in previously published research. This chapter provides detailed information about the research design. Specifically, this chapter details the children who participated in the study (Section 3.1) and the instruments that were used, including the data collection and scoring protocols (Section 3.2). Details about the statistical analyses can be found in Section 3.3.

3.1. Participants

Participants were 89 typically-developing children who spoke their L1 at home and were learning English as an L2, primarily through schooling. Children were on average 5;0 years old (SD = 4.17 months) and had an average of 12.72 months of exposure to English in school (MOE; SD = 8.44 months). All of the children had foreign-born parents. Thirty-two of the children were also foreign-born. Children were all typically-developing language learners and there was no indication any hearing difficulties or cognitive impairments.

Detailed information about children's environment and input was gathered using the Alberta Language Environment Questionnaire (ALEQ: Paradis, 2011) (see Section 3.2.1). In terms of environment-level variables, information was collected about mother's level of education, family size, mother's length of residency in Canada and the child's age of arrival (foreign-born or Canadian-born). There was a large amount of variation within the sample in maternal level of education. The average number of years of education was 11.95 years (SD = 5 years), with 51 mothers reporting that they had not completed any post-secondary training (25

had completed high school, 8 had the equivalent of a junior high education (grade 9), 12 had attended elementary school, and 6 had no experience with formal education) and 38 mothers reporting that they had completed some post-secondary training (9 had completed college diplomas, 18 held bachelor degrees and 11 had received graduate degrees). Further details about maternal education can be found in Section 3.1.1. Variation was also noted for family size, ranging from some children (n = 10) who had no siblings to one child who had seven siblings. The mean number of siblings was 2.08 (SD = 1.63). Finally, the amount of time that mothers had lived in Canada ranged from some families who had been in Canada for less than one year to others having arrived more than a decade before data collection (mean = 8 years; SD = 6.5 years; range = 0.5-26 years).

In the case of input-level variables, information included the relative amount of English spoken by family members, the amount of time children had been in school (MOE) and quality of input variables. For relative language use, it is worth-noting that these households were all bilingual. As such, the relative amount of L1 spoken within these families was calculated as one minus the amount of English that was spoken. For example, if a mother's input to her child was comprised of 0.40 English (i.e., 40%), than 0.60 (i.e., 60%) of her input to the child was in L1. For the quality of language input measure, reading, story-telling and singing were combined into two home language richness scores: one for English and one for the L1 (see Section 3.2.1). Screen time was also calculated as a separate quality of input variable. However, it is worth-nothing that screen time in the L1 was limited for most children: 53/89 children had no L1 technology use at home. In contrast, only four children had no reported English screen time. As a further measure of English quality of input, mothers also provide information about their own

English fluency levels. The details of the environment, the quantity of input and the quality of input are summarized in Table 3.1.

As can be seen in Table 3.1, these children had diverse L1 backgrounds, including: Arabic, Cantonese, Farsi, Gujarati, Hindi, Mandarin, Punjabi, Somali, Spanish and Urdu. According to the 2011 Canadian Population Census (which constitutes the most recent data at the time of writing), there were 4,705,030 people who reported speaking a non-official language at home, 291,750 of these were children under the age of 5 and a further 239,745 were children between the ages of 5-9 (see Table 3.2). These children account for 13-16% of the children across Canada, although this percentage is more substantial in many major urban centers. For example, the percentage of school-aged children who speak a non-official language at home is estimated by Statistics Canada (2011) to be 12% in Edmonton, 24% in Toronto and 27% in Vancouver. School boards in these regions, however, estimate the number of children who speak a non-official language at home to be much higher (across all grade levels: Edmonton Public School Board: 21%; Toronto District School Board: greater than 50%; Vancouver School Board: 60%) (District Reception and Placement Centre, n.d.; Markus, 2014; Robertson, 2014a, 2014b). Thus, child L2 learners represent a substantial percentage of Canadian children.

Table 3.1. Summary of Demographic Information of Participants

Demographic Variable	Mean	SD	Range
Age	60.43 months (5;0)	4.17 months (0;4)	50 – 66 months (4;2 - 5;6)
MOE	12.72 months	8.44 months	2 – 36 months
Age of Arrival	32 foreign-born children; 57 Canadian-born children		
Mother's Level of Education	11.95 years	5.00 years	0 – 20 years
Family Size	2.08 siblings	1.63 siblings	0 – 7 siblings
Mother's length of residency in Canada	97.29 months (8;1)	75.67 months (6;3)	6 – 312 months (0;6 – 26;0)
Mothers' relative English Use to the Child (input)	0.20	0.21	0 – 0.75
Siblings' relative English Use to the Child (input)	0.63	0.33	0 – 1
Child's relative English Use to Family Members (output)	0.50	0.30	0 – 1
L1 Richness at Home	2.27 out of 6	1.74	0 – 6
English Richness at Home	3.39 out of 6	1.65	0 – 6
L1 Screen Time	0.57 out of 4	0.81	0 – 4
English Screen Time	2.71 out of 4	1.11	0 – 4
Mother's (self-reported) fluency	2.43 out of 4	1.13	0 – 4
First Languages (number of participants)	Arabic (8), Cantonese (10), Farsi (2), Gujarati (1), Hindi (2), Mandarin (12), Punjabi (7), Somali (26), Spanish (7), Urdu (14)		

Table 3.2 Non-Official Language Use by Children in Canada (Statistics Canada, 2011)

	Language(s) Spoken Most Often at Home:					
Age Groups	Non-official language	English and non-official language	French and non-official language	English, French and non-official language	Total	% of Population
Under 5 years	230,205	48,850	10,055	2,640	291,750	0.16
5-9 years	169,480	56,340	9,745	4,180	239,745	0.13
All Age Groups	3,673,865	875,135	109,700	46,330	4,705,030	0.14

The specific L1s included in this sample were selected from amongst the most widely-spoken L1s of children under the age of 10 years, as can be seen in Table 3.3. This table does not include people who speak both English and a non-official language at home because this information has not been tabulated by Statistics Canada. As such, this table only includes the subset of respondents who reported speaking a single language at home (i.e., the first column of Table 3.2). Nevertheless, this information is sufficient for portraying the distribution of L1s amongst immigrant and refugee children. The percentages are based out of the number of children who speak a non-official language at home that is not an Aboriginal language (i.e., First Nations, Métis and Inuit speakers have not been included in Table 3.3). The ranking in the final column is the prevalence with which this language is spoken in comparison to other non-Official and non-Aboriginal languages. It is worth-noting that there is not a single language that largely dominates in population size; consequently, diverse samples, like that included in this dissertation, are necessary to accurately reflect Canadian society.

Table 3.3 Percentage of Children in Canada who Speak the Target L1s at Home (Statistics Canada, 2011)

Language	Number of Children Under 10 years who Speak this L1 (in Canada)	% of Children who Speak this L1 (out of non-official language speakers)	Rank amongst other Non-official languages (out of 122)
Punjabi	45,070	11%	1
Arabic	31,315	8%	2
Spanish	31,785	8%	3
Chinese n.o.s	22,960	6%	4
Urdu	23,245	6%	5
Mandarin	21,025	5%	6
Cantonese	13,415	3%	7
Farsi	12,305	3%	8
Gujarati	7,200	2%	13
Hindi	4,975	1%	17
Somali	4,080	1%	19

As a final note, this sample contains an overlapping but not identical sample to several previous studies (Blom, Paradis, & Sorenson Duncan, 2012; Blom & Paradis, 2014; Paradis, Emmerzael, & Sorenson Duncan, 2010; Paradis, Schneider, & Sorenson Duncan, 2013; Paradis, 2011; Sorenson Duncan & Paradis, 2016; Tessier, Sorenson Duncan, & Paradis, 2012). Crucially, these previous studies did not include children from Somalia. Furthermore, of these previous studies, only Paradis (2011) considered maternal education as a determinant of language acquisition. However, the range of levels of maternal education in Paradis (2011) was more restricted than is the case in this sample, with her sample being skewed towards high levels of education. Her study also focused on child-internal (child-level) compared to child-external (input- and environment-level) variables as determinants of acquisition and not on the interdependencies between child-external variables.

3.1.1. Immigration Status and Maternal Education.

The children in this sample came from two distinct groups of migrant children: some children (or their families) arrived in Canada as immigrants, while other children (or their families) came as refugees. In this dissertation, this distinction is important because, as is highlighted in both the results (Chapters 4 through 6) and the discussion (Chapter 7), it has implications for understanding interdependencies in the determinants of children's bilingual acquisition. In particular, the role of maternal education in children's language development varies across these two samples of children.

For the sample of immigrant children in this dissertation, detailed information about the specifics of families' immigration stories were not collected. As such, more detailed analysis of immigration status is not possible. However, given the nature of the Canada's immigration policy, these families were not refugees. Sixty-three of the children came to Canada (or if the child was born in Canada their parents arrived) as immigrants. Twenty-one of these children were foreign-born. These children had diverse L1 backgrounds and were exposed to English for an average of 14 months (SD = 2.21 months). They ranged in age from 4;10-5;6. Maternal levels of education were high within this group with a mean of 14.07 years (SD =3.19 years), with 36 (57%) mothers having completed at least one post-secondary program. The level of maternal education within this immigrant group is commensurate with previous research on children who are learning the majority language as an L2 (see Section 2.2.1).

The remaining 26 children in this dissertation were of Somali heritage and their families arrived in Canada as refugees. Eleven of the children were foreign-born and came to Canada as refugees themselves. Of these children, one came to Canada via Eritrea, three from Kenya, one from Somalia, one from South Africa, and five via Turkey. Children had an average of 9 months

(SD = 4.35 months) of exposure to English and ranged in age from 4;2-5;2. Maternal levels of education were low within this group with a mean of 6.8 years (SD = 4.87 years), with two (8%) mothers having completed at least one post-secondary program. Six (23%) mothers reported completing high school and fourteen (54%) mothers had a sixth grade or lower education. The level of maternal education within this Somali-refugee group is distinct from previous research on children who are learning the majority language as an L2 (see Section 2.2.1). The limited amount of educational opportunities for Somali parents is relevant to this dissertation because it enhances the variation within what constitutes a "low" maternal education group. Furthermore, a broader range of education levels, within a single study, allows for greater exploration of how maternal education levels influence language acquisition.

3.2. Procedures: Instruments, Data Collection and Data Processing, Statistical Analyses

Data was generated for this dissertation through two parental interviews and an English standardized measure of story-telling. All data were collected and analyzed by a native-speaker of English (often myself).

3.2.1. Environment and Input

The Alberta Language and Environment Questionnaire (ALEQ: Paradis, 2011; Paradis, n.d.) was designed to gather detailed information about children's home language environments and includes information about environment and input level variables. It is a set of questions that are administered as an oral interview between the parent and the researcher, often with the assistance of an interpreter/cultural broker. Qualitative responses to each interview question were recorded on the response sheet during the interview. Where appropriate, quantitative responses

were later determined following set rubrics. For example, if a mother described a situation where she could communicate in some situations (e.g., doctor's visit) but felt she could not speak and understand English well enough to handle a diverse set of topics (e.g., in the work place), then her English fluency would be rated as a "2", "somewhat fluent in English". Relative quantity of English was also scored from qualitative responses. If a mother reported speaking mostly the L1 with her child, but occasionally using English than the relative quantity of English input would be rated as 0.25. These scoring rubrics are based on the scoring system outlined on the ALEQ (see Appendix 1).

There were several factors that influenced the decision to use a parental interview. First and foremost, parental report is an established method within bilingual research and variables generated through parental report have consistently been shown to predict bilingual children's development (e.g., Armon-Lotem, Walters, & Gagarina, 2011; Bohman et al., 2010; Hammer, Davison, Lawrence, & Miccio, 2009; Hoff, Welsh, et al., 2014; Marchman & Martínez-Sussmann, 2002; Paradis, 2011, 2016; Scheele, Leseman, & Mayo, 2010; Unsworth, 2014). Second, parental report is often the only feasible method to accurately capture information about the diverse environments and input of preschool and school-aged children (Paradis, 2017). Research with infants and toddlers is generally restricted to the home environment and input from the primary caregiver (i.e., the mother) (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). However, older children have a much broader experience and their daily lives can involve multiple caregivers, siblings, friends, school and extracurricular activities. The complexities of children's environment are further complicated when multiple language are involved (Kohnert, 2010; Paradis & Grüter, 2014; Paradis, 2017). Thus, parental interview provides a window into

the richness of children's linguistic experiences, in a way that no other 30-60 minute snapshot could.

A range of social environment and linguistic input variables were calculated from this interview. The environment-level information includes: maternal level of education, length of residency in Canada, whether mom works or attends school in English, if the child was born in Canada, and family size. The input level variables are: maternal fluency in English, language use patterns of each family member (i.e., relative quantity of input), the child's language use patterns (i.e., relative quantity of output), and information about other sources of linguistic input (e.g., television and books).

The relative quantity of English and L1 use was not tabulated across the entire family, as has been done in previous studies (e.g., Armon-Lotem et al., 2011; Gutiérrez–Clellen & Kreiter, 2003; Paradis, 2011). A separate score was tallied for the mother and the siblings, although the relative language use by siblings was averaged across siblings. This average was more appropriate for the statistical techniques employed in this dissertation (see Section 6.2.3). The relative quantity of input was calculated on the basis of the scale that is outlined in the first paragraph of this subsection and can also be found in Appendix 1.

From information about sources of linguistic input, two home richness scores were tallied: (a) a home richness score that measures the amount of language-based interactions that the family engages in with the child (i.e., reading books, story-telling and singing); and (b) a screen time measure that reflects the amount of time children engaged in language-based screen time (i.e., watching television or movies and playing games on the computer). The maximal number of points for the home richness score was six and for screen time, it was four. It is important to note that these richness measures are more specific than the aggregate "richness"

scores which have been included in previous research (e.g., Jia & Aaronson, 2003; Paradis, 2011) (see Section 2.2 and specifically Section 2.2.3). As such, these refined scores will offer a more nuanced perspective on quality of input (e.g., Scheele et al., 2010).

3.2.2. L1 Development

The Alberta Language Development Questionnaire (ALDeQ: Paradis et al., 2010; Paradis, n.d.) was used to generate L1 scores. Like the ALEQ, it is an oral interview conducted between the parent and researcher, often with the assistance of an interpreter/cultural broker. This particular questionnaire was selected because it was specifically designed for use with children from diverse L1 backgrounds in multilingual contexts (Paradis et al., 2010). Only Section B: Current L1 Abilities was administered (see Appendix 2). Parents were asked a series of questions about their child's current L1 abilities and asked to rate their child compared to other children on a scale ranging from 0-3 (0 = not very well; 1 = some difficulties; 2 = the same; 3 = very good/better/one of the best). These questions focus on productive language abilities. A total score out of 18 is tabulated for this section. Higher scores are commensurate with stronger L1 abilities and lower scores represent children who are struggling in their L1. At the extremes, a score of 18 indicates that the parent rated the child as having very strong (better than average) L1 oral abilities on every question. A score of zero indicates that the parent rated the child as having very limited L1 abilities for every question, suggesting that the child has limited productive oral abilities and is likely functioning as a receptive bilingual.

However, most children score in the middle of these two extremes. As such, it is necessary to establish some guidelines for interpreting children's performance on this measure. The most obvious solution would be to use the original study to set benchmarks for performance

on this task (Paradis et al., 2010). This is not possible because this dissertation includes an overlapping sample with that study. Instead, benchmarks were established on the basis of the scoring rubric. If the parent responded that the child was the same as other children her age for every question, the child would obtain a score of 12/18 (0.67). As such, any score above 0.67 was taken as evidence of strong L1 abilities. If the parent responded that the child had some difficulties in response to every question, the child would receive a score of 6/18 (0.33). As such, a score of 0.33 or lower was taken as evidence of very limited productive abilities.

Using a parental questionnaire (interview) as a measure of L1 development has many advantages in this context. For example, questionnaires have been reliably employed across diverse cultural groups (Alcock et al., 2015; Dale & Penfold, 2011; Lee, Chiu, van Hasselt, & Tong, 2009). Parental questionnaires have also been shown to be a reliable method for obtaining data about bilingual children's language development (e.g., Gutiérrez–Clellen & Kreiter, 2003; Marchman, Martínez-Sussmann, & Dale, 2004; Restrepo, 1998). Another motivation for using this interview was that it allows children from diverse backgrounds to be considered simultaneously.

A final consideration for selecting a parental questionnaire is that other data techniques were not available. L1 elicitation requires carefully constructed tasks. L1 tasks do not exist for all of the languages included in this dissertation and translation of English tasks may not yield meaningful information (e.g., Abedi, Hofstetter, & Lord, 2004; Hambleton & Patsula, 1998; Kopriva, 2000; Okazaki & Sue, 1995; Peña, 2007; Van Widenfelt, Treffers, De Beurs, Siebelink, & Koudijs, 2005). The creation of such tasks or the use of naturalistic L1 sampling would require expensive interpretation services and possible additional time to validate the measures. Thus, parental questionnaires are not only a reliable method for obtaining information about children's

L1 development, they are also often the only feasible method in diverse linguistic contexts, like Canada (Paradis et al., 2013).

3.2.3. L2 Development

The Edmonton Narrative Norms Instrument was used to sample children's L2 abilities (ENNI: Schneider, Dubé, & Hayward, 2005**)**. This task is comprised of six picture books (stories), divided across two sets of characters. The researcher strategically holds the books so as to never view the pictures. Children are first allowed to view the pictures without responding. They are shown the pictures a second time and are asked to tell the researcher the story. Each story is completed before the next set of pictures is revealed to the child. Stories were video-recorded and later transcribed and analyzed by a native-speaker of English (myself or other trained research assistants who were undergraduates or graduate students in linguistics). A second researcher transcribed a subset of the data to verify the reliability of these transcripts. For the first phase of data collection (i.e., the immigrant group), 5% of the corpus was independently transcribed and the transcription reliability (based on words) was 91%. That is, for every word in the transcript, the researchers independently agreed on 91% of them. For the second phase of data collection (i.e., the Somali-refugee group), 10% of the corpus was independently transcribed. Reliability was 90%.

One advantage of using a story-telling task is the wealth of data it generates. In this case, scores were calculated for story grammar, referring expressions (first mentions), syntactic complexity (complexity index), morphosyntactic abilities (mean length of utterance), and productive vocabulary (lexical diversity). Raw scores and monolingual age-matched scores were recorded for each measure. Monolingual age-matched standard score were calculated on the

basis of the norming tables available through the ENNI website (Schneider et al., 2005). All standard scores are based on a mean of 10 and standard deviation of 3.

Story Grammar. Raw scores were calculated for the third story in the set (a complex, four-character story). Each story element was scored individually and raw scores were the sum of each individual unit. In this scoring scheme, not all story grammar units are weighted equally. For example, each character in the story is scored as one, but the main plot points (e.g., the initiating event, "the ball went in the water") are scored as two. Yet, scoring is on a pass/fail basis – either the element was included or it was not. Thus, for elements worth two points, either a score of two or a score of zero was possible, no partial points were allotted. A maximum of 40 points is possible on this task (see Appendix 3). The scoring reliability (based on 10% of each corpus) was 0.93 for the first phase and 0.89 for the second.

For statistical modelling of the determinants of story grammar scores, items that received a score of one or two in the raw score tabulation were counted as included, and those that received a score of zero were counted as excluded. As such, each element was weighted equally. In this scoring scheme, the maximum possible score was 31 included story grammar components. More details can be found in Section 3.3.

Referring Expressions. For children's raw scores, their introduction of each character was scored on a three point scoring system, as was done in Paradis and Kirova (2014) (see Section 2.1.2): three for appropriate introduction with an indefinite article (e.g., a giraffe), two for inappropriate introduction with a definite article (e.g., the giraffe), one for use of a pronoun with no prior mention (e.g., he) and zero for exclusion of a character all together. Raw scores were then calculated by summing children's first mentions across all six stories. The maximum

possible score was 42 (see Appendix 4). Scoring reliability (based on 10% of the corpus) was 0.91 for the first phase of data collection and 0.95 for the second phase.

To prepare for logistic regression modelling, the raw scores were decomposed into three component scores: (a) inclusion of characters, (b) use of nominal and (c) use of the indefinite article. The number of characters and crucial objects that were included and excluded was tallied to create the inclusion of characters score. Characters were counted as included no matter what construction was used. There were 14 characters/objects that were scored for the inclusion of characters score. Next, the use of nominal score was tallied. This count represents the number of included characters that were introduced with a noun or alternatively with a pronoun. Finally, the indefinite article score was tallied, as a count of the number of nouns that were introduced with the indefinite article. This scoring scheme is multi-level with the number items scored at each stage depending on the counts from the previous level. For example, if a child included ten of the characters/objects, then ten items would be scored in the use of nominal score. If five of these elements were introduced with nouns, then five elements would be scored in the indefinite article score. For each component score two values were entered for each child: (a) number of included items, (b) number of excluded items, (c) number of nouns, (d) number of pronouns, (e) number of indefinite articles use and (f) number of other constructions (i.e., constructions with "the" or no article). An example of this scoring system is provided in Table 3.4 and further details of the further details on the statistical analyses are provided in Section 3.3.

Table 3.4. Sample Scoring of Referring Expressions

Child	Item	Utterance	Included	Noun	Indefinite article
017SOF	Giraffe (A1)	"the elephant talks to a friend"	included	noun	correct
017SOF	Elephant (A1)	"the elephant talks to a friend"	included	noun	incorrect
016SOM	Airplane (A3)	"he nice airplane"	included	noun	incorrect
016SOM	Lifeguard (A3)	"he can't get it"	included	pronoun	NA
016SOM	Sandcastle (B1)	(no mention)	excluded	NA	NA

Syntactic Complexity. The syntactic complexity measure on the ENNI is referred to as a complexity index. This measure is a ratio of the number of sentences that contain dependent clauses. The raw score for this measure is calculated by summing the number of communicative units (C-units) and dependent clauses and then dividing by the number of C-units. In most instances, a C-unit is synonymous with independent (main) clause, but partial clauses that act as a complete utterance can also be C-units (Schneider et al., 2005). Dependent clauses contain verbs but cannot stand alone; that is, they must be attached to a main clause. This scoring system allows for children to obtain higher scores if they embed multiple dependent clauses within one sentence. A sample of this scoring is provided in Table 3.5. This sample is for a single story but raw scores were tallied across all six stories. The reliability for this score between two independent researchers (for 10% of each corpus) averaged 98% for the first phase of data collection and 96% for the second phase.

Table 3.5. Sample Scoring of (Syntactic) Complexity Index Raw Score

Child	Story	Utterance	Independent Clauses	Dependent Clauses
003SOM	B1	"the bad rabbit says I'm going to get more."	1	2
003SOM	B1	"rabbit got more"	1	0
003SOM	B1	"and is putting down there on the castle."	1	0
003SOM	B1	"the castle almost broked in half."	1	0
003SOM	B1	"then no more castle xxx."	1	0
003SOM	B1	"and then now the elephant try to make back."	1	1
		Total:	6	3
		Complexity Index:	(6+3)/6	1.5

The complexity index score is inappropriate for linear regression modelling (detailed in Section 3.3) because it is bound on the lower limit. Many of the children obtain scores close to 1 (see Table 4.1) but scores less than one are not possible. Yet, linear regression models are likely to predict these values (i.e., <1). As such, logistic regression is more appropriate because it avoids this noted downfall by modelling the probability of correct responses indirectly through a logit link function (Baayen, 2008). Logistic regression requires a binary variable and as a consequence, the complexity index was converted to: the number of simple utterances and the number of complex utterances (i.e., utterances that contained a main clause and at least one dependent clause) (see Section 3.3). A sample of this scoring system is provided in Table 3.6. Again, this illustration is based on a single story, but counts were tallied across all six stories.

Table 3.6. Sample Scoring of Complex Clauses

Child	Story	Utterance	Simple or Complex
003SOM	B1	"the bad rabbit says I'm going to get more."	complex
003SOM	B1	"rabbit got more"	simple
003SOM	B1	"and is putting down there on the castle."	simple
003SOM	B1	"the castle almost broked in half."	simple
003SOM	B1	"then no more castle xxx."	simple
003SOM	B1	"and then now the elephant try to make back."	complex
		Total Simple:	4
		Total Complex:	2

Morphosyntactic Development. Mean length of utterance (or communicative unit) was calculated as a measure of morphosyntactic development, using the MLU command in CLAN (MacWhiney, 2016). In this case, it was calculated as the average number of words (not morphemes) per utterance. Words were selected as the basis of this measure to ensure comparisons could be made with the ENNI norming sample.

Productive Vocabulary (Lexical Diversity). Three measures of productive vocabulary were tabulated from children's stories: total number of word (tokens), total number of unique words (types) and a type:token ratio. Counts were calculated across all six stories. As per the ENNI manual, word types are tallied on a lemma basis, where changes in inflection do not constitute new word types. These counts were generated automatically using the FREQ command in CLAN, following Paradis (n.d.).

Although the above measures are straightforward to calculate, they are not straightforward in terms of interpreting children's lexical acquisition. Productive language tasks like story-telling or spontaneous speech sampling are flawed in that they can drastically vary on the basis of a child's verbosity (e.g., Mäkinen, Loukusa, Nieminen, Leinonen, & Kunnari, 2014; Ukrainetz & Blomquist, 2002; C. R. Wagner, Sahlén, & Nettlebladt, 1999). More talkative

children will produce more types and tokens, biasing raw counts in favor of verbose children who may not actually have larger vocabularies (see Section 2.1.2). In this sample of children, the number of words (tokens) ranged from 78 to 935, with a standard deviation of 157.31 words. It is very likely that the child who used 935 words to complete the narrative task did have a larger vocabulary than the child who used 78 words. However, for children who do not fall at the extremes, verbosity could influence both their total number of words (tokens) and their total number of unique words (types). In this sample, the correlation between the tokens and type counts was very strong (r (75) = 0.89, p < 2.2e-16). As such, raw counts bias the data to suggesting that talkative children have larger vocabularies.

In place of these raw counts, a type:token ratio was calculated as a lexical diversity measure of vocabulary development (e.g., Malvern, Richards, Chipere, & Durán, 2004; Roy, Frank, & Roy, 2009). It was calculated by dividing the types (number of different (novel) words) by the tokens (total number of words). This ratio, however, is inappropriate for linear regression modelling. Consequently, the lexical diversity score was modelled as a log odds ratio of novel (types) to repeated words (tokens - types) (Table 4.1).

3.3. Statistical Analyses

The data necessary to answer the proposed research questions were generated through a series of regression analyses. All analyses were conducted in R (R Core Team, 2015). In this dissertation, the term outcome variable is used to refer to the dependent variable in a model and predictor variable is used to refer to the independent variables (e.g., Hosmer & Lemeshow, 2000). It is important to note that some variables are outcome variables in one analysis, but predictor variables in another (e.g., family size is an outcome variable in Chapter 5, when

maternal education predicts family size, and then family size is a predictor variable in Chapter 6, when family size predicts, for example, lexical diversity).

Regression modelling was selected for the statistical technique because it allows for multiple predictors to be considered simultaneously (Baayen, 2008; Jaeger, 2008) and because of its robustness, which is important in cases of unequal observations (e.g., the referring expression scores) (Blom et al., 2012). Linear regression was used to model determinants of the raw scores for L1 and English MLU. For all other L2 measures, logistic regression was used. Logistic regression is statistical technique used with binary (categorical) outcome variables: for example, "correct versus incorrect, regular or irregular, direct object constructions versus prepositional object constructions etc. (Baayen, 2008, p. 195)." This technique avoids the limitations of linear regression models, which are inappropriate when the outcome variable is bound (e.g., in this dissertation, the complexity index score and type:token ratio) (Baayen, 2008; Peng, Lee, & Ingersoll, 2002).

Table 3.7 provides a summary of the binary outcome variables that were modelled with logistic regression. Each variable has been divided into a pass/fail dichotomy. In every case, the column labelled Observation 1 is the "pass" column. This column is the column of interest because it is the outcome on which the interpretations of the coefficients are based. That is, in the regression models, a positive β coefficient (estimate) indicates an increase in this value (more "passes") and a negative indicates a decrease (less "passes", or inversely more "fails"). For example, in a logistic regression model with Story Grammar as the outcome variable, a positive β coefficient (estimate) for maternal education would indicate that higher levels of education were associated with more included story grammar elements. The column labelled Observation 2 is the inverse of the Observation 1 column (i.e., it represents the "fail" responses).

Table 3.7. Language Measures as Binary Outcome Variables

Language Measure	Observation 1	Observation 2
Story Grammar	Included	Excluded
Referring Expression		
Included	Included	Excluded
Noun	Noun	Pronoun
Indefinite article	Correct	Incorrect
Complex Clause	Complex Clause	Simple Clause
Lexical Diversity	Novel	Repeated

4. Results: Mother's Level of Education as a Determinant of L1 and L2 Acquisition

Maternal level of education is an established determinant of language development in monolingual populations (e.g., Hoff, 2006). However, in bilingual populations, the extent to which maternal level of education influences acquisition is less clear (see Section 2.2.1). As such, the first research question addressed in this dissertation is the extent to which maternal education is a determinant of language development within this sample of children.

4.1. L1 Descriptive Statistics

The majority of children in this sample were reported to have strong L1 abilities; 64% of children scored 0.67 or higher (see Figure 4.1). The mean score was 0.65 (SD = 0.27, range = 0.00-1.00). Despite these high L1 scores, parents noted L1 attrition in their children and that many children had a preference for English. Of the 81 parents who answered this question, 40 parents (10 from the Somali-refugee group) reported that their child was not showing signs of attrition and 41 parents (16 from the Somali-refugee group) reported that their child was experiencing some degree of attrition. Attrition and L1 scores were related, as was evidenced by a Welch two sample *t*-test. This test revealed a significant difference in ALDeQ scores between children whose parents reported attrition and those who did not (no attrition mean = 0.80; attrition mean = 0.46; $t(63.11) = 7.32$, $p = 5.58e\text{-}10$). It is important to note that a chi-square test indicated that there was no significant difference in the amount of reported attrition for the children in the immigrant group compared to the children in the Somali-refugee group.

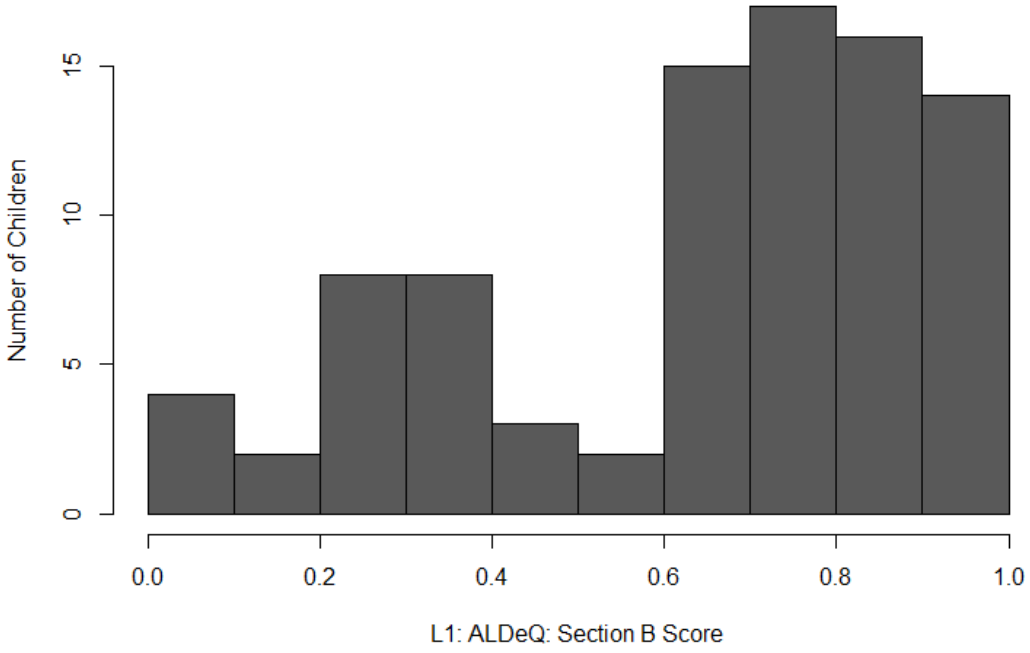

Figure 4.1. Distribution of L1 Scores

4.2. L2 Descriptive Statistics

As detailed above, several English (L2) language measures were calculated from the narrative data (ENNI) (see Section 3.2.3). Children's performance on each of these measures is summarized below in Table 4.1. This table includes information for both the raw and standard scores for the ENNI, as well as for the binary variables that were computed for the logistic regression models. The total number of available scores for each measure is listed in the second column. The most common reason for missing data points was technological malfunctions that resulted in missing video files. Occasionally missing data occurred because the child refused to complete the task. The final column provides details of the number of children who reached age-matched monolingual expectations for each measure, which was defined as a standard score of 7 or higher (monolingual mean = 10; range = 7-13). With only 12 months of exposure to English,

61% of these child L2 learners reached native-speaker norms for story grammar, 45% for referring expressions, 58% for MLU, 75% for the complexity index, 86% for the total number of words (tokens) and 61% for the number of unique words (types). That is, for all measures except referring expressions, at least half of the children had already achieved scores within the range considered typical for their monolingual English peers.

In terms of the number of children who reached native-speaker expectations, the total number of words was the highest ranked score and referring expressions was the lowest. In terms of the average standard score, children also showed the highest performance on the total number of words and the lowest performance on referring expressions. The rankings between measures are summarized in Table 4.2. A significant repeated measures analysis of variance verified that children had unequal performance across measures ($F(5,82) = 12.10$, $p = 6.54e\text{-}11$). However, story grammar scores were mid-ranked amongst the language measures (see Section 2.1.2 for details about the prediction that story grammar would be the highest of these measures). Planned paired t-tests of children's standard scores reveal that story grammar standard scores were only significantly better than referring expression scores ($t(76) = 3.54$, $p = 0.0007$). However, there was a trend towards story grammar scores also being significantly better than MLU scores ($t(76) = -2.96$, $p = 0.004$). In contrast, these children received significantly better language scores on the complexity index ($t(81) = -2.46$, $p = 0.02$) and for the total number of words ($t(76) = -2.96$, $p = 0.004$) than they did for story grammar. There was no significant difference between standard scores for story grammar and the number of different words.

Table 4.1. Scores on English Language Measures

L2 Measure	*n*	Mean Raw Score (*SD*, range)	Mean Standard Score (*SD*, range)	# Reached Monolingual Expectations
Story Grammar	82	14.83 (7.26, 1-26)	7.05 (3.99, 0-13)	50 children ≥ 7
Number of Included Elements		10.09 (4.84, 1-18)		
Referring Expressions (First Mentions)	77	25.18 (7.47, 10-40)	6.11 (3.63, 0-14)	35 children ≥ 7
Number of Included Elements		11.17 (2.47, 4-14)		
Number of Nouns		9.07 (3.18, 2-14)		
Number of "a"		4.39 (3.02, 0-12)		
MLU	77	5.68 (1.56, 1.47-9.15)	6.50 (3.69, 0-15)	45 children ≥ 7
Complexity Index	77	1.19 (0.12, 1-1.47)	7.96 (2.78, 3-14)	58 children ≥ 7
Number of Simple Sentences		55.33 (21.42, 9-125)		
Number of Complex Sentences		10.27 (7.62, 0-34)		
Number of Total Words (tokens)	77	395.90 (157.31, 78-935)	8.28 (2.69, 2-17)	66 children ≥ 7
Number of Different Words (types)	77	103.57 (29.72, 46-199)	7.28 (2.66, 2-16)	47 children ≥ 7
Lexical Diversity (type:token ratio)		0.27 (0.07, 0.16-0.60)		

Table 4.2 Profile Effects in English Measures

Rank based on mean standard score	Rank based on number of children who scored above 7
1. Total number of words	1. Total number of words
2. Complexity index	2. Complexity index
3. Number of different words	3. Story grammar
4. Story grammar	4. Number of different words
5. MLU	5. MLU
6. Referring Expressions.	6. Referring Expressions

Ranking is from most like monolingual expectations (1) to least like monolingual expectations (6).

4.3. Maternal Level of Education as a Determinant of L1 and L2 Scores

4.3.1. Mother's Level of Education and L1 Scores

Linear regression modelling was used to evaluate the extent to which maternal education predicted children's ALDeQ Section B scores. The outcome variable was the numerator of this score and the predictor variables were mother's level of education in years and immigration status. The immigrant group was the reference level. An interaction was also included in the model. Maximum likelihood tests on nested models revealed that the model with the interaction was the optimal model (see Table 4.3, where the optimal model, a sub-optimal model and a model comparison are provided for illustration). The model labelled "sub-optimal model" is a nested model of the "optimal model" because it contains all of the same variables, minus one (the interaction). The model comparison between these models is significant. This significance indicates that the additional variable (the interaction) explains sufficient variation in the model to justify the extra degrees of freedom that it introduces (Baayen, 2008). The optimal model revealed a trend for each of the main effects: (a) mother's level of education (*estimate* = 0.338, t = 1.935, p = 0.056) and (b) immigration status (*estimate* = 5.647, t = 1.929, p = 0.057). There

was also significant interaction between mother's level of education and immigration status (*estimate*= -0.914, t = -3.646, p = 0.0005).

Table 4.3. Mother's Level of Education as a Determinant of L1 Score.

Model	Predictor Variables	*estimate*	*t*	*p*
Optimal Model	Intercept	7.774	3.089	0.003
	Mother's level of education	0.338	1.935	0.056
	Immigration Status: Somali-Refugee	5.647	1.929	0.057
	Education*Status: Somali-Refugee	-0.914	-3.646	0.0005

Model	Predictor Variables	*estimate*	*t*	*p*
Sub-Optimal Model	Intercept	14.003	7.089	3.53e-10
	Mother's level of education	-0.105	-0.784	0.435
	Immigration Status: Somali-Refugee	-3.790	-2.589	0.011

Model Comparison	χ^2 Difference	p
Sub-Optimal to Optimal Model	13.293	0.0005

Interpreting the optimal model on the basis of the *estimate* is challenging because of the interaction. As such, the effects are plotted in Figure 4.2, which was created using the Effects package in R (Fox & Hong, 2009; Fox et al., 2016). This figure illustrates that there is a positive effect of mother's level of education on L1 scores for children in the immigrant group (the left panel of the figure). However, there is a negative effect of mother's level of education on L1 scores for children in the Somali-refugee group (the right panel of the figure).

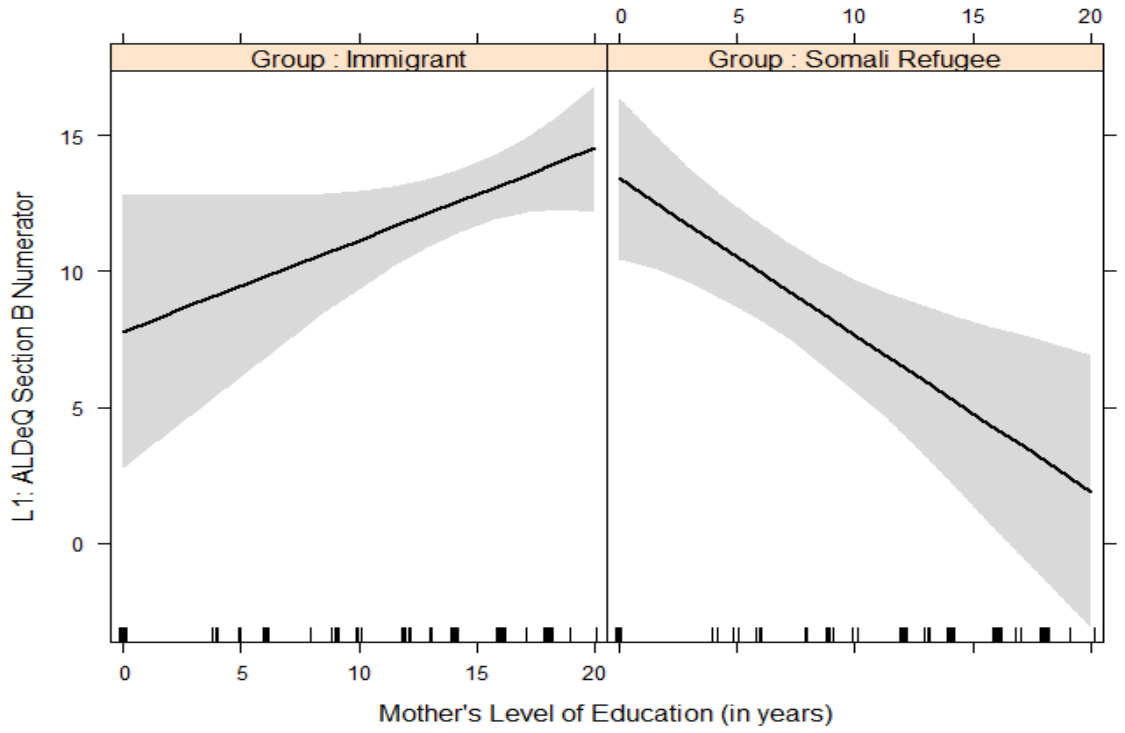

Figure 4.2. L1 Scores: Interaction of mother's level of education and immigration status

When considering these results, it is important to keep in mind that the immigrant and Somali-refugee groups are not equivalent in terms of the distribution of education levels (see Figure 2.1). In the Somali-refugee group, 92% of mothers had no post-secondary education; whereas in the immigrant group, only 54% of mothers had no post-secondary education. As such, it is possible that the above interaction reflects something different about mothers with post-secondary educations compared to those without (e.g., Paradis, 2011). As such, the above analysis was repeated with only the children whose mothers had no post-secondary education.

Within this subset of the immigrant group, the majority of mothers had completed high school (19/35). As such, there was not sufficient variation to model the effect of maternal education in years on L1 scores. As an alternative, a new binary variable was created as to whether mothers had completed high school or not. A linear regression model was then created

with the raw ALDeQ Section B scores as the outcome variable. The predictor variables were the binary maternal education variable, immigration status and an interaction between these two predictors. There were no significant main effects in this model, but the interaction between completion of high school and immigration status showed a trend towards significance (*estimate* = -5.716, t = -1.89, p = 0.06). The negative *estimate* indicates that this interaction follows the same pattern as is noted above in Figure 4.2. As such, the interaction between mother's level of education and immigration status is unlikely a simple artifact of the higher proportion of mother's with post-secondary educations in the immigrant group (see Section 7.2.4).

4.3.2. Mother's Level of Education and L2 Scores

Regression models were built to examine the effect of maternal level of education on each of the L2 scores considered in this dissertation. Logistic regression was used as the statistical technique in all instances, except for MLU (see Section 3.3, especially Table 3.7). In the case of MLU, linear regression was used. Mother's level of education and immigration status were tested as predictor variables, along with an interaction between them. The immigrant group was the reference level. Mother's level of education was the sole positive predictor for story grammar, referring expressions (use of nominal and indefinite article use), complex syntax and MLU. That is, as mother's level of education increased, scores on these measures also increased. Mother's level of education was also the sole predictor for lexical diversity, but in this case the relationship was negative, suggesting that as mother's level of education increased, English lexical diversity scores decreased. For the referring expressions sub-score that measured the inclusion of characters, there was a significant interaction between mother's level of education and immigration status. For ease of interpretation, this interaction was plotted (see Figure 4.3).

This figure illustrates that mother's level of education has a positive effect for children in the immigrant group, but a negligible effect for children in the Somali-refugee group. Table 4.4 provides the regression model results for each L2 measure.

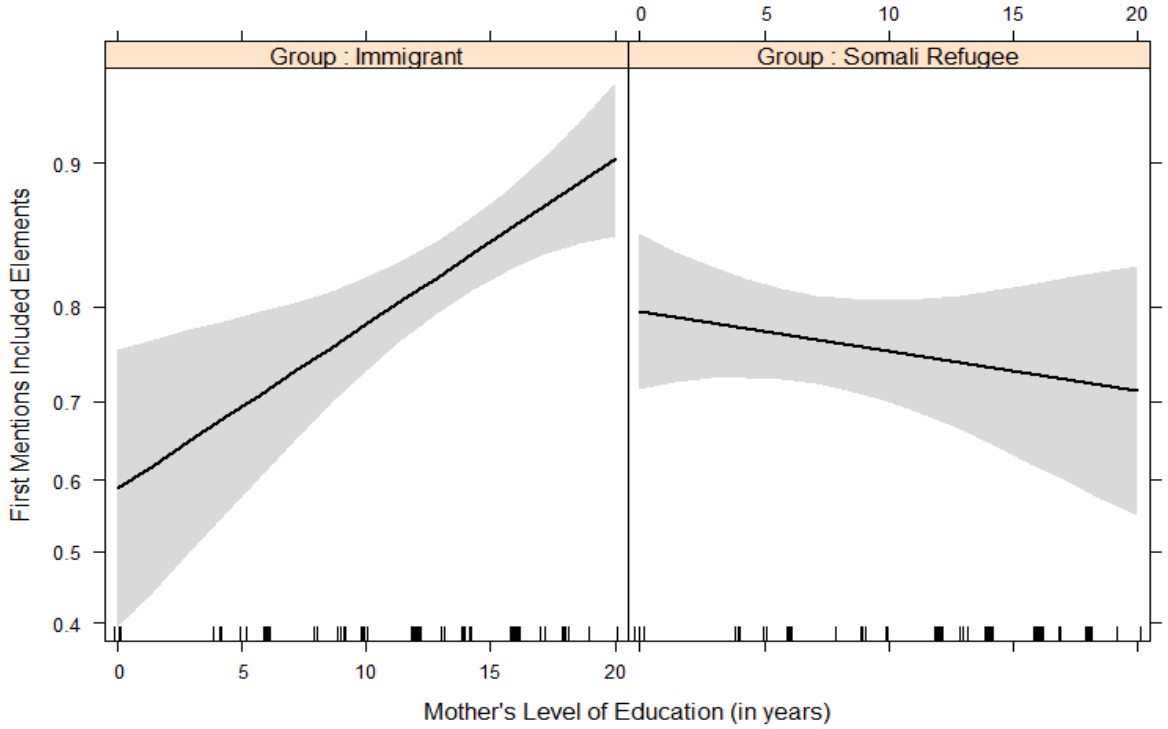

Figure 4.3. Number of included elements (referring expressions): the interaction between education and immigration status.

Table 4.4. Mother's level of education as a determinant of L2 scores

Measure	Predictor Variables	*estimate*	*t / z* [(a)]	*p*
Story Grammar (A3)	Intercept	-1.131	-10.008	<2e-16
	Mother's level of education	0.0342	3.883	0.0001
Referring Expressions (First Mentions)				
Included	Intercept	0.356	0.891	0.373
	Mother's level of education	0.093	3164	0.002
	Immigration: Refugee	1.004	2.192	0.028
	Moted* Immigration	-0.116	-2.937	0.003
Noun	Intercept	0.766	3.925	8.68e-05
	Mother's level of education	0.062	3.815	0.0001
Indefinite	Intercept	-0.561	-2.779	0.005
Article	Mother's level of education	0.041	2.653	0.008
Complex Clauses	Intercept	-2.312	-20.713	<2e-16
	Mother's level of education	0.051	6.162	7.18e-10
MLU	Intercept	4.590	10.910	<2e-16
	Mother's level of education	0.094	2.820	0.006
Lexical Diversity	Intercept	-0.965	-28.531	<2e-16
	Mother's level of education	-0.006	-2.311	0.02

[(a)] This value is a z-value for logistic regression and a *t*-value when linear regression was used

In summary, mother's level of education is a determinant of a wide range of L2 measures. The remainder of the results chapters focus on detailing possible explanations for these maternal education effects, namely through an investigation of intermediary input variables.

5. Results: Maternal Level of Education as a Determinant of Intermediary Variables

The previous chapter established that maternal level of education was a determinant of children's L1 and L2 development. However, maternal level of education is an environment-level variable (also referred to as a distal variable) (see Figure 1.1). As a consequence, it is important to consider what intermediary input (or proximal) variables could mediate the relationship between maternal education and children's language development. Available research suggests that the relationships between intermediary variables and maternal education are likely more complicated in bilingual development than is the case for monolingual children (e.g., Scheele et al., 2010).

This chapter provides the results of analyses examining the relationship between maternal education and other determinants of acquisition. That is, this chapter pertains to the research question: is maternal level of education a source of individual difference in input variables? The outcome variables for these analyses were selected based on two criteria: (1) previous research suggested a possible link between these variables and maternal education (see Section 2.2.4) and (2) the variable was a significant predictor of children's L1 and L2 scores in this dissertation (see Chapter 6). Specifically, two environment-level variables are considered: (a) family size and (a) age of arrival in Canada. Several quantity based input variables are also examined: (c) MOE, (d) child's relative English output at home, (e) relative amount of English input from siblings, and (f) relative amount of English input from the mother. Consideration is also given to quality based input measures, such as (g) mother's English fluency, (h) English richness at home and (i) amount of screen time (in English). Measures of L1 quality of input were not considered in this chapter because they did not significantly predict L1 scores within this sample of children (see

Chapter 6). As such, these variables could not mediate the relationship between maternal education and L1 scores for this group of children.

In addition to modelling the extent to which maternal education is a determinant of the above noted variables, this chapter also considers other possible interdependencies between variables. Most notably, because of the differences between the Somali-refugee group and the immigrant group (e.g., access to education, preference for large families, see Sections 1.1 and 3.1.1), an interaction between maternal level of education and immigration status was also considered as a predictor of the above-noted variables. Where justified in previous research, additional variables were also considered as sources of individual difference (see Sections 2.2.4 and 2.3, especially Question 3). These additional variables were included to enhance the comprehensive nature of this investigation and allow for greater discussion of the interdependencies between variables.

Linear regression was used to model individual differences in continuous variables, which included family size, MOE, mother's English fluency, English language richness at home and screen time. Logistic regression was used to model individual differences in age of arrival and relative quantity of input. As discussed in Sections 3.2.1 and 3.3, relative quantity is a proportion and as a result was converted to a binary variable for the purposes of regression modelling. Modelling began with a full model that overfit the data and was reduced to the optimal model (see Table 4.3 for a sample of this procedure).

5.1. Mother's Level of Education as a Determinant of Other Environment-Level Variables

5.1.1. Family Size

The optimal model included both of maternal education and immigration status, as well as an interaction between them. These results are presented in Table 5.1. For ease of interpretation the interaction is plotted in Figure 5.1. The left side of the plot illustrates that, within the immigrant group, as mother's level of education increases, family size decreases. The right side of the plot portrays the opposite effect. That is, within the Somali-refugee group, as maternal level of education increases, family size also increases.

Table 5.1. Determinants of Family Size

	Estimate	*t*	*p*
Intercept	3.366	4.156	7.69e-05
Mother's level of Education	-0.1236	-2.251	0.027
Immigration Status	0.571	-0.606	0.546
MotEd * Status	0.196	2.430	0.017

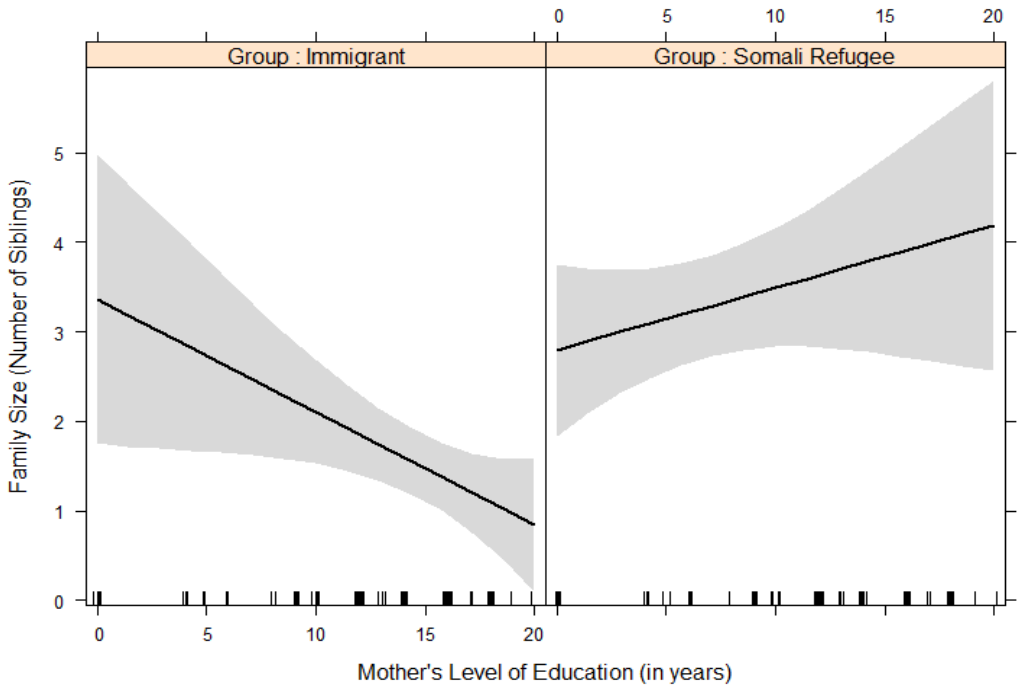

Figure 5.1. Family size: The interaction between mother's level of education and immigration status.

5.1.2. Age of Arrival

The optimal model predicting age of arrival included mother's level of education and immigration status and an interaction between them. Table 5.2 provides the details of this model and indicates that children in the immigrant group are more likely to be foreign-born if their mother has a higher level of education. In the Somali-refugee group, children were more likely to be born in Canada if their mother had a higher level of education.

This relationship is depicted in Figure 5.2. This figure, unlike other interaction plots in this dissertation, is not the idealized values from the regression model. Instead, it represents the actual distribution of maternal education levels across these groups of children. A different style of graph was necessary in this case because of the strict binary nature of the outcome variable

(i.e., a child cannot be part way between foreign-born and Canadian-born). The left panel shows the distribution of education levels for the immigrant group and the right panel shows the distribution for the Somali-refuge group. Within each panel, the groups are further divided into foreign-born (abroad) and Canadian-born (Canada) groups. The significant differences between foreign-born and Canadian-born groups are noted by stars on each panel (immigrant group: $t(42.66) = 2.046$, $p = 0.05$; Somali-refugee group: $t(21.722) = -2.498$, $p = 0.021$). It is important to note that the direction of the relationship is different between the two groups, with the foreign-born group having a higher mean level of maternal education in the immigrant group and the Canadian-born group having a higher mean level of maternal education in the Somali-refugee group.

Table 5.2 Determinants of Age of Arrival

	Estimate	*z*	*p*
Intercept	3.372	2.316	0.021
Mother's level of Education	-0.186	-1.941	0.056
Immigration Status	-4.815	-2.718	0.007
MotEd * Status	0.405	2.879	0.004

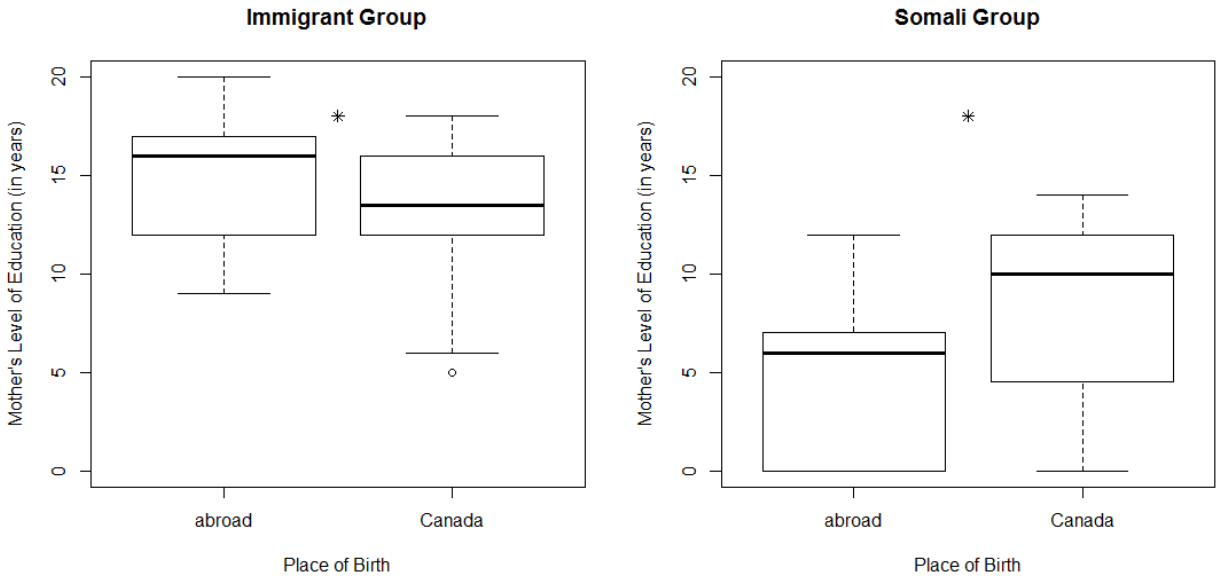

Figure 5.2. Age of Arrival: The interaction between mother's level of education and family size.

5.2. Mother's Level of Education as a Determinant of Input-Level Variables

5.2.1. Quantity of Input

Months of Exposure to English. Maternal education significantly predicted MOE, with higher levels of maternal education being associated with children having been enrolled in school for a greater period of time. This finding is summarized in Table 5.3. There was no significant effect of immigration status and no significant interaction between immigration status and maternal education.

Table 5.3 Determinants of MOE

	Estimate	*t*	*p*
Intercept	7.845	3.448	0.0009
Mother's level of Education	0.408	2.320	0.023

Child's Relative L1/English Output. Previous research suggests a number of possible influences on the relative language use patterns of children (see Section 2.2.4). These variables were tested here. Prior to modelling, relationships between variables were inspected. No predictor variables were associated at greater than $r = 0.5$ and as such there were no collinearity concerns between these predictors (see Table 6.1). The child's output was modelled as a log odds ratio of the amount of English and L1. The amount of English spoken by the mother, the amount of English spoken by siblings and the number of older siblings in the house were significant and positive predictors of the amount of English spoken by the child. That is, children used more English at home as the amount of English their mothers and siblings spoke to them increased, and as the number of older (school-aged) siblings increased. These results are summarized in Table 5.4. Mother's level of education, immigration status and MOE were not significant predictors of the relative quantity with which children spoke English.

Table 5.4 Determinants of the Quantity of English Output from the Child

	Estimate	*z*	*p*
Intercept	-2.120	-6.319	2.63e-10
Mother's Input to Child	0.387	2.287	0.02
Siblings' Input to Child	0.582	5.316	1.06e-07
Number of Older Siblings	0.222	2.388	0.02

Siblings' Relative L1/English Input to the Child. As was the case for the child's output, the relative input from siblings was modelled as a log odds ratio of the amount of English and L1. An additional note about this variable is that it was based on an average across all siblings. This was done because it was not possible to model every sibling as a predictor variable (see 6.2.3). The results of this logistic regression reveal that the amount of English spoken by the

child in the home positively predicted the amount of English that their siblings spoke to that child (see Table 5.5). It is important to note that maternal education, immigration status and the relative language use of the mother (to the target child) did not predict the relative quantity of English input that siblings provided to the target child.

Table 5.5 Determinants of the Relative Quantity of English Input from Siblings

	Estimate	*z*	*p*
Intercept	-1.508	-5.297	1.18e-07
Child's Output	4.397	7.565	3.88e-14

Mother's Relative L1/English Input to the Child. As was the case for the child's output and input from siblings, the relative input from the mother was modelled as a log odds ratio of the amount of English and L1 spoken. There were two potential issues with collinearity amongst the considered predictors. First, the amount of English spoken by the child and their siblings was strongly correlated (r (72) = 0.71, p = 9.49e-13). As such, prior to modelling, these variables were decorrelated by regressing one on the other and using the residuals as a predictor. Specifically, the relative language use of the siblings (to the child) was predicted from the child's relative language use and a new variable Sibling_Input_RESID was created. The correlation between the original variable and the residualized variable was strong (r(72) = 0.70, p= 3.77e-12), suggesting that the new residualized variable was an adequate substitute for the original variable. Second, the number of older siblings and the presence of older siblings are essentially different measures of the same thing. Consequently, they were not included in a regression model at the same time. Instead, each was tested separately from the other.

One further issue that needed to be addressed before the regression models were created was the varied scales of the predictor variables. For example, maternal education (in years) is a

much larger scale (ranging from 0-20) than the proportion of English use by the child (ranging from 0-1). These varied ranges lead to models with non-significant intercepts. Non-significant intercepts are not in principle a problem (Grace-Martin, 2016; Peng et al., 2002). They suggest that if all predictors had a value of zero then the outcome variable would be zero (Frost, 2013). That is, the mother would only speak in the L1 to her child. Although this mathematically makes sense, we must be certain that the math represents a plausible reality (Frost, 2013). In this scenario, a complete lack of English use is unlikely. For example, English is the majority language and lingua franca in this community (Golberg et al., 2008) and almost all children have older siblings who are likely to increase the amount of English spoken by all family members, including the mother (Bridges & Hoff, 2014). Consequently, all continuous variables were scaled before modelling. Scaling the variables creates variables on similar scales to one another, which, in this case, led to the expected significant intercept without effecting the interpretation of the results (i.e., the same predictor variables were significant whether scaled or raw variables were used as predictors).

Mother's relative use of English with the child was predicted by an interaction between mother's level of education and immigration status, her fluency in English and the amount of English spoken at home by the child. That is, within the immigrant group, mothers used less English with their child, the more education they had. In contrast, in the Somali-refugee group, mothers used more English with the child, the more education they had (although this effect is less pronounced within this group compared to the immigrant group, as is illustrated in the varied slopes of the regression line in Figure 5.3). Mothers with higher English fluency and mothers whose children used more English also used more English with their children. These results are summarized in Table 5.6 and the interaction is plotted in Figure 5.3. The following list of

variables did not significantly impact mother's relative language use in this dissertation: the amount of English spoken by the siblings (to the child), the number of school-aged siblings, whether there were school-aged children in the home, mother's length of residency in Canada, and whether she works in English.

Table 5.6 Determinants of the Relative Quantity of English Input from Mother to Child

	Estimate	*z*	*p*
Intercept	-1.127	-5.692	1.25e-08
Mother's level of education (scaled)	-0.99	-3.142	0.002
Immigration Status: Somali-refugee	-0.411	-0.982	0.326
Mother's English fluency (scaled)	0.764	4.358	1.31e-05
Child's English use (scaled)	0.538	3.218	0.001
Mother's level of education (scaled) * Immigration Status	1.233	3.021	0.003

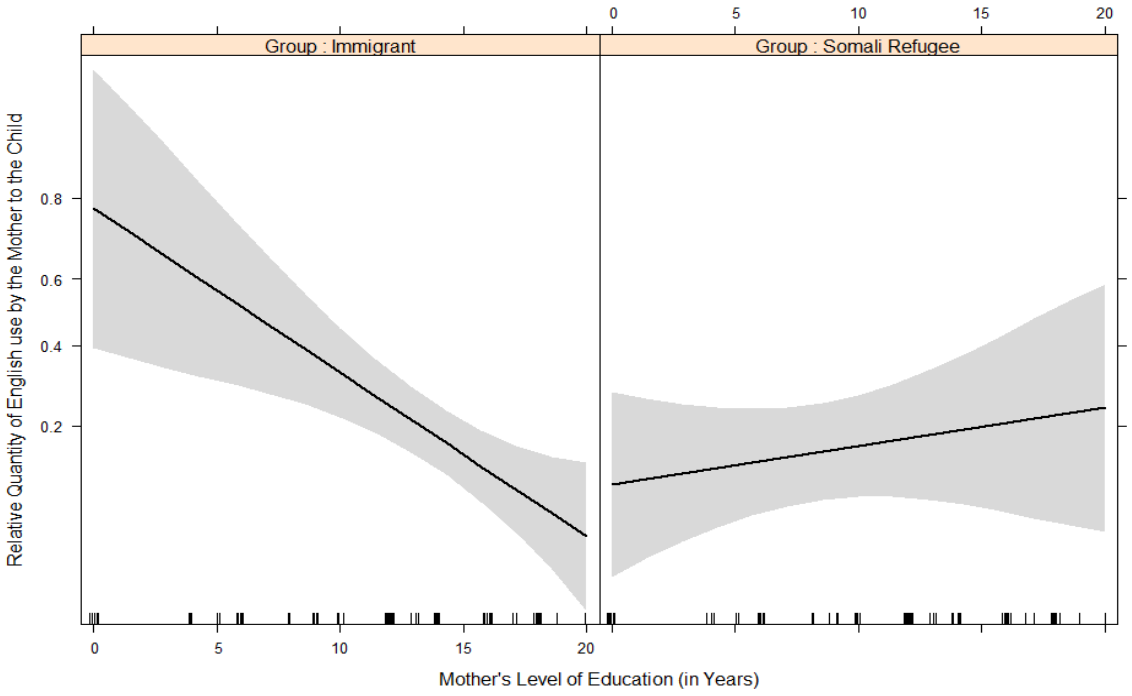

Figure 5.3. Mother's English Use: Interaction between Mother's Level of Education and Immigration Status.

5.2.2. Quality of Input

Mother's English Fluency. The outcome variable was the raw fluency ratings provided by the mothers. Linear regression modeling revealed that an interaction between mother's level of education and immigration status, the amount of English that she spoke with her child and her length of residency in Canada predicted maternal L2 fluency (see Table 5.7). That is, mothers who used more English, who had lived in Canada longer, and had higher levels of education, reported having greater English fluency. The effect of maternal education was more pronounced within the immigrant group, compared to the Somali-Refugee Group (see Figure 5.4). The relative amount of English spoken by her children – the target child or siblings – did not predict mother's fluency. The number of school-aged children, the presence of school-aged children and whether the mother worked or attended school in English were also not predictors of her English fluency.

Table 5.7 Determinants of Mother's English Fluency

	Estimate	*z*	*p*
Intercept	-2.073	-4.229	4.65e-05
Mother's level of education	0.269	8.824	1.47e-13
Immigration Status: Somali-refugee	3.345	6.307	1.32e-08
Mother's Relative English use	0.004	3.039	0.003
Mother's Length of Residency	0.493	4.584	1.59e-05
Mother's level of education * Immigration Status	-0.232	-4.945	3.91e-06

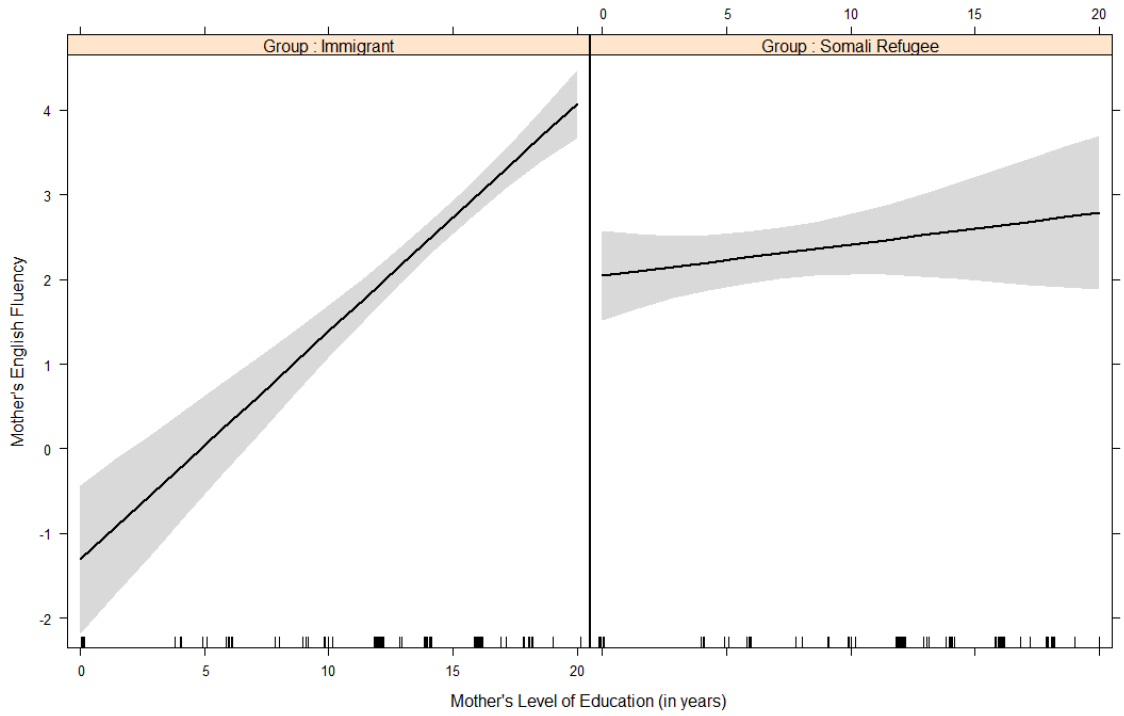

Figure 5.4 Mother's English Fluency: The Interaction between Mother's Level of Education and Immigration Status

English Richness at Home. The raw numeric richness score were the outcome variable. As was the case in Section 5.2.1, the varied scales of these predictors resulted in a non-significant intercept. Again, a complete absence of English language activities is unlikely. To adjust for this, all predictors were scaled. The results of this regression modelling revealed that English richness was positively predicted by mother's level of education and the amount of English spoken at home by the child. Additionally, there was a trend towards significance for the amount of English spoken by the mother (see Table 5.8). In other words, higher levels of education, higher levels of English input from the mother and increased English use at home by the child were all associated with higher English richness scores. English richness at home scores were not predicted by mother's length of residency, her English fluency or immigration status.

Table 5.8 Determinants of English Richness at Home

	Estimate	*z*	*p*
Intercept	3.393	22.608	<2e-16
Mother's level of Education (Scaled)	0.623	3.913	0.0002
Mother's Relative English Input (Scaled)	0.327	1.930	0.057
Child's Relative English Output (Scaled)	0.570	3.217	0.002

English Screen Time. The amount of screen time each week was the outcome variable. Only the amount of English spoken by the child was a significant and positive predictor of English screen time (see Table 5.9). That is, children who spoke English more often at home spent more time engaged in English-based screen time.

Table 5.9. Determinants of English Screen Time.

	Estimate	*z*	*p*
Intercept	2.199	9.952	5.07e-16
Child's Relative English Output	1.027	2.683	0.009

5.3. Chapter Summary

The results of these statistical analyses revealed that mother's level of education is a source of variation in a number of other environment and input level factors. Specifically, mother's level of education predicted family size, age of arrival, MOE, mother's relative English language use, mother's English fluency, and English richness at home (these results are summarized in Table 5.10). Notably, for many of these variables, maternal education interacted with immigration status, meaning that the exact direction and/or strength of the relationship depended on if children were in the immigrant or Somali-refugee group.

This chapter also revealed a number of key interdependencies that further broaden the influence of mother's level of education on children's environment and input (i.e., those cells

marked "indirectly" in Table 5.10). For example, mother's level of education did not predict the child's relative language use of English. Despite these null results, there was an indirect relationship with maternal education because children's relative language use was influenced by the amount of English spoken by the mother and her language use was predicted by her education. In turn, the child's relative amount of English use influenced the amount of English spoken by siblings and also the amount of English-based screen time each week. As such, the effect of maternal education extends beyond the variables that were found to be significantly predicted by it.

As a final point in summarizing the results presented in this chapter, all significant relationships are summarized in Figure 5.5. This figure, a repeat of Figure 1.1, highlights the interwoven nature of environment- and input-level variables. An arrow has been added for each significant relationship that was reported in this chapter. The dotted lines indicate instances of an interaction between maternal education and immigration status.

Table 5.10. Summary of Maternal Education as a Determinant of Intermediary Input Variables.

	Family Size	Age of Arrival	MOE	Child's English Output	Sibling's English Input
Mother's Level of Education	✓	✓	✓	*indirectly*	*indirectly*
	Mother's English Input	Mother's English fluency	English richness at home	Screen Time	
Mother's Level of Education	✓	✓	✓	*indirectly*	

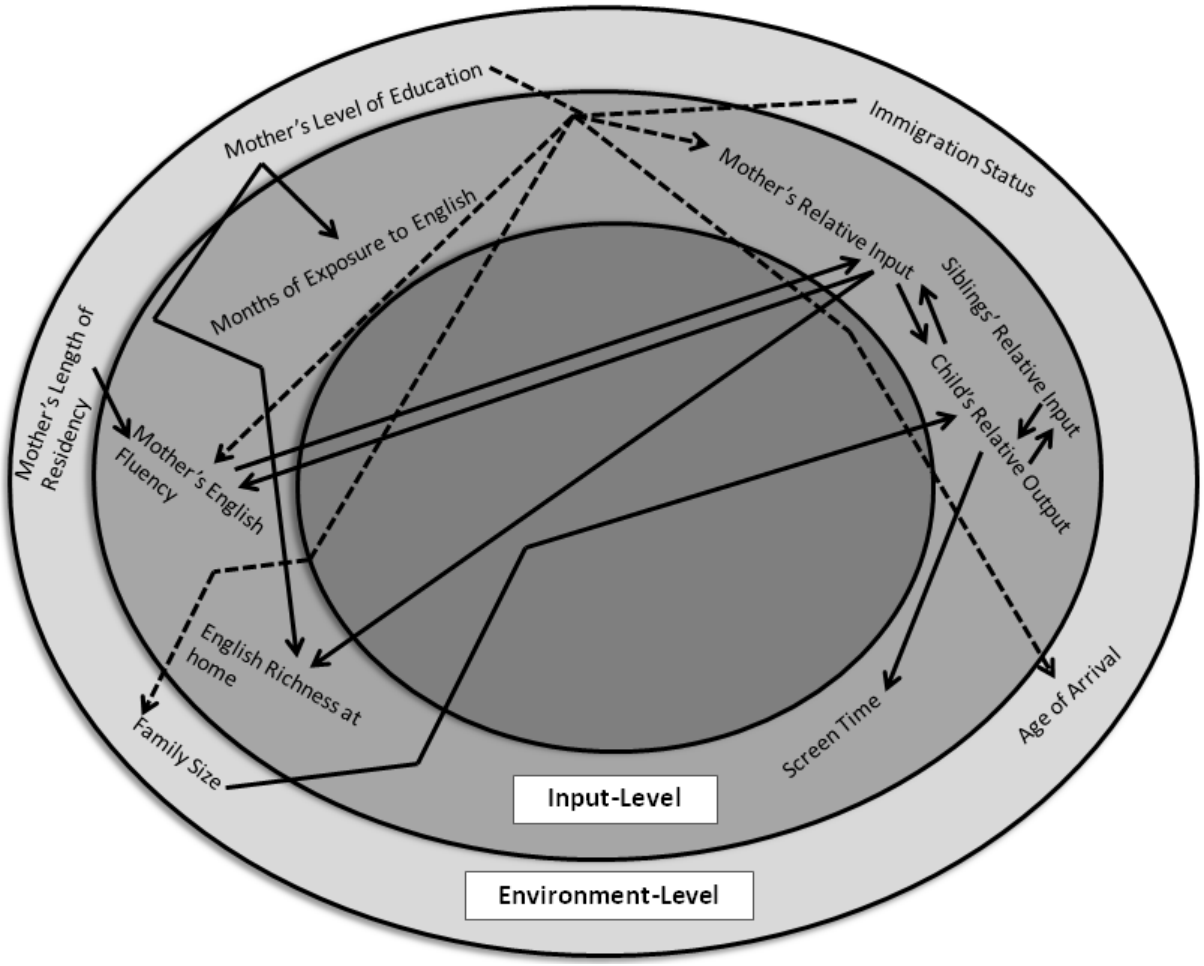

Figure 5.5. Summary of Interdependencies between Environment (including Maternal Education) and Input Level Factors

Dotted lines represent instances where a significant interaction was reported between maternal education and immigration status in predicting the input-level factor.

6. Results: Intermediary Input Variables as Determinants of Language Acquisition

In Chapter 4, maternal level of education was shown to be a determinant of children's L1 and L2 development. It was hypothesized that this relationship is mediated by other environment and input variables. In testing this hypothesis, Chapter 5 demonstrated that maternal level of education was a determinant of a number of intermediary environment and input variables. However, past research has suggested that these intermediary variables may not always influence bilingual acquisition as expected. As such, this chapter empirically evaluates these intermediary variables as determinants of children's L1 and L2 development. That is, this chapter addresses the research question: Are differences in intermediary environment and input factors determinants of children's L1 and L2 development?

Specifically, two environment-level variables are considered as determinants of bilingual acquisition: (a) family size and (b) age of arrival in Canada (Canadian or foreign-born). Several quantity based input variables are also considered: (c) MOE, (d) child's relative English output at home, (e) relative amount of English input from siblings, and (f) relative amount of English input from the mother. Consideration is also given to quality based input measures, such as (g) mother's English fluency, (h) English richness at home and (i) amount of screen time in English.

Determinants of both L1 and L2 were evaluated. The L2 measures included: story grammar, referring expressions, complex clauses, MLU, and lexical diversity. Linear regression was used to model individual differences in L1 scores and MLU. Logistic regression modelling was used to predict sources of individual differences in the remaining L2 abilities (see Section 3.3 and Table 3.7). Prior to completing this modelling, predictors were compared to determine if there were any potential issues with collinearity. For relationships between binary and continuous variables, *t*-tests were used. For relationships between two continuous variables,

correlations were calculated. These results are summarized in Table 6.1. Issues with collinearity were identified as any significant *t*-test or any significant correlation where *r* was greater or equal to 0.50. There were three potential collinearity issues and these are shaded in Table 6.1: (a) the relative input from siblings and the child's relative output (r (72) = 0.71, p = 9.49e-13), (b) age of arrival and mother's input to child (t (77.39) = -3.87, p = 0.0002), and (c) age of arrival and the English richness at home score (t (56.81) = -2.46, p = 0.02). To address the potential for collienarity between English use of siblings and the target child, a new decorrealted variable was created for sibling input (see Section 5.2.1). In the case of collienarity with age of arrival, decorrelated variables were not created. This technique was avoided because in instances where there is one binary and one continuous variable, it is the continuous variable that must be entered as the residualized variable. In both instances, the continuous variable is of greater interest (has more relevance to the research questions). Consequently, age of arrival was modelled separately from these two continuous variables.

Table 6.1. Correlations between Predictor Variables

	Age of arrival in Canada	Mother to child	Child Output	Sibling to Child	MOE	L1 rich at home	L1 Tech	L2 rich at home	L2 Tech	NWR	Mother's English fluency
Family size	t (67.55) = -1.74, p = 0.09	r (87) = 0.15, p = 0.15	r (87) = 0.31, p = 0.003	r (72) = 0.14, p = 0.25	r (87) = -0.37, p = 0.0004	r (87) = -0.04, p = 0.74	r (87) = -0.18, p = 0.09	r (87) = -0.03, p = 0.80	r (87) = -0.06, p = 0.56	r (85) = -0.20, p = 0.06	r (87) = -0.04, p = 0.73
Age of arrival in Canada (blocked)	-	t (77.39) = -3.87, p = 0.0002	t (62.04) = -0.15, p = 0.88	t (37.22) = -0.42, p = 0.67	t (74.85) = -1.64, p = 0.11	t (65.85) = 0.30, p = 0.76	t (61.07) = -1.43 p = 0.15	t (56.81) = -2.46, p = 0.02	t (61.58) = -0.32, p = 0.74	t (64.55) = 1.26, p = 0.21	t (73.66) = -1.59, p = 0.12
Mother to child		-	r (87) = 0.44, p = 2.02e-05	r (72) = 0.37, p = 0.001	r (87) = -0.03, p = 0.78	r (87) = -0.22, p = 0.04	r (87) = -0.16, p = 0.15	r (87) = 0.35, p = 0.0007	r (87) = 0.24, p = 0.02	r (85) = 0.06, p = 0.57	r (87) = 0.41, p = 5.94e-05
Child Output			-	r (72) = 0.71, p = 9.49e-13	r (87) = -0.19, p = 0.08	r (87) = -0.07, p = 0.49	r (87) = -0.16, p = 0.12	r (87) = 0.32, p = 0.002	r (87) = 0.28, p = 0.009	r (85) = -0.05, p = 0.61	r (87) = 0.09, p = 0.39
Sibling to Child				-	r (72) = 0.03, p = 0.81	r (72) = -0.04, p = 0.70	r (72) = -0.07, p = 0.53	r (72) = 0.39, p = 0.0004	r (72) = 0.34, p = 0.003	r (70) = 0.02, p = 0.85	r (72) = 0.18, p = 0.13
MOE					-	r (87) = 0.13, p = 0.23	r (87) = 0.24, p = 0.02	r (87) = 0.17, p = 0.10	r (87) = -0.20, p = 0.06	r (85) = 0.03, p = 0.79	r (87) = 0.15, p = 0.15
L1 rich at home						-	r (87) = 0.28, p = 0.009	r (87) = 0.01, p = 0.92	r (87) = 0.07, p = 0.48	r (85) = -0.13, p = 0.22	r (87) = -0.007, p = 0.95
L1 Tech							-	r (87) = 0.17, p = 0.11	r (87) = 0.02, p = 0.82	r (85) = -0.04, p = 0.74	r (87) = 0.05, p = 0.65
L2 rich at home								-	r (87) = 0.15, p = 0.14	r (85) = -0.04, p = 0.69	r (87) = 0.28, p = 0.007
L2 Tech									-	r (85) = -0.03, p = 0.81	r (87) = 0.01, p = 0.93
NWR										-	r (85) = 0.13, p = 0.23

6.1. Intermediary Determinants of L1 Development

The raw numerator score from ALDEQ, Section B was the outcome variable. Mother's relative quantity of English input and the child's relative quantity of English output were significant predictors of L1 scores. That is, lower L1 scores were associated with greater English use by the mother and child (see Model A in Table 6.2). Recall, greater English use is conversely less L1 use. Because of issues of collinearity, a second model was created with age of arrival instead of maternal input as a predictor (see Table 6.1 and adjacent explanation). Age of arrival was also found to significantly predict children's L1 scores, with Canadian-born children having lower L1 abilities. It is important to note that this effect aligns with the relative quantity of input provided by the mother. Children who were born in Canada heard more English spoken by their mothers (and conversely less L1) (mean for foreign-born group = 0.41 out of 4, mean for Canadian-born group = 1.04 out of 4; t (77.39) = -3.87, p = 0.0002). In other words, the mothers with foreign-born children spoke almost exclusively in the L1; whereas mothers with Canadian-born children spoke about 25% English to their child (see Model B in Table 6.2).

Table 6.2. Intermediary Determinants of Children's L1 Scores.

Model A	*Estimate*	*t*	*p*
Intercept	17.133	22.86	<2e-16
Mother's Relative English Input	-1.240	-2.436	0.017
Child's Relative English Output	-9.061	-6.349	9.83e-09

Model B	*Estimate*	*t*	*p*
Intercept	18.134	20.316	<2e-16
Age of Arrival: Canada	-2.002	-8.206	2.02e-12
Child's Relative English Output	-10.522	-2.518	0.014

In addition to examining determinants of children's L1 scores, input was also considered as a determinant of L1 attrition. Maternal English input to the child is relatively low (and

conversely L1-input is quite high) for all children. The mean relative L1 use for the entire sample of mothers (foreign-born and Canadian-born combined) was 80% (SD = 21%). In fact, the vast majority of mothers (84%) reported using at least 75% L1 with their child. It has been suggested that as little as 25%-L1 input at home is sufficient to maintain bilingualism (Pearson, Fernandez, Lewedeg, & Oller, 1997) and consequently these children's L1s would be predicted to be strong. Yet, 51% of parents reported their children were experiencing L1 attrition. Grouping the children by the amount of L1 input they receive from their mothers (i.e., greater than or less than 25%), reveals that 48% of children who hear more than 25% of their maternal input in the L1 and 64% of children who hear less than 25% of their maternal input in the L1 are experiencing attrition. A chi-square test revealed no significant difference in the amount of attrition reported for children who received greater than 25% L1-input from their mothers and those who received less than 25% input.

The pattern of L1-use amongst the children, however, reveals much greater English use compared to that of the mothers. On average, when at home, children speak half of the time in English and half of the time in their L1 (SD = 0.30). One third of children spoke at least 75% of the time in the L1 and 27% of the sample spoke 25% or less of the time in the L1. In the less than 25%-L1 use group, 87% of children were reported to be experiencing L1 attrition. In contrast, only 36% of children who spoke more than 25% in the L1 were reported to be experiencing L1 attrition. A chi-square test revealed that attrition was much more likely if children spoke less than 25% of the time in the L1 ($\chi^2 = 15$, $p = 0.0001$).

In summary, the regression analysis and chi-square tests point to quantity of input and especially output as key factors in L1 development and maintenance.

6.2. Intermediary Determinants of L2 Development

6.2.1. Story Grammar

The outcome variable was the log odds ratio of included and excluded elements. MOE and age of arrival were significant predictors. That is, being foreign-born and having higher MOE were associated with greater story grammar performance. These results are summarized in Table 6.3.

Table 6.3. Intermediary Determinants of English Story Grammar.

	Estimate	*z*	*p*
Intercept	-0.901	-10.232	<2e-16
AOA: Canada	-0.258	-2.873	0.004
MOE	0.027	5.085	3.67e-07

6.2.2. Referring Expressions

Section 3.2.3 outlines a gradient for referring expressions ranging from the least appropriate (excluding elements) to the most appropriate ("a NOUN"). Logistic regression modelling was based on this gradient. The outcome variables were: (a) the number of included (excluded) elements, (b) the number of elements that were introduced by nouns (pronouns) and (c) the number of nouns that were used in indefinite constructions ("a NOUN") (also see Table 3.7 and Section 3.3).

Included Elements. The log odds ratio of included and excluded elements was the outcome variable. The optimal model included family size, MOE, mother's fluency and age of arrival as significant predictors. That is, having fewer siblings, being foreign-born, having higher MOE and having a mother with higher English fluency were all associated with a greater inclusion of characters. These results are summarized in Table 6.4.

Table 6.4. Intermediary Determinants of Referring Expressions: Included Elements.

	Estimate	*z*	*p*
Intercept	1.300	5.210	1.88e-07
Family Size	-0.095	-1.962	0.050
AOA: Canada	-0.487	-2.807	0.005
MOE	0.024	2.194	0.028
Mother's fluency	0.184	2.615	0.009

Nouns. The log odds ratio of the number of nouns and pronouns was the outcome variable. Age of arrival was the only significant predictor, with foreign-born children having higher noun use. These findings are summarized in Table 6.5.

Table 6.5. Intermediary Determinants of Referring Expressions: Number of Nouns

	Estimate	*z*	*p*
Intercept	1.769	11..791	<2e-16
Age of Arrival: Canada	-0.465	-2.567	0.01

Indefinite Article ("a/an"). The log odds ratio of the number of nouns in constructions that included the indefinite article "a" compared to those that did not (either with "the", e.g., the airplane, the giraffe, or bare nouns, e.g. airplane) was the outcome variable. MOE, English richness at home and screen time were found to predict children's use of indefinite articles in the introduction of characters. That is, greater English exposure, higher English language richness (i.e., more story-telling, book reading and songs) and less screen time were associated with more instances of indefinite articles (see Model A in Table 6.6).

As there is an issue of collinearity between age of arrival and English language richness at home, a second model was created which included age of arrival and not English language richness. Age of arrival was also found to be a significant predictor with foreign-born children

having higher indefinite article use (see Model B in Table 6.6). This does not follow what would be predicted from English richness scores. That is, children who were foreign-born had, on average, lower English richness scores (English richness in the foreign-born group = 2.81 and in the Canadian-born group = 3.72; $t(56.81) = -2.46$, $p = 0.02$). As such, the effect of age of arrival is not the by-product of English language richness because if that was the case, Canadian-born children would have higher indefinite article use.

It is worth-noting that the intercept for both these models was not significant. As was the case in Section 5.2.1, the variables were scaled. However, in this case, the intercept remained non-significant. A non-significant intercept is not in principle a problem (Grace-Martin, 2016; Peng et al., 2002). It suggests that if all predictors had a value of zero (Frost, 2013), then children's use of indefinite articles would also be zero. Two of these predictors are MOE and English richness which are linguistic input variables. Input has been shown to be a crucial component of bilingual children's development of the English article system (Zdorenko, 2011). As such, it is plausible that if these variables were equal to zero, children would not use (acquire) the indefinite article and consequently a non-significant intercept is not worrisome.

Table 6.6. Intermediary Determinants of Referring Expressions: Indefinite Articles.

Model A	Estimate	z	p
Intercept	-0.271	-1.014	0.311
MOE	0.026	2.824	0.005
English Language Richness – at home	0.164	3.408	0.0007
Screen Time	-0.251	-3.564	0.0004

Model B	Estimate	z	P
Intercept	0.202	0.799	0.424
MOE	0.037	3.9445	7.97e-05
Screen Time	-0.360	-2.325	0.02
Age of Arrival: Canada	-0.188	-2.763	0.006

6.2.3. Syntactic Complexity (Complex Clauses)

The log odds ratio of the number of complex and simple utterances was the outcome variable. Family size, relative English input from siblings, MOE and screen time were significant predictors of the amount of complex clauses. That is, more complex sentences were used by children who had more siblings, heard more English from their siblings, had longer exposure to English outside the home, and had less screen time. These results are summarized in Model A, Table 6.7.

There are two aspects of Model A that warrant further comment. First, input from siblings was averaged across all siblings. This decision allowed a score to be entered for every child that had at least one sibling. The logic for this choice was to minimize the amount of missing data (i.e., NAs). Missing data leads to exclusion from the analysis. As such, minimizing NAs is necessary to maximize the number of children in the analysis. For example, only one child had seven siblings. If a variable had been created for Sibling 1, Sibling 2, through to Sibling 7, every child who did not seven siblings would have NAs in the column labelled Sibling 7. As such, only the child with seven siblings would be included in any model that included sibling input as a variable.

Second, only children were not included in this model because they do not have siblings to provide input. As such, these children had missing values (NAs) for this variable and were excluded. The decision to put NAs for their input from siblings was made because the alternative of entering zeros (no English input) would have been misleading. That is, it would equate a child without siblings to a child who has siblings who only speak the L1 with the child. These are not equivalent situations. As there were only ten children who did not have siblings, the sample size

was too small to separately model individual differences in their complex clause use. Alternatively, a model without input from siblings was created. This model is a nested model of Model A and is provided as Model B in Table 6.7. In this model, screen time and family size were no longer significant and as a consequence they were also excluded from the model.

Table 6.7. Intermediary Determinants of Syntactic Complexity: Complex Clauses

Model A	Estimate	z	p
Intercept	-2.542	-14.609	<2e-16
Family Size	0.117	4.009	6.10e-05
Input from Siblings	0.138	3.892	9.94e-05
MOE	0.024	4.441	8.95e-06
Screen Time	-0.076	-2.042	0.041

Model B	Estimate	z	p
Intercept	-1.958	-28.470	<2e-16
MOE	0.021	4.918	8.73e-07

6.2.4. Morphosyntactic Development (MLU)

The outcome variable was the raw numeric score for this measure. The relative quantity of English spoken across all siblings was not a significant predictor of MLU. However, the relative amount of English input from older siblings predicted MLU and there was a trend towards an effect of mother's English fluency. That is, children who heard more English from their older siblings and whose mother's had higher English fluency produced longer utterances when completing the story telling task. Age of arrival was added to this model but it was not a significant predictor. These results are summarized in Table 6.8, Model A. This model however, does not apply to any child who is the eldest or is an only child (n = 32) (see Section 6.2.3 for a discussion of missing values). As such, the nested model – that is, the one without input from

older siblings – was also considered and is presented below (Table 6.8, Model B). This model reveals a significant effect of mother's English fluency on children's MLU.

Table 6.8. Intermediary Determinants of Syntactic Complexity: MLU.

Model A	*Estimate*	*z*	*p*
Intercept	4.092	7.042	6.34e-09
Mother's English Fluency	0.284	1.749	0.09
Relative English Input from Older Siblings	0.293	2.036	0.05

Model B	*Estimate*	*z*	*p*
Intercept	4.919	12.344	<2e-16
Mother's English Fluency	0.318	2.111	0.04

6.2.5. Productive Vocabulary (Lexical Diversity)

The log odds ratio of the number of new and repeated words was the outcome variable. Family size, relative English input from the mother, relative English output by the child, relative English input from the siblings and the amount of English screen time all had a significant effect on lexical diversity. That is, children with fewer siblings, who heard more English from their mothers, who heard more English from their siblings, who spoke more English at home, and who had less screen time, obtained higher lexical diversity scores (i.e., used more different words) (see Table 6.9). Age of arrival was tested in an alternate model that did not include mother's input and was not a significant predictor.

Table 6.9. Intermediary Determinants of Lexical Diversity.

	Estimate	*z*	*p*
Intercept	-0.967	-22.398	<2e-16
Family Size	-0.032	-3.160	0.002
Input from Mother	0.063	3.422	0.0006
Child's Output	0.138	2.217	0.027
Input from Siblings (Residual)	0.081	4.769	1.85e-06
English Screen Time	-0.043	-3.299	0.001

6.3. Chapter Summary

This chapter reported several regression analyses, demonstrating that environment-level variables (age of arrival in Canada [Canadian or foreign-born] and family size), quantity based input variables (MOE, child's relative English output at home, relative amount of English input from siblings and relative amount of English input from the mother), and quality based input measures (mother's fluency English, richness at home and amount of screen time in English) were all determinants of children's L1 and L2 development. However, it is worth-noting that not every predictor significantly predicted every language ability. As such, Table 6.10 provides a summary of the significant predictors for each language measure. Plus marks indicate a positive and significant result. Negative signs indicate a negative and significant result.

Table 6.10. Summary of Intermediary Input Variables as Determinants of Children's L1 and L2 Acquisition

		L1				L2			
		ALDeQ Section B	Story Grammar	Referring Expressions: Included	Referring Expressions: Nouns	Referring Expressions: Indefinite Article	Syntactic Complexity: Complex Clauses	Syntactic Complexity: MLU	Lexical Diversity
Environment	Family Size			-			+		-
	Age of Arrival (Blocked): Canadian-Born	-	-	-	+	-			
Quantity of Input (English)	MOE		+	+		+	+		
	Child's English Output	-							+
	Input from Siblings						+	+	+
	Input from Mother	-							+
Quality of Input	Mother's English fluency			+				+	
	English richness at home					+			
	Screen Time					-	-		-

As can be seen in Table 6.10, some predictors have a more robust impact on language acquisition than others. That is, they significantly predict multiple language measures. In this dissertation, robust predictors are defined as those that significantly influence at least one third (i.e., three) of the language measures. Crucially, the robust predictors included environment- and input-level factors. However, maternal input was not among the robust predictors. Nevertheless, all robust predictors were directly or indirectly related to mother's level of education in this sample (see Section 5.3 and specifically Table 5.10).

The environment-level variables were both robust. Family size had both a positive and negative effect, depending on the particular language measure. For example, larger family size (i.e., more siblings) was associated with increases in complex syntax use, but decreases in lexical diversity. Age of arrival was also a significant predictor of many language measures, with the general pattern being that foreign-born children had advantages in both the L1 and in English. For the quantity of input variables, MOE, and input from siblings were both robust and positive predictors of English language abilities. It is worth-nothing that relative English input from the mother was not a robust predictor of these children's bilingual development. For the quality of input variables, screen time was a robust, but negative predictor. That is, increased screen time was associated with reduced English language scores. As was the case for quantity of input, maternal quality of input, as measured via her L2 fluency, was not a robust predictor.

The robustness of predictors, however, is not central to this dissertation; rather, the interdependencies between these variables are of primary concern. As such a comparison between the results in Chapter 4 with the results of Chapters 5 and 6 is necessary, especially to answer the final research question put forth in this dissertation (see Section 2.3). The results across all analyses align, suggesting that the intermediary variables tested in this dissertation do

mediate the relationship between maternal education and bilingual development. For example, in Chapter 4, maternal education was shown to influence L1 scores, however, the direction of the relationship depended on children's immigration status. Higher scores were associated with higher levels of maternal education in the immigrant group but the opposite pattern existed for the Somali-refugee group. This finding aligns with the findings from Chapters 5 and 6. That is, increased English use by the mother led to decreased L1 abilities in all children, and maternal language use and maternal education were related in a parallel manner as maternal education and L1 scores. That is, the amount of English used by the mothers was predicted differently by her education, depending on her immigration status. In the immigrant group, higher education was associated with less English use (and thus higher L1 scores for children). In the Somali-Refugee Group, higher education was associated with more English (and thus depressed L1 scores for children). Similar alignments can be found across the results. It is worth-noting, however, that relative quantity of maternal input is not always the mediating input variable. For example, for English MLU, it is maternal English fluency that seems to mediate the relationship between maternal education and L2 morphosyntactic development. Samples of proposed intermediary variables for each language measure are outlined in Table 6.11.

Table 6.11 Comparison of Results across Chapters 4-6
Samples of Intermediary Variables Possibly Mediating the Relationship between Maternal Education and Bilingual Development

Environment → Input → Acquisition	Alignment
Maternal Education→ Relative Quantity of English Input from the mother → L1	Yes
Maternal Education → Months of Exposure to English outside the home → Story Grammar	Yes
Maternal Education → Age of Arrival → Referring Expressions: Included	Yes
Maternal Education → Age of Arrival → Referring Expressions: Nouns	Yes, but for the immigrant group only
Maternal Education → English Language Richness at home → Referring Expressions: Indefinite Articles	Yes
Maternal Education → Months of Exposure to English outside the home → Complex Clauses	Yes
Maternal Education → Mother's English Fluency → MLU	Yes
Maternal Education → Relative Quantity of English Input from the mother → Productive Vocabulary (Lexical Diversity)	Yes, but for the immigrant group only

Table 6.11 illustrates that there is not one single variable that mediates the relationship between maternal education and bilingual development. This suggests that there is a complex relationship between maternal education and acquisition in this group of children. In fact, this chapter revealed a number of variables that simultaneously influenced bilingual development; these variables were either directly or indirectly related to maternal education (see Table 5.10 and corresponding explanation). As such, these results highlight the fact that multiple variables are interwoven into a complex system that supports development. This complexity is illustrated in Figure 6.1, which provides a summary of the reported interdependencies between variables. An arrow was provided for every predictor that was significant for at least one language

measure. The black arrows represent interdependencies between maternal level of education and intermediary variables. The white arrows represent significant results between intermediary variables and language acquisition.

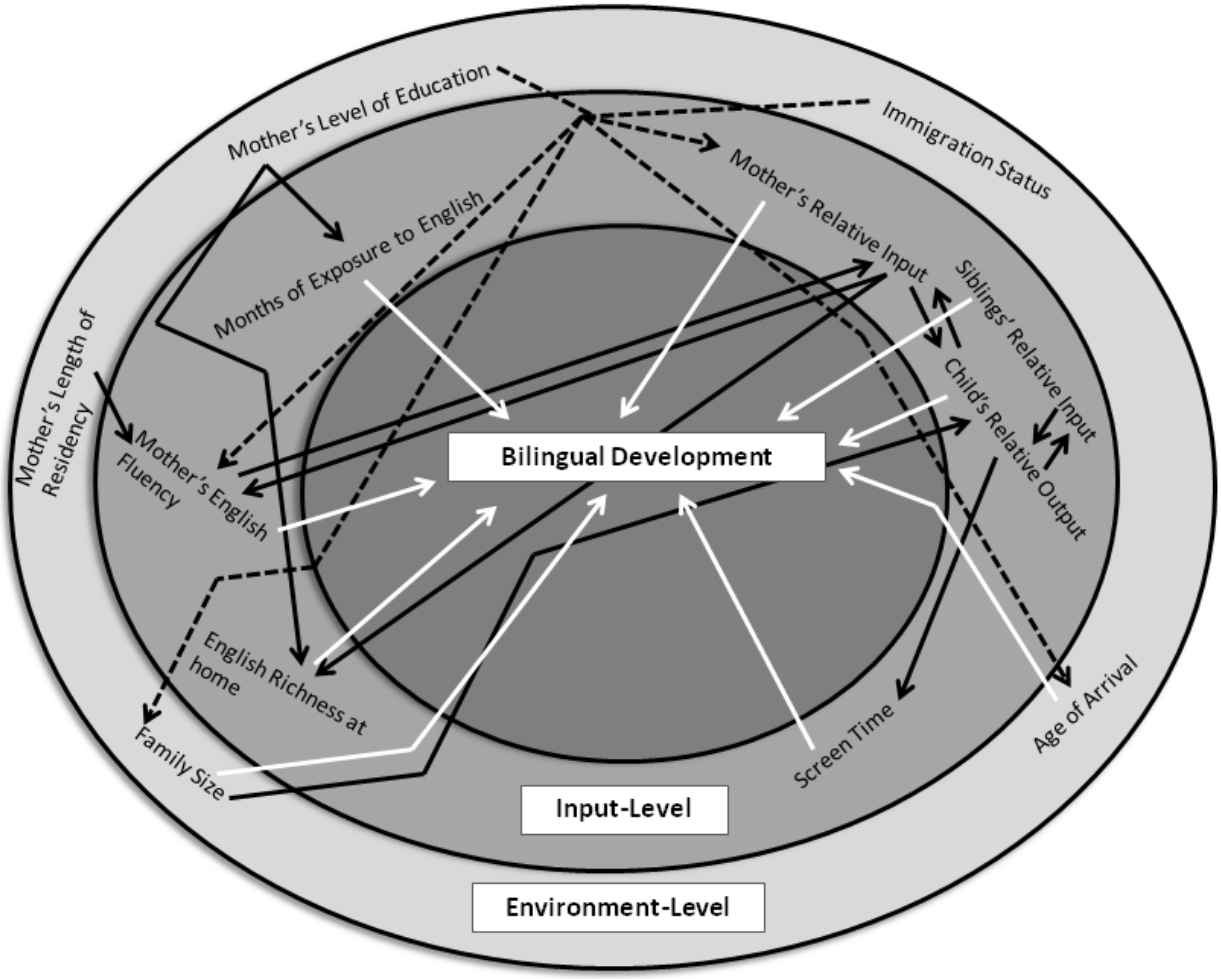

Figure 6.1. Summary of Interdependencies between Environment (including Maternal Education), Input and Language Acquisition

Black arrows represent relationships between environment and input. Dotted lines represent instances where a significant interaction was reported between maternal education and immigration status in predicting the input-level factor. White arrows represent relationships between input and acquisition.

7. Discussion

To date, research into the environment- and input-level determinants of language acquisition has largely focused on one or two variables, such as the quantity of input to children and the amount of linguistic output from children, within a single study (e.g., Hammer et al., 2012; Unsworth, 2013). Previous studies have also been limited to examining a single language measure, often vocabulary (e.g., Hoff, Rumiche, et al., 2014) or omnibus tasks (e.g., Winsler, Burchinal, et al., 2014). This dissertation is unique in that it investigated multiple environment factors, considered the interdependencies between these factors and examined multiple linguistic sub-domains.

Using the relationship between maternal education and input factors as a test case, this multi-level study demonstrates that children's bilingual development occurs through the complex interaction of a number of factors. In providing the context for the discussion of these interdependencies, this chapter begins with a discussion of the patterns of L1 and L2 development observed for the child L2 learners studied here (Section 7.1). It also details the relationships between child L2 learners' bilingual development and individual environment (Section 7.2.1) and input factors (Sections 7.2.2 and 7.2.3), before discussing the interdependencies between these variables (Section 7.2.4).

7.1. Language Development in Immigrant and Refugee Children

7.1.1. L1 Vulnerability

Previous research has suggested that children's L1 abilities are likely strong prior to the onset of schooling in the majority language (the L2) (e.g., Hoff, Rumiche, et al., 2014; Kohnert et al., 2010). This trend was replicated in this study of immigrant and refugee children, as the

majority of children were reported to have strong L1 abilities (see Section 4.1). However, once children begin school, prior research suggests that they will show a preference for the majority language and their L1 will become vulnerable to attrition (e.g., Hoff, Rumiche, et al., 2014). This finding was also replicated in this dissertation, with 50% of parents reporting that their children were beginning to have decreased L1 abilities and favor English within the first year of school.

These data illustrate rapid majority-language shift, where children show a preference for the majority language (English) shortly after starting school and highlight that L1 vulnerability is a concern from a very young age. Although from this cross-sectional snapshot we ultimately cannot know what their long-term L1 outcomes will be; it may be the case that they will demonstrate protracted or divergent attainment (e.g., R. Jia & Paradis, 2015; Montrul, 2015). However, this rapid majority-language shift could be indicative of a worrisome trajectory towards ultimate L1 loss if children do not continue to receive adequate L1 support (see Section 2.2 and 6.1). As such, if educators, clinicians and parents aim to foster bilingualism in today's immigrant and refugee children, L1 vulnerability needs to be considered. Too often, the focus is placed on ensuring that children quickly develop necessary L2 skills, with little consideration given to the dire consequences this may have on children's L1 abilities (e.g., Murphy & Evangelou, 2015; Murphy, 2014). Subtractive bilingualism, where second language acquisition ultimately leads to first language loss, is not the only option, nor is it desired (e.g., Cummins, 2000; Lambert, 1975; Laundry & Allard, 1993).

Additive bilingualism has many benefits for children. For example, stronger L1 skills have been shown to support L2 development in children (e.g., Cummins, 1981; Meier, 2010; MacSwan & Pray, 2005; Thomas & Collier, 2001). Furthermore, bilingual development has been associated with better conflict resolution skills, increased executive control (cognitive abilities),

greater ability to navigate between cultures and to foster multiple allegiances, stronger empathy, enhanced maintenance of bonds within families and communities, and greater employment opportunities as adults (Bekerman & Horenczyk, 2004; Bialystok, 2015; Genesee, 2009; Kirova, 2016; LaFromboise, Coleman, & Gerton, 1993; Meier, 2010; Toppelberg & Collins, 2010). Thus, supporting additive bilingualism is beneficial for these children, and researchers, educators and clinicians should be encouraged to offer programming in children's L1s.

7.1.2. L2 Emergence and Profile Effects

The child L2 learners in this dissertation performed below monolingual age-matched expectations on all measures of their English language abilities. In the case of vocabulary, complex syntax and story grammar, the child L2 learners' average standard scores were within the normal range for monolinguals, but at the low end. For MLU and referring expressions (first mentions), the child L2 learners' average standard scores were below the normal range for monolingual children (see Table 4.1). This lower performance is not surprising, given the limited amount of exposure to English these children have received. In fact, the proximity of their scores to the normal range for monolingual children of the same age suggests that these children are "catching up" and that they are rapidly acquiring the L2. For all measures, except referring expressions, at least half of the children achieved scores within the range considered typical for their monolingual English peers.

L2 narrative and language abilities. The children's narratives were analyzed across a number of measures, which varied in the amount of language-specific knowledge that was required. At the extreme, story grammar skills were expected to rely the least on language-specific abilities and thus be more advanced than other language-specific skills (e.g., Paradis &

Kirova, 2014). Of the 31 possible story grammar elements, the children in this dissertation included, on average, 10 items. However, in interpreting this result, it is worth noting that monolingual children are not expected to provide all 31 potential elements. To compare the children in this dissertation with both monolingual children and other child L2 learners, children's standard scores were examined. This choice was made because previous studies do not provide a count of the number of included elements. A group mean of ten for standard scores, suggests that, as a group, children are performing like native-speakers. Recall, the child L2 learners in Paradis and Kirova (2014) did perform on par with native-speakers (mean standard score = 9.76). However, in this dissertation, the mean standard score was 7.05, which is a full standard deviation below the monolingual mean. These reduced story grammar scores, as is discussed in the following subsection on profile effects, may stem from more limited English abilities for the children in this dissertation.

As noted in Section 2.1.2, the participants (i.e., characters and objects) in a story are a noteworthy aspect of story grammar. The child L2 learners in this dissertation included an average of 79% (11/14) of participants. Furthermore, the children seemed to understand that they needed to use nouns in order to convey this information to the listener; only an average of 18% (2/11) of characters were introduced using pronouns. However, on average, fewer than half (4/9) of these nominal introductions included in an indefinite article (e.g., *an elephant*). As such, it appears that children were aware of the need to convey information about who was involved in the story to the listener, but that their language-specific skills were still developing in terms of the most appropriate English constructions.

The children also had somewhat limited language-specific abilities related to lexical, morphosyntactic and syntactic development. As noted above, they scored below age-matched

native-speaker expectations for each of these measures. However, comparing their performance to native-speaker expectations might underestimate the extent of English proficiency that they have already acquired. That is, this comparison highlights what they cannot do and does not illustrate what they can do. For example, these children, who had 12 months of exposure to English and were 60 months age, used an impressive 130 unique lexical items to tell these six short stories, putting their lexical abilities on par with 48-month-old, English-speaking monolingual children (Schneider et al., 2005). Furthermore, these child L2 learners produced 15.7% of their utterances as complex clauses. In contrast, the 46 month-old monolingual, English-speaking children in Huttenlocher et al. (2010) only produced 5.8% of their utterances as complex clauses. However, there are noteworthy differences between these two studies. Most importantly, the language sampling technique was different. Huttenlocher et al. (2010) recorded daily interactions between parents and their children, whereas this dissertation used a narrative task. Sentences in narratives have been shown to be longer and more complex compared to those used in daily conversation (e.g., Karlsen et al., 2016) and consequently, the higher percentage of complex clauses in this dissertation is not evidence of more advanced English grammar on the part of the child L2 learners. Nevertheless, the relatively high percentage of complex clauses in these child L2 learners' utterance does suggest the possibility that these children may have precocious acquisition of these constructions.

Profile effects. Each of the above-noted abilities is necessary in order for children to tell a story. However, these abilities did not emerge uniformly for these child L2 learners, as was evidenced by their unequal attainment of native-speaker expectations. The children obtained the highest average standard score for complex syntax (7.96) and the lowest average standard score for referring expressions (6.11). Story grammar, which was predicted to be the least influenced

by limited language abilities, was the fourth ranked (out of six measures) based on the average standard score (7.05), and the third ranked based on the number of children who reached monolingual expectations (i.e., scored 7 or higher) (see Table 4.2). This mid-ranking suggests that story grammar skills are not emerging in advance of other linguistic skills. In fact, for some language-specific skills, syntax and vocabulary, children had significantly better performance than for story grammar (see Section 4.2). As such, the profile effects in this dissertation do not align with the prediction of more advanced story grammar skills compared to language-specific abilities (e.g., Paradis & Kirova, 2014).

As Section 2.1.2 details, the advantaged status of story grammar has been reported in several previous studies and is thought to result from the transfer of a cognitive skill between languages (e.g., Bohnacker, 2016; Gagarina, 2016; Karlsen et al., 2016; Kunnari et al., 2016; Paradis & Kirova, 2014; Roch et al., 2016). Nevertheless, other studies have not found story grammar scores to be advanced compared to language-specific measures for child L2 learners. Researchers have suggested that a certain level of language development is necessary to convey the relevant plot points of a story (e.g., Gutiérrez-Clellen, 2002; Montanari, 2004; Roch et al., 2016; Uccelli & Páez, 2007). This point can be illustrated with a comparison between my results and Paradis and Kirova (2014), who found evidence of English story grammar skills being more advanced than language-specific skills, and this dissertation, which did not.

The children in both studies were at the onset of schooling in Edmonton, Canada and were of similar ages (mean in Paradis and Kirova, 2014 = 58 months; this dissertation = 60 months). In both studies, children came from diverse L1 backgrounds. Finally, both studies also employed the same narrative task. Nevertheless, Paradis and Kirova (2014) reported profile effects, with an advantaged status for story grammar; that is, children had higher standard scores

for story grammar than any other measure. In fact, the children in their study had story grammar scores on par with native-speaker expectations. In contrast, children in this dissertation obtained an average standard score that was almost three points lower than that reported in Paradis and Kirova (2014). Furthermore, story grammar scores were not higher than scores for language-specific measures. One notable difference between these two studies is that the children in this dissertation obtained lower standard scores on every measure compared to the scores reported in Paradis and Kirova (2014). As such, the children in this dissertation had lower English language abilities, and their lower L2 skills may have limited their ability to convey story grammar units, even if they knew these story grammar units were required (e.g., Montanari, 2004).

7.2. Determinants of Bilingual Acquisition

As the previous section details, it is broadly the case that child L2 learners make rapid gains in their L2 within the first year of school. However, at the individual level children, vary in their L1 and L2 abilities. Understanding the underlying determinants of this variation provides insights into the environment- and input-level factors that support bilingual development (e.g., Paradis & Grüter, 2014). In the case of this dissertation, several variables were simultaneously considered and a particular focus was placed on understanding the interdependencies between maternal education, intermediary input variables and language development for this population of children.

Several *environment*-level variables were found to be determinants of bilingual acquisition; they include (a) maternal education, (b) immigration status, (c) family size and (d) age of arrival in Canada. In addition, several input variables were also determinants of acquisition. They include *quantity of input* variables such as (e) MOE, (f) child's relative English

output at home, (g) relative amount of English input from siblings, and (h) relative amount of English input from the mother. Finally, the *quality of input* children received influenced their performance. These predictors include (i) mother's English fluency, (j) English richness at home and (k) amount of screen time. These effects are discussed in Sections 7.2.1 to 7.2.3. These variables, however, did not exist in isolation from each other. Instead, these variables are intricately connected to produce the particular learning context of each child. This point is demonstrated through a discussion of interdependencies between variables, particularly focusing on the relationship between maternal education and input factors (see Section 7.2.4).

7.2.1. Environment-Level Determinants of Acquisition

Maternal Education. As in previous research, maternal education was a significant predictor of children's L1 and L2 scores among the participants detailed in this dissertation. However, the nature of the relationship varied by immigration status and measure (see Chapter 4). Children's L1 scores and L2 ability with referring expressions (specifically the sub score for the inclusion of characters) was significantly influenced by an interaction between immigration status and maternal education. For children in the immigrant group, higher levels of education were associated with higher L1 scores and higher inclusion of characters in their L2 stories. However, for the Somali-refugee group, higher levels of maternal education were associated with lower L1 scores and negligible changes in the number of characters they included in their L2 narratives. These findings align with previous research that has also found that the effect of maternal education varies depending on the particular population of L2 children who have been studied (e.g., contrast Bohman et al., 2010 with Hammer et al., 2012; see Section 2.2.1). In a further parallel with previous research, maternal education was generally found to be a positive

predictor of L2 abilities in this dissertation (e.g., Golberg et al., 2008; Hammer et al., 2012; Oller & Eilers, 2002; Rojas et al., 2016; Winsler, Kim, et al., 2014; Winsler, Burchinal, et al., 2014). Specifically, in this dissertation, higher levels of maternal education were associated with higher scores for: story grammar, the number of characters that were introduced with nouns, indefinite article use, the number of complex clauses and MLU.

There was, however, one unexpected finding in the results; maternal education was a negative predictor of children's L2 lexical diversity. This seemingly surprising result was likely mediated by an interdependency between maternal education and relative language use. As discussed below (and also above in Table 6.11), mothers with higher levels of education (at least in the immigrant group) tended to speak more of the L1 (and less English) to their children. However, increased English use was positively related to children's emerging English vocabularies (see Sections 7.2.2). Thus, in the case of L2 vocabulary development, more highly educated mothers tended to provide less of the necessary input for this skill than mothers with lower levels of education. In summary, the results of this dissertation point to a more nuanced relationship between maternal education and bilingual development and highlight the need to consider interdependencies between maternal education, intermediary input variables and acquisition.

Immigration Status. As the previous section illustrates, immigration status is an important determinant of acquisition through its influence on other factors, including maternal level of education. One of the main findings of this dissertation was that in the immigrant group, mothers with higher levels of education were more likely to speak in the L1 with their children, whereas in the Somali-refugee group, mothers with higher levels of education were more likely to speak to their children in English (see Section 7.2.4 below). As such, families' immigration

status is necessary for understanding the relationship between maternal education and relative language input in this dissertation.

Family Size. Following Armon-Lotem et al. (2014), I measured family size according to the number of siblings children had. Armon-Lotem et al. (2014) found that the impact of siblings depended on the particular group of children that they studied: null results within the English-Hebrew group and negative results within the Russian-Hebrew group. That is, the number of children in a family had no effect on the Hebrew scores of English-speaking children, but larger families were associated with a negative effect on the Hebrew scores of Russian-speaking children (see Section 2.2.1). In this dissertation, varied results were also reported for the role of family size in children's language development. However, in this case, the differences were based on the language measure, rather than on immigration status (group). For example, family size did not predict L1 scores, but it did predict some L2 scores. Children with more siblings were more likely to use complex clauses in their story-telling but less likely to use a variety of vocabulary items (i.e., they had lower lexical diversity scores). Children with more siblings also introduced fewer participants into their narratives.

The latter two findings align with the negative result reported in Armon-Lotem et al. (2014) and with other research about family size (e.g., Cherian, 1990): that is, children from larger families routinely show decreased performance on language, academic and cognitive measures of development compared to children from smaller families. One long-standing explanation for these results is Blake's (1989) dilution hypothesis. The basic premise is that as family size increases, the family's resources (e.g., time) are diluted, and this has a negative effect on development. In the context of this dissertation, the relative quantity of English input from mothers had a positive effect on children's lexical diversity scores. Perhaps mothers with more

children had less time to provide individual input to their children, and this diminished input led to lower vocabulary scores. Future research with more exact measures of the absolute quantity of input from mothers is necessary to verify this line of reasoning.

Counter to the general trend of a negative relationship between family size and development, children with more siblings had better syntactic complexity scores. At first glance, this finding may seem counter-intuitive. However, siblings change the structure of language that is used in the home and these changes may offer greater opportunities to learn complex syntax. Specifically, in households with older siblings, talk between the mother and older siblings contains more examples of complex language than is the case for children without older siblings (Woollett, 1986). As such, it is possible that, more complex language was used in the homes of children who had more siblings. In support of this, input from siblings to the child had a positive connection with children's use of complex syntax (see Table 6.10). Perhaps for the children studied here, a greater number of siblings led to higher absolute L2 input from siblings. Future research that specifically investigates the absolute (instead of relative) amount of input from siblings as a function of family size is necessary to verify this suggestion. Research that empirically evaluates the type of input that siblings provide is also necessary (i.e., does L2 input from siblings increase the syntactic complexity in children's L2 input at home?).

In summary, as was the case for maternal education and immigration status, this discussion of family size highlights the need to consider environment-level determinants of acquisition within a multi-level approach. That is, the range of results can only be understood when interdependencies between environment (family size) and intermediary input are considered.

Age of arrival. In this dissertation, foreign-born children had advantages compared to Canadian-born children in L1, L2 story grammar and L2 referring expression. The L1 results presented here align with those of previous research, which has also found L1 skills to be more advanced in foreign-born children (G. Jia, et al., 2005; G. Jia & Aaronson, 2003; R. Jia & Paradis, 2015; Montrul, 2008). In terms of the L2 scores, previous research suggests that Canadian-born and foreign-born children will have comparable performance (e.g., Paradis & Kirova, 2014). However, in this dissertation, foreign-born children showed more advanced L2 skills than those of children born in Canada – particularly, more highly developed narrative macrostructure (narrative) skills. Recall, macrostructure skills are more transferable between languages (see Sections 2.1.2 and 7.1.2). Consequently, it is possible that foreign-born children's stronger L1 skills aided them in developing their L2 abilities (e.g., Paradis & Kirova, 2014; Thomas & Collier, 2001). In summary, the general pattern in these data suggests that an older age of arrival was advantageous for both languages. This finding runs counter to the popular belief that delayed introduction of the L2 will automatically lead to reduced L2 outcomes (e.g., Murphy & Evangelou, 2015). It does, however, align with a growing body of empirical evidence. Studies investigating the age of onset of L2 acquisition have also shown that older children have advantages in language learning (Blom & Bosma, 2016; Blom & Paradis, 2015; Golberg et al., 2008; Roesch & Chondrogianni, 2016).

7.2.2. Quantity of Input as a Determinant of Acquisition

Quantity of input was assessed in two ways in this dissertation: via (a) cumulative L2 exposure, which was measured as the number of months children had been in school, and (b) relative amount of L1/L2 use at home, which was measured as a proportion of English use by the

child, the siblings and the mother. Each of these measures was a significant determinant of children's emerging language skills.

Months of exposure to English. Months of exposure to English was a positive and significant predictor of children's narrative macrostructure scores (for both L2 story grammar and the number of participants that children included in their L2 stories), children's use of indefinite articles and children's use of complex syntax. That is, children with higher levels of exposure to English had higher English language scores. This finding is expected, given the wide range of studies that have previously reported a relationship between the amount of cumulative L2 exposure and L2 development (e.g., Altman et al., 2016; Blom et al., 2012; Blom & Paradis, 2015; G. Jia & Fuse, 2007; Paradis, 2011; Unsworth, 2013).

Despite the robustness of months of exposure to English as a determinant of acquisition, this variable did not predict MLU or L2 lexical diversity in this group of children. The null results for MLU align with those of Wiechmann et al. (2016), who found that exposure was a reliable predictor of both complex syntax and vocabulary, but not MLU. These researchers suggest that in older bilingual children (i.e., preschool and school-aged children, as opposed to toddlers) MLU may be a less reliable index of development; consequently, it is not surprising that there was a null result for the relationship between MLU and exposure in this dissertation.

The null result for lexical diversity, however, is surprising given that other studies have reported a connection between exposure and vocabulary development (e.g., Golberg et al., 2008; Oller & Eilers, 2002; Wiechmann et al., 2016). One notable difference is that the previous studies have included children who are slightly older than the children in this sample. This is an important difference because in Edmonton (the location of the present study) preschool and kindergarten programs are half a day in length; whereas first grade classes and higher are full-

day programs. As such, the children in this dissertation may have had comparable exposure in terms of months (e.g., 12.72 months of exposure in this study compared to 9 months of exposure in Golberg et al. [2008], which was also conducted in Edmonton), but they may have had half as many hours of English exposure during that period. As a consequence, for the children in this dissertation, vocabulary scores were related to language use at home rather than the number of months children had been in school (see the following subsections). In contrast, vocabulary scores in Golberg et al. (2008) were related to months of exposure in school rather than home language use. As such, it seems that home language use may be more important for younger children, and that exposure at school may have more relevance for vocabulary development in older children. However, further empirical study of this hypothesis is required.

Relative quantity of L1/English output from the child at home. In this dissertation, children's relative language output was measured as the relative proportion that they spoke English. Notably, increases in English use corresponded with decreases in L1 use. Children with higher levels of English language use had lower L1 scores and higher English vocabulary scores. This finding aligns with previous studies, which have also highlighted the importance of considering children's language use as a determinant of acquisition (Bedore et al., 2012; Bohman et al., 2010; Paradis, 2011; Rojas et al., 2016).

Relative quantity of L1/English input from siblings. The relative amount that siblings spoke English to the child positively and significantly impacted their use of complex syntax in the L2, their L2 MLU and their L2 lexical diversity score. As such, these findings, like those of Rojas et al. (2016), illustrate that siblings are an important source of linguistic input for children. However, in contrast to the results presented in Rojas et al. (2016) and Wong-Fillmore (1991), language input from siblings had no effect on the L1 abilities of children in this dissertation. As

such, this work demonstrates that different interlocutors may be important for supporting different languages for these children. In this case, siblings were a significant determinant of children's emerging L2 skills, whereas maternal input was essential for L1 development.

Relative quantity of L1/English input from the mother. In this dissertation, children who received more L1 input from their mothers had higher L1 scores. This finding aligns with the dominant trend in previous research, which also suggests a positive relationship between the relative language input children hear in the minority language and their proficiency in that language (e.g., Bohman et al., 2010; Mueller Gathercole et al., 2015; Place & Hoff, 2011; Prevoo et al., 2014). Conversely, children who received more English input from their mothers had higher L2 scores, but only for productive vocabulary. Relative quantity of maternal input had no effect on children's English story grammar scores, abilities with referring expressions, use of complex sentences or morphosyntactic abilities.

It seems that several factors may be responsible for the limited effect of the proportion of English spoken by the mother to the child on the above noted L2 abilities. One possibility is that because these children are in school, they have many sources of linguistic input beyond their mothers (e.g., Paradis, 2017; Rojas et al., 2016). Interestingly, in this dissertation, the amount of time children had been in school predicted all of the English abilities that were not predicted by maternal input. An additional factor is that these children's mothers were non-native speakers of English. Adult second language learners are known to use simpler sentences and to omit grammatical morphology (e.g., Ionin, Zubizarreta, & Philippov, 2009; Larsen Freeman, 1975; O'Brien, Segalowitz, Collentine, & Freed, 2006); as such, input from these mothers may have lacked the necessary morphemes and syntactic complexity to support children's development in these domains (e.g., Golberg et al., 2008; Paradis, 2011; Zdorenko, 2011). Vocabulary, on the

other hand, is a skill with which adult L2 learners make steady gains (e.g., Coady & Huckin, 1997), perhaps allowing mothers to more easily support their children's L2 vocabulary development, as was the case in this dissertation.

7.2.3. Quality of Input as a Determinant of Acquisition

As the previous section highlights, the quality of input children receive is a fundamental factor in acquisition, perhaps outweighing the quantity of input. This is particularly the case with respect to maternal input, where mother's L2 fluency is a determinant of more L2 abilities than the relative quantity of input from the mother. Consequently, this dissertation considered the effect of three quality of input measures: (a) mother's L2 fluency, (b) richness of input and (c) screen time.

Mother's L2 fluency. In this dissertation, maternal fluency predicted the number of characters that children included in their story and children's English MLUs. The latter finding aligns with previous research that suggests that mothers with higher levels of English fluency are less likely to omit grammatical morphemes and thus more likely to provide English input that can support morphosyntactic development (e.g., Chondrogianni & Marinis, 2011; Hammer et al., 2012; Hoff et al., 2014; Paradis, 2011). Despite this general effect on morphosyntax, maternal fluency was not found to influence child L2 learners' accuracy in using articles in referring expressions that introduce characters. It is possible that even highly proficient adult learners have not acquired sufficient accuracy with this particular construction to support its development in their children.

The finding with respect to character introduction is somewhat surprising given that the inclusion of characters is hypothesized to be a cognitive skill, related to story grammar (see

Section 2.1.2 and 7.1.2). As such, maternal fluency was not expected to affect this skill because knowledge of which characters need to be introduced to the listener was predicted to transfer between languages. However, it is worth noting that, within this sample, mothers with higher English fluency were also more likely to be more highly educated. As such, it is possible that these mothers had more experience with literacy, and might consequently have provided their children with more experience in story-telling generally and character introduction specifically. In support of this hypothesis, maternal fluency was weakly correlated with English language richness, which included an estimate of the amount of reading and story-telling in the home ($r(87) = 0.28$, $p = 0.007$, see Table 6.1).

Language richness. In terms of L1 development, children who heard more of the L1 spoken by their mothers had higher L1 scores, but the language richness scores for the L1 did not predict L1 abilities. It is important to note that all of the mothers were native speakers of the language the children were learning as a L1. Consequently, it is possible that these mothers provided sufficient quality of input in their daily interactions, and that enriching activities did not sufficiently boost the quality of input to generate significant differences between participants. In contrast, children's indefinite article use in English was improved by language richness activities in the L2. As noted above, articles can be particularly difficult for adult L2 learners but indefinite articles are an essential component to the appropriate introduction of characters (e.g., a giraffe). As such, increased reading (i.e., being read to) might have provided more opportunities for children to hear appropriate indefinite article use at home. Children who more frequently engaged in such activities, thus, had higher scores.

Screen time. Among the children in this dissertation, screen time appeared to exert no influence on their L1 abilities. However, this finding needs to be interpreted cautiously, because

60% of the children had no access to L1-based screen time. Consequently, it is not surprising that a null result was found. Future research with children with greater access to screen time in their L1 is still necessary. For children's L2 development, screen time had a negative effect on complex syntax scores, morphosyntactic abilities and productive vocabulary size. That is, increases in English-based screen time were associated with lower performance on these measures. As such, it seems that, for this sample of children, screen time may have detracted from the more meaningful social interactions that underlie language development (e.g., Hoff, 2006).

It is important to note, however, that the scope of this finding may be limited because the English screen time score was comprised primarily of television viewing. This imposes at least two limitations on generalizability. First, it is possible that more socially engaged forms of screen time (e.g., videogames with a multiplayer component) may benefit child L2 learners, as has been suggested for older learners (e.g., Peterson, 2010; Rankin, McNeal, Shute, & Gooch, 2008). Second, television viewing was measured broadly as amount of exposure per week. The specific type of programming was not taken into consideration; previous research has suggested that educational programming may benefit children's language development (e.g., Chonchaiya & Pruksananonda, 2008; Close, 2004; Rice, Huston, Truglio, & Wright, 1990). As such, it is possible that certain types of screen time may be beneficial for children. Consequently, the results of this dissertation should not be interpreted as making a broad claim that screen time is problematic. Instead, these results caution against the indiscriminate use of television for language input, especially if that viewing time could be spent on other activities, like shared book reading or interactive play.

7.2.4. Interdependencies between Determinants

The previous section highlights a number of determinants that significantly influence children's bilingual development. However, as Sections 1.2 and 2.2.4 detail, these factors are not predicted to influence acquisition in isolation of each other. In fact, the social interactionist perspective adopted here emphasizes interdependencies between variables. These interdependencies are particularly evident in Section 7.2.1 where the relationship between maternal education and language development can only be understood vis-a-vis an interaction between maternal education and immigration status. This section details these interdependencies, using a multi-level approach that considers the ways in which environment-level variables, such as maternal education, influence input level variables, such as maternal language use, which in turn influences children's language development.

Maternal education and mother's relative language use. For all children, the relative proportion that their mothers used English versus the L1 was shown to influence L1 development and L2 productive vocabulary. That is, more L1 input supported children's L1 development and more L2 input supported children's L2 productive vocabularies. This finding was related to maternal education because it was shown to influence the relative proportion of mothers' English language use with their children. However, this relationship was not straightforward because it was mediated through an interaction with immigration status. That is, within the immigrant group, mothers with higher levels of education used less English with their children. This finding aligns with those of some previous studies (e.g., Golberg et al., 2008; Hammer et al., 2012; R. Jia & Paradis, 2015; Mueller Gathercole, Kennedy, & Thomas, 2015). In contrast, in the Somali-refugee group, mothers with higher levels of education used more English with their children. This finding aligns with those studies that have reported that increased maternal education is

associated with increased L2 use (e.g., Bohman et al., 2010; Oller & Eilers, 2002; Prevoo et al., 2014; Winsler, Kim, & Richard, 2014). As such, both of the seemingly conflicting findings from previous literature are represented within this dissertation. In order to understand these conflicting results, the relationship between maternal education and language input needs to be considered in a more nuanced way. For example, details of the mothers' educational experiences also need to be taken into account.

The interaction between maternal education and immigration status on mothers' relative quantity of language use is likely related to the language in which they were educated (e.g., Hoff & Giguere, 2015). Although specific details were not systematically collected from the women who participated in this study, general knowledge about immigration patterns and countries of origin provide relevant insights into potential differences in educational experiences. For example, access to education was limited for Somali women prior to migration (see Sections 1.1, 2.2.1 and 3.1.1). As a consequence, higher levels of education are likely associated with educational experiences post-migration, which often occurred in English (specific examples from this sample of mothers include English education at a refugee camp in Kenya and adult education courses in Edmonton). In contrast, mothers in the immigrant group had access to education throughout their childhood, adolescence and young adulthood. Consequently, they might have completed substantial amounts (if not all) of their education in L1-based programs, prior to migration. In summary, the language of education aligns with the effect of education on maternal input. Higher levels of English education were associated with increased English use at home among the mothers in the Somali-refugee group and higher levels of L1 education were associated with increased L1 use at home among those in the immigrant group.

Maternal education and maternal English fluency. Maternal L2 fluency was significantly related to children's English morphosyntactic development in this dissertation. In turn, maternal fluency was related to maternal education overall (regardless of the language of instruction); that is mothers with higher levels of education reported having higher levels of L2 proficiency. This finding is somewhat surprising, especially given the interaction noted just above. Differences between the immigrant group and Somali-refugee group were expected because, as discussed above, the language of education likely differed for these women. Furthermore, previous research has suggested that when mothers are educated primarily in their home country before migration, they have lower proficiency than mothers who have attended school in the United States (in English) (e.g., Hammer et al., 2012). However, this was not the case in this dissertation; fluency levels were comparable across the two groups (the mean for the immigrant group was 2.46/4 and for the Somali-refugee group, 2.35/4), suggesting that mothers who experienced L2-based instruction (Somali-refugee group) were not more proficient than those who were primarily educated prior to migration (immigrant group).

In seeking to understand the comparable proficiency between these different groups, it seems that different types of education may have contributed to comparable proficiency levels. In the case of the immigrant group, increased access to foreign-language courses (presumably English classes) is hypothesized to underlie the finding that education and English fluency are positively connected for these women. In the Somali-refugee group, in contrast, increased English-medium schooling post-migration is hypothesized to contribute their proficiency levels. Consequently, more education, regardless of where it took place, likely involved more English language training. In interpreting this finding, it is important to keep in mind that these two groups were not equivalent in the absolute level of education that was attained; the Somali-

refugee group generally had lower levels of education (see Figure 2.1 and Section 3.1.1). As such, it is expected that if the Somali women had completed higher levels of education, their L2 proficiency would surpass those who completed post-secondary education prior to migration, but who studied English as a foreign language. Future research that takes into account specific details about maternal education in a more nuanced way is, thus, necessary in order to understand the relationship between mother's level of education, her L2 proficiency and children's L2 development.

Other influences on maternal language use. Within the social interactionist framework, multiple factors are expected to interact to produce developmental outcomes (e.g., Bronfenbrenner & Morris, 2006). As a consequence, several factors, beyond maternal education, were also considered as predictors of both mothers' relative language use and L2 fluency in this dissertation. In terms of relative language use, it was found that mothers with higher L2 fluency levels were more likely to speak English to their children. This finding aligns with previous research (e.g., Place & Hoff, 2011). Also in parallel with previous researchers, mothers whose children used more English were more likely to speak English to their children (e.g., Bridges & Hoff, 2014; Eilers et al., 2006; Shin, 2002). This latter finding demonstrates that bidirectional influences, which are predicted in the bioecological model, exist for children's bilingual acquisition. That is, it is not the case that children are passive recipients of language input. They actively shape their own experiences.

Mothers' L2 fluency was also determined by a number of factors. In addition to the influence of education on proficiency, mothers were more likely to report higher English fluency levels if they used English more often and if they had lived in Canada longer. These findings align with previous research about L2 development generally, which suggest that increased

language use in naturalistic settings is related to increased proficiency (e.g., Chiswick & Miller, 1994; Chiswick, 2009; Collentine & Freed, 2004; Derwing, Munro, & Ron, 2008). As such, these findings highlight the importance of considering mothers as dynamic language learners whose language use and abilities is influenced by the social context in which they live.

Influences on home activities. The English language richness score, which included estimates of the amount of reading, story-telling and singing that the children participated in English, was significantly and positively related to maternal levels of education and the relative amount of English spoken by the mother and by the child. These findings align with previous research that has also reported that more highly educated mothers are more likely to engage in language-rich activities such as reading with their children (e.g., Prevoo et al., 2014). These results also demonstrate that language-rich activities and language use patterns in general are intricately connected. That is, in this dissertation, the mothers and children who used more English in their conversations with each other were also more likely to engage in more English-based activities, such as reading English books together. In other words, language use patterns may reflect the preferred language of speakers (Armon-Lotem et al., 2014), and this preference is reflected in other activities in which the family engages. This relationship between language use and preferred language was particularly evident in the amount of English television that children watched each week, because screen time was only predicted by the amount of English-spoken by the child. That is, children who spoke more English at home watched greater quantities of English television programming each week.

***Influences on the relative language use of children*.** The amount of English that children spoke at home was significantly and positively impacted by the amount of English that their mother and siblings spoke to them. That is, the more English that was spoken to children, the

more English they spoke. This finding is expected given past studies which have shown that bilingual children are sensitive to the language use patterns of their interlocutors (e.g., Genesee, Boivin, & Nicoladis, 1996; Genesee, Nicoladis, & Paradis, 1995; Paradis & Nicoladis, 2007). Previous research has also reported that school-aged children are more likely to speak English at home, which increases the amounts of English used by family members in general (Bridges & Hoff, 2014; Hoff, Rumiche, et al., 2014; Wong-Fillmore, 1991). This finding was also replicated in this dissertation because the children who had a greater number of school-aged siblings used more English than children with fewer older siblings.

Summary of Interdependencies. In taking a social interactionist approach to bilingual development, this dissertation emphasizes the complex relationships that exist between environment, input and acquisition. Results related to maternal education levels and other variables are a prime example of the extensive interdependencies that exist amongst factors. Maternal education was a predictor of both L1 and L2 development. These effects were expected based on past research, and were hypothesized to arise from interdependencies between maternal education and the linguistic input mothers provide their children (e.g., Hart & Risley, 1995; Hoff, 2006). This prediction was supported in this dissertation; however, these relationships were more nuanced than has been reported in monolingual studies. Most notably, the relationship between maternal education and relative maternal language use was mediated by an interaction between education and immigration status, suggesting that it is not only the amount of education that matters but also the language of that education (e.g., Hoff & Giguere, 2015). Furthermore, maternal education did not just predict maternal language use in this dissertation. It was also significantly related to other variables, including months of exposure to English and age of arrival. These other interdependencies highlight the need to cautiously interpret the role of

maternal education in language development because it may not always be the case that maternal education, which is easily measured, is a proxy for maternal language use, which is difficult to measure. As Table 6.11 illustrates, no single variable mediates the relationship between maternal education and bilingual development. Instead, there are a number of input factors that appear to mediate this relationship.

This dissertation also illustrated that multiple determinants of acquisition are simultaneously at play in an intricately connected social system. For example, the relative amount of English spoken by the mothers in this dissertation was not determined solely by their education and immigration status, but also by the child's relative language use patterns and her own L2 fluency. Similarly, English language richness scores were simultaneously influenced by maternal education and the relative language use patterns of the child. These interdependencies highlight the fact that children's language development should be considered within the complex social context of their daily interactions (see Figure 6.1), interactions within which the children are actively engaged and not passive observers.

8. Conclusion

Children learn language from the linguistic input they receive from the people around them. However, input varies on an individual basis, and this variation leads to differences in children's emerging language skills (e.g., Lieven, 2010; Tomasello, 2003). One explanation for this variation is that the environments in which children live shape the specific linguistic input that they receive (e.g., Hart & Risley, 1995; Hoff, 2006). This interdependence between environment, input and acquisition has been well documented in monolingual research. For example, maternal levels of education have been associated with both the quantity and quality of language input that children receive, and these have in turn been related to children's emerging language abilities (e.g., Hart & Risley, 1995). To date, however, there has been limited empirical investigation of such interdependencies in bilingual populations, despite the fact that bilingual populations experience greater diversity in input and environment (e.g., Paradis & Grüter, 2014). This population, as a result of this increased variation, affords an ideal opportunity to test for interdependencies amongst determinants. As such, this dissertation investigated interdependencies between environment, input and bilingual development in a diverse group of child L2 learners, focusing in particular on the relationship between maternal education, intermediary input factors and acquisition.

Previous research with bilingual children has yielded mixed results regarding the relationship between maternal education and language development. Some researchers have reported that higher maternal education is linked to lower L1 outcomes and higher L2 outcomes (e.g., Bohman, Bedore, Peña, Mendez-Perez, & Gillam, 2010; Oller & Eilers, 2002; Prevoo et al., 2014; Winsler, Kim, & Richard, 2014), while others have reported that higher maternal education is linked to higher L1 outcomes, but has a marginal to negative impact on the L2 (e.g.,

Golberg et al., 2008; Hammer et al., 2012; R. Jia & Paradis, 2015; Mueller Gathercole, Kennedy, & Thomas, 2015). As such, the first research question addressed in this dissertation was: Is maternal education a determinant of children's L1 and L2 Development? If so, are higher levels of education associated with higher language scores?

Within this sample of children, the effects of maternal education on language development were robust. Children's L1 abilities and a wide range of L2 skills, such as story grammar, complex syntax and morphosyntactic development, were positively associated with maternal levels of education. That is, mothers with higher levels of education had children who obtained higher scores on each of these linguistic sub-domains. However, there was one unexpected finding: mothers with higher levels of education tended to have children with smaller English productive vocabularies. This finding appears to be connected to the relationship between maternal education and the relative language use patterns of these mothers (see Table 6.11 and Section 7.2.1). As such, these results highlight the need to consider interdependencies between maternal education and intermediary input variables when investigating determinants of acquisition.

Thus, the next research question addressed in this dissertation was: Does maternal education impact the linguistic input migrant children receive at home? If so, does maternal education have the same effect on the linguistic input provided to immigrant compared to refugee children? In this dissertation, mother's education was related to both the quantity and quality of input children received at home. In the case of quality of input, mothers with higher levels of education reported higher levels of English fluency and greater frequency of language-enriching activities, such as shared book reading. In terms of quantity of input, maternal education was directly related to the relative amount of English spoken by the mother. However,

this relationship was mediated by an interaction with immigration status. The mothers in the immigrant group, who had higher levels of education, were more likely to speak to their children in the L1; whereas the mothers in the Somali-refugee group, who had higher levels of education, were more likely to speak in English to their children.

A further connection can be drawn between maternal education and language use in the family more broadly because the relative amount of English spoken by the mother influenced the amount of English that was spoken by other family members, most notably the target child. As noted above, the child's output was an important determinant of acquisition. As such, the effect of maternal education on relative quantity of language use extends beyond the mother's own speech. Taken together, these findings highlight the fact that variation in maternal levels of education is intricately connected with both the quantity and quality of input that bilingual children receive.

Having established a connection between maternal education and linguistic input, the next phase involved investigating a connection between this input and acquisition. As such, this dissertation also considered the following questions: Do these intermediary environment and input factors determine children's L1 and L2 development? If yes, do the results generated to address each of the previous research questions align? Findings were considered to align if, for example, maternal education positively influenced L1 scores, maternal education positively influenced input from mothers, and maternal input positively impacted L1 scores. Such parallel results suggest that maternal education influences children's development through that particular intermediary variable (see Section 2.3).

The intermediary variables considered in this dissertation were factors that have previously been identified as determinants of acquisition. They included: environment-level

variables (family size and age of arrival in Canada [Canadian or foreign-born]), several quantity-based input variables (MOE, child's relative English output at home, relative amount of English input from siblings, and relative amount of English input from the mother), and quality of input factors (mother's English fluency, English richness at home and amount of screen time in English). These variables were all found to be directly or indirectly related to maternal education (see Chapter 5, especially Table 5.10) and they were all confirmed to be determinants of acquisition (see Chapter 6, especially Table 6.10). Furthermore, the results of the initial analyses (i.e., maternal education → acquisition) align with the results of the subsequent multi-level analyses (i.e., maternal education → input → acquisition). However, it was not the case that one single variable mediated the relationship between maternal education and linguistic development. For example, maternal education was a significant predictor of mothers' relative language use and relative language use was a significant predictor of children's L1 abilities. In contrast, the relationship between maternal education and L2 MLUs appeared to be mediated by maternal L2 fluency. As such, the intermediary input factor varied for the different linguistic sub-domains (see Table 6.11).

In some cases, the intermediary variables aligned with what would be expected on the basis of monolingual studies. Monolingual research suggests that maternal education influences the ways in which mothers speak to their children (e.g., Hart & Risley, 1995), and researchers who study bilingual development have proposed similar interdependencies (e.g., Bohman et al., 2010; Golberg et al., 2008; Oller & Eilers, 2002; Paradis, 2011; Prevoo et al., 2014). The above examples highlight this pattern. It is important to note, however, that not all L2 skills were related to the above-noted pattern of maternal education influencing acquisition via maternal input. For example, children's use of complex syntax was predicted by the number of months

they had been in school and by the amount of English input they received from siblings (see Table 6.7). In this dissertation, months of exposure outside the home was significantly related to maternal levels of education. Sibling input was also indirectly related to maternal levels of education because, as noted above, the more English the mother spoke (which was related to her education level), the more English the child spoke, and hence the more English that the siblings spoke to that child (see Chapter 5).

In sum, these interdependencies highlight the need to cautiously interpret the role of maternal education in language development because, as noted in Chapter 7, other input variables may also mediate the relationship between maternal education and language development. As a consequence, the full story of the connection between maternal education and acquisition is more complicated than a strict one-to-one mapping between maternal education and maternal input.

A further complication that was revealed in this dissertation was that measuring maternal education levels is more complex in bilingual populations compared to the same measurements in monolingual populations. In monolingual samples, higher levels of education are equivalent to higher levels of education in that language. For example, English-speaking mothers with higher levels of education have higher levels of English-medium education. However, for bilingual populations, mothers vary in the amount of education that they have received in each language. As such, the highest credentials that these women have achieved does not provide the same clear cut estimation of the amount of L1- or L2-based education they have completed (e.g., Hoff & Giguere, 2015). This point is exemplified in the differences between the educational experiences of the women in the immigrant and Somali-refugee groups (see Sections 1.1, 3.1.1 and 7.2.4). The necessity of appealing to such details to explain complex results further highlights the need

to consider development from a multi-level perspective that simultaneously takes into account multiple factors. That is, this dissertation illustrates that environment- and input-level factors do not determine children's language acquisition as isolated variables. Instead, the complex relationships that exist between these factors are instrumental in shaping acquisition.

Indeed, the parallel inquiry into the interdependencies amongst intermediary variables highlights these complexities, as can be seen in the results for relative quantity of input. Such complexities are predicted by the social interactionist framework. In fact, this framework predicts that multiple environment- and input-level variables will interact to generate the specific linguistic input children receive (Bronfenbrenner & Morris, 2006; Hoff, 2006). As such, as a follow-up, this dissertation addressed the following question: Besides maternal education, what other variables influence the linguistic input children receive at home?

In this dissertation, linguistic input was measured via several quantity and quality of input variables and, as Chapter 5 illustrates, each of these variables was influenced by other determinants of acquisition. For example, the relative quantity of English input that mothers provided to their children was simultaneously predicted by an interaction between maternal education and immigration status, her L2 fluency and the relative amount of English the child spoke at home. Summarizing across the results in Chapter 5, the most prominent finding was that the language use patterns of all family members were intertwined. That is, as previous research has found (e.g., Bridges & Hoff, 2014; Eilers et al., 2006; Genesee et al., 1996; Ghimenton et al., 2013; Paradis & Nicoladis, 2007; Wong-Fillmore, 1991), people, including children, are influenced by the language choices of their interlocutors. This finding is important because it highlights that children's interlocutors are also sensitive and responsive to the ways in which children use language. As such, in understanding determinants of acquisition, it is important to

remember that children are agents who can influence their own environments. It is not just the environment that influences the child (Bronfenbrenner & Morris, 2006). More broadly, these findings reinforce the crucial point that interdependencies need to be given a more prominent role in theories of language acquisition.

The results presented from this dissertation have implications beyond advancing theoretical accounts of bilingual development. The effects of maternal education (and socio-economic status more broadly) on language development are not easily remedied through intervention (Mueller Gathercole et al., 2015). However, greater understanding of the ways in which maternal education impacts other determinants of acquisition and in turn how these variables influence development may provide an opportunity to create more appropriate strategies to provide interventions when necessary. For example, Suskind et al. (2016) demonstrated that parent education programs can successfully alter the quantity and quality of input that is provided to children, particularly those from lower socio-economic backgrounds. For bilingual children, understanding which intermediary variables support specific linguistic skills and how these variables relate to maternal education is, thus, essential to determining the types of parental education programs which could prove useful for children who need extra supports in their language development.

In sum, using the multi-level perspective of the social interactionist framework, this dissertation emphasizes the importance of studying determinants in the broader context in which they occur. In fact, a number of instrumental interdependencies were revealed (see especially Figure 6.1). These interdependencies highlight the premise of the bioecological model (Bronfenbrenner & Morris, 2006), which, when applied to the context of this dissertation, could be stated as, to truly understand bilingual development, research must be conducted within the

entire context of children's experiences. To study acquisition from the perspective of individual variables – in isolation of each other – misses important and rich details about how input and environment shape acquisition.

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Appendix 1: Alberta Language and Environment Questionnaire

(ALEQ: Paradis, 2011; Paradis, n.d.)
https://www.ualberta.ca/linguistics/cheslcentre/questionnaires (accessed Sept. 30, 2016)

Name / Participant Code: _____
Date of birth of target child: _____
Gender of target child: _____
Date of interview: _____
Interpreter or broker (*if any*) / Research Assistant: _____
"target child" – can use the child's name in the oral interview

Age at Test	Year	Month	Day	**Age of Arrival**	Year	Month	Day	**Months of Exposure** *(copy from page 8)*
Date of Testing	_____	____	____	Date of Arrival	_____	____	____	
Date of Birth	_____	____	____	Date of Birth	_____	____	____	
Chronological age	_____	____	____	Chronological age	_____	____	____	

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):

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

0 **Not Fluent in English**	**1** **Limited Fluency in English**	**2** **Somewhat Fluent in English**	**3** **Quite Fluent in English**	**4** **Very Fluent in English**
No understanding or speaking ability	Some understanding and can say short, simple sentences	Good understanding and can express myself on many topics	Can understand and use English adequately for work and most other situations	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	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)

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

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)

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

0	4
Most Mother Tongue	**Mostly English**

Score: /4

Enter as a variable in the Data File

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:

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 *most often* with the other people in your home?

0 **Most Mother Tongue**	**4** **Mostly English**

Score: /4

Enter as a variable in the Data File

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	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

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:

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	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)

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 care giver)?

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 MT always	**ENG seldom MT usually**	**ENG 50% MT 50%**	**ENG usually 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	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

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

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

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

Enter the following Variables into the Data File:
Birth Order: 0 – only child; 1 – first born; 2 – second born, etc. _____

Family Size: Total Number of siblings _____

Number of Older Siblings _____

Language Use in the Home:

NOTE: Higher scores (greater than 0.5) indicate more of a shift towards English use in the home. Lower scores (less than 0.5) indicate maintenance of the Mother Tongue.

	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: *Sum of scores* *Number of scores x 4*		**5/12**	**TOTAL:** *Sum of scores* *Number of scores x 4*		**10/12**

To Calculate Language Use in the Home:

Add both totals together and then divide to get a proportion score:

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square} \quad \frac{\square}{\square} + \frac{\square}{\square} = \frac{\square}{\square} = \square$$

Example:

$$\frac{5}{12} + \frac{10}{12} = \frac{15}{24} = 0.63$$

** 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*

NOTE: This aggregate measure of relative quantity of language use was not used in this dissertation. That is, language use was considered by individual family members and not as a combined score across the household. However, input from siblings, when there was more than one sibling, was aggregated in this manner.

Questions to parents about the TARGET CHILD

28. What school does the target child currently attend?
Does the target child currently go to a daycare or have a babysitter?

How much English exposure does your child receive each day?
Here are some possible places your child might receive English input. You can indicate more than one.
Indicate what languages are spoken at the babysitter's, daycare, and/or school.

Language?

☐ preschool/daycare/babysitter full-time _____
☐ preschool/daycare/babysitter part-time hours per week? _____
☐ after or before school child care hours per week? _____
☐ junior or senior kindergarten: half day full day _____
☐ 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 day, outside of the home. The examples below are meant as guidelines only):

0.00	0.25	0.50	0.75	1.00
e.g. The child is enrolled in a full-day program where 100% of the school is not in English, e.g., first language or French immersion	e.g. The child is enrolled in a bilingual half-day Kindergarten program	e.g. The child is enrolled in a bilingual Grade 1 program or in an English-only half-day Kindergarten program	Use as appropriate	e.g. The child is enrolled in English-only Grade 1 program or an English-only Kindergarten program and then goes to daycare (in English)

29. At what age did the target child start receiving consistent and significant exposure to English?
consistent and significant = English-language daycare or babysitter full-time or at least three days per week or equivalent part-time. English-language school of any kind counts as consistent and significant exposure.

Age = _____ Date of entry into program (month/year) = _____

Age of Exposure		**Months of Exposure**
	Year Month Day	
Date of Exposure	_____ ____ ____	Convert Age of Exposure to Months:
Date of Birth	_____ ____ ____	Convert Age at Test to Months (page 1):
Age of Exposure	_____ ____ ____	Subtract: Age at Test – Age of Exposure
Additional Information:		

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)
Extra-curricular: outside of school

	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	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 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 attends mother tongue classes outside of school (more than one day/week)
1 = Child attends mother tongue classes outside of school (once a week)
0 =Child receives little or no formal instruction in his/her mother tongue

MT score: /4

31b. Does you child attend any extra-curricular activities?

	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?

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**

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

MT Score: / 4

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	
Question 30	____ 10
Question 31b	____ 2
Question 32	____ 4
Total:	____ **16**

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

NOTE: This aggregate richness score was not used in this dissertation. For English richness at home, 30a, 30d and 30e were combined. For the technology (or screen time) score, 30b and 30c were combined.

Appendix: For Additional Siblings

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

36. What language(s) does **Sibling 3** 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**

SIB3-CHI

Score: /4

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

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**

CHI-SIB3

Score: /4

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

39. What language(s) does **Sibling 4** 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**

SIB4-CHI

Score: /4

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

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**

CHI-SIB4

Score: /4

Appendix 2: Alberta Language Development Questionnaire

(ALDeQ: Paradis et al., 2010; Paradis, n.d.)

https://www.ualberta.ca/linguistics/cheslcentre/questionnaires (accessed Sept. 30, 2016)

Date of birth of target child: _____

Gender of target child: _____

Date of interview: _____

Interpreter or broker? _____

NOTE: If parent does not or cannot answer a question, remove the question from the scoring calculation (i.e., from the numerator and denominator)
If the parent only gives a qualitative response, you can indicate what numeric response best fits. There is space for writing down qualitative responses

B. Questions for the parents about the child's current abilities <u>in the mother tongue</u>

**Please compare the child to other children who are also learning ESL in an English-speaking society, except for question 10*

5. Compared with other children of the same age, how do you think that your child expresses him/herself? **0 = not very well; 1 = a little less well; 2 = the same; 3 = very good/better/one of the best**	**Score: /3**
6. Compared with other children of the same age, how do you think your child pronounces words? **0 = not very clearly; 1 = sometimes not clear; 2 = same; 3 = very clear, one of the best**	**Score: /3**
7. Is it easy for your family or friends to have a conversation with your child? **3 = very easy; 2 = easy enough; 1 = sometimes not easy; 0 = no, very hard**	**Score: /3**
8. Compared with other children of the same age, does your child have difficulty producing correct sentences? *Example: have appropriate vocabulary, correct grammar, long enough sentences to get the idea across* **3 = no difficulties, maybe better; 2 = same; 1 = some difficulties; 0 = a lot of difficulties**	**Score: /3**

9. Are you satisfied with how your child speaks your mother tongue? **3 = completely satisfied; 2 = satisfied; 1 = maybe not satisfied; 0 = not satisfied at all**	**Score: /3**
9b. If not satisfied, why do you think this? (Optional: Do you think he/she may be losing the mother tongue in favor of English?	
10. Do you think your child speaks your mother tongue like the children in the home country? **0 = not as good as home country; 1 = sort of like home country, with some differences; 2 = mostly yes – close to home country; 3 = yes – better or just like home country**	**Score: /3**
10b. Why do you think this? (Optional: Do you think he/she may be losing the mother tongue in favor of English?)	
To calculate the subtotal for Section B, add the total possible score for all questions or questions answered as the denominator. Then add the scores for the parent's responses as the numerator. If all questions were answered, the denominator would be: 18	**SUB TOTAL B** **/**

The purpose of the un-scored questions, 9b and 10b, is to better understand what the reason might be for the answers the parent has given for the scored questions. Specifically, they are designed to reveal whether less than satisfactory abilities in the mother tongue could be linked, in whole or in part, to the child losing his/her mother tongue. This information could be useful in interpreting the score for this subsection, and the child's overall score on the questionnaire.

Appendix 3: Story Grammar Scoring Sheet

(Schneider et al., 2005)

Specific URL for scoring sheet: https://d1pbog36rugm0t.cloudfront.net/-/media/rehabilitation/faculty-site/departments/csd/documents/enni/sg-a1-scoring-sheet.pdf (accessed Sept. 30, 2016)

Edmonton Narrative Norms Instrument
Story Grammar Scoring Sheet for Story A3

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	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 Elephant 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:	

*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 4: First Mention Scoring Sheet

(Schneider et al., 2005)

Specific URL for Scoring Sheet: https://d1pbog36rugm0t.cloudfront.net/-/media/rehabilitation/faculty-site/departments/csd/documents/enni/enni-frist-mentions-scoring-criteria.pdf (accessed Sept. 30, 2016)

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) Pronoun **I/me** if the child puts him/herself in the story, e.g., "I was at the pool with my friend"	**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 individually previously) Pronoun **I/me** if the child puts him/herself in the story, e.g., "I was at the pool with the giraffe"	**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*) **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) **his/her/their [family member]**(e.g., *daddy*, *brother* if clear whose family member) **name** (e.g., *Mr. Lifeguard*)	**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) **the elephant** (if first elephant was introduced as a/the elephant)
Character	**Score as 3**	**Score as 2**	**Score as 1**
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*) 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)* **another _____** (e.g.,*lifeguard*, *elephant* or *girl* if at least one previous character identified with same term) **name** (e.g., Mrs. Lifeguard) **someone / somebody** **the _____ + relative clause** (if a plausible role, e.g., *the person who cleans the pool*)	**the/that _____**(e.g., *the woman, the person who catches toys*) **a [invented word]**	**pronoun** (*he, she, it*) **the [invented word]** (an invented **name** would be scored as 3) **the elephant / the girl elephant** (if first or second elephant introduced as a/the [girl] elephant)
Net – Story A3	**a/this _____** **possessive + noun** (e.g., her net)	**the/that _____** indefinite vague or empty term, e.g., *a thingy/something* **a [invented word]**	**pronoun** 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) Pronoun **I/me** if the child puts him/herself in the story as this character	**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., *Robbie*) **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) Pronoun **I/me** if the child puts him/herself in the story as the rabbit	**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*) definite vague or empty term, e.g., **the thingy** **the [invented word]**

Character	Score as 3	Score as 2	Score as 1
Doctor – Story B2	**a/this** _____ (e.g., *a doctor, this woman)* **name** (e.g., *Mrs. Rabbit*) **his/her/their [family member]**(e.g., *her mommy,* if clear whose family member) **Another rabbit** (if first rabbit introduced as a rabbit)	**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*) **another rabbit** (if first rabbit was not introduced as such)	**pronoun** (*he, she, it*) **the [invented word]** (an invented **name** would be scored as 3) **the rabbit** (if first rabbit was introduced as a/the rabbit)
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/rabbit**	**the/that**_____ (e.g., the balloon seller)	**pronoun** (*he*) **the rabbit** (if first or second rabbit was introduced as a/the rabbit)
Balloon(s) at end of Story B3*	*a balloon* *balloons* *two balloons* *their own balloon(s)*	*the/that balloon* *those balloons*	**pronoun** (*it, them*)