

**Bilingualism in Children with Autism Spectrum Disorder: Bilingual Development and Advantages on
Executive and Adaptive Functioning**

by

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Abstract

Many children, including those on the autism spectrum, need to communicate in two or more languages to participate fully in their lives and communities. Despite bilingualism being a worldwide phenomenon, bilingual development in autistic children is a relatively new area of study, with a limited and growing body of literature emerging within the past ten years. It is well established that learning two languages does not disadvantage the development of non-autistic children, with some evidence suggesting bilingualism confers an advantage in executive functioning (EF) skills. Despite a possible bilingual advantage, some parents of autistic children receive recommendations against exposure to a bilingual language environment. This recommendation is not supported by available research, which suggests no detrimental effects of exposure to bilingualism for children with autism. Parents themselves may also express apprehension towards bilingualism for their autistic child. The decision to restrict a child's language environment may have significant implications for the child and their family. The study of the intersection of bilingualism and autism is complicated by the diversity and heterogeneity inherent to both bilingualism and autism. Current research primarily investigates bilingualism as a two-category construct (i.e., monolingual vs. bilingual). Bilingual language profiles can be further defined and understood by individual differences in age of acquisition, exposure, proficiency level, language use and bilingual environment, among other factors. Additionally, autism includes a heterogeneity of skills, talents and abilities.

Building on prior research, this dissertation presents two studies exploring the relationship between bilingualism and autism while addressing the inherent complexities in both. Recognizing the relative dearth of research examining the complexity of bilingualism in autism, the first study examines the bilingual language development of children with autism in the context of their language exposure using a mixed-methods case study design. Relying on parent-report measures and semi-structured interviews, I examine the complexity of bilingual language development for autistic children in the

context of their home and school language exposure among a sample of 25 children with autism. The role of bilingualism within a family requires particular attention as the home environment, and family values contribute to the use of bilingualism in daily life. The second study examines the bilingual advantage in parent-reported executive functioning (EF) and adaptive functioning among a sample of 121 autistic children and non-autistic children. Children within the sample were exposed to various language conditions, including simultaneous bilingualism, sequential bilingualism and functional monolingualism. Using a continuous approach, multiple regression analyses were used to explore the predictive relationship between individual bilingual variables (e.g., age of acquisition, exposure to a second language, parent-reported proficiency) and EF and adaptive skills. The results of both studies suggest that autistic children have diverse bilingual experiences. Bilingualism does not contribute any disadvantage to the development of bilingual autistic children. Parents report positive attitudes toward bilingualism, receive a mix of recommendations regarding bilingualism for their autistic children and make decisions about language exposure that are congruent with their beliefs. Taken together, the two studies contributed to the limited and growing body of evidence that counters recommendations against bilingualism for children with autism. An understanding of bilingual development has important implications for supporting bilingual families raising autistic children.

Preface

This thesis is an original work by Chantal Labonté. This thesis research received research ethics approval from the University of Alberta Research Ethics Board, Project Name “Bilingualism in children with autism spectrum disorder: Effect of dual language learning on executive, social and adaptive functioning”, Study ID Pro00062055, on March 9, 2016.

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Chapter 1. Introduction

Autism is characterized by differences in social communication and interaction and repetitive and restricted patterns of behaviours (American Psychiatric Association, 2013). Autism encompasses a heterogeneity of intelligence, verbal abilities, skills, and talents (Motttron & Bzdok, 2020; Meilleur et al., 2015). More than seventy percent of autistic children and adults are reported to have special isolated talents in memory, spatial abilities, drawing or music (Happé, 2018). Although not part of the diagnostic criteria, difficulties with executive function (EF) are commonly found in autistic children (see Demetriou et al., 2017 and Lai et al., 2017 for reviews). Children with autism also have language skills that are extremely heterogeneous and can range from nonverbal to superior abilities (Tager-Flusberg, 2006).

Although referred to as a disorder (i.e., autism spectrum disorder) within the diagnostic classification system of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) and the *International Classification of Diseases* (ICD-11; World Health Organization, 2018), many autistic individuals reject the use of the word 'disorder' in favour of emphasizing autism as a natural variation in neurodevelopment (Fletcher-Watson & Happé, 2019). This perspective is aligned with the concept of neurodiversity which asserts that autism and other neurodevelopmental conditions are normal human differences among brain structures and functions (Armstrong, 2010; Singer, 2017). As such, throughout the current dissertation, I refer to autism instead of autism spectrum disorder. Furthermore, there is no consensus among the autistic community regarding how to refer to individuals with autism (see Botha et al., 2021; Bottema-Beutel et al., 2021; Kenny et al., 2016 for discussion). To be respectful to autistic people, I include identity-first language (i.e., autistic person) and person-first language (i.e., a person with autism) interchangeably throughout this dissertation.

Bilingualism and Autism

Bilingualism, the ability to use two languages, is a worldwide phenomenon (Saville-Troike, 2012). Many children, including those on the autism spectrum, must communicate in two or more languages to participate in their lives and communities. Historically, in North America, learning two languages had been hypothesized to exceed children's developmental capacities, putting young children at an intellectual disadvantage (Peal & Lambert, 1962). It is now understood that learning two languages does not disadvantage non-autistic children and that non-autistic children raised in households where two languages are spoken generally become bilingual (Paradis et al., 2011). However, when children present on the autism spectrum, the belief that bilingualism will overwhelm developmental capabilities, exacerbating potentially existing delays, often remains (Prévost & Tuller, 2022). For instance, parents have reported that they have been advised against exposing their child to a second language (Baker, 2013; Beauchamp & MacLeod, 2017; Kay-Raining Bird et al., 2012) due to concern among clinicians that exposure to a bilingual environment will further delay language development resulting in the insufficient acquisition of either language (Howard et al., 2021; Kremer-Sadlik, 2005; Yu, 2013). The clinical recommendation to limit the language exposure of autistic children is not evidence-based (Beauchamp & MacLeod, 2017) and counters second language learning recommendations given by clinicians for non-autistic children (Paradis et al., 2011).

Clinicians are not the only ones with the belief that bilingualism may further delay language development resulting in the insufficient acquisition of either language. Parents themselves also uphold the concern that exposure to a second language may cause confusion and possibly further impair language development for their autistic child (Hampton et al., 2017; Sher et al., 2021; Yu, 2013). Factors influencing parents' decision around maintaining their heritage language for their child include the severity of the child's autism, the professional advice they received, and the importance of English as the dominant language in society (Howard et al., 2021). Potentially due to a recommendation to limit their

child's language environment, children with autism from families new to Canada heard and spoke more English and less of their heritage language than newcomer peers with non-autistic development. As a result, autistic children were found to have similar English abilities and lower heritage language skills compared to their non-autistic peers. These findings suggest that children with autism risk losing their heritage language based on the limited opportunities provided by their language environments (Paradis et al., 2018).

Despite these concerns, recently emerging literature has shown that, for preschool-aged autistic children, exposure to a bilingual environment does not lead to disadvantaged language development. Hambly and Fombonne (2012) found that children with autism, aged 36 to 78 months, who are exposed to a bilingual environment do not experience additional delays in dominant language development compared to monolingual children with autism. Other research on 24 to 52 months old children found no statistically significant differences between monolingual-exposed and bilingual-exposed autistic children on measures of receptive language, expressive language, and functional communication in one language. Additionally, there were no statistically significant differences between the age of first words and the age of first phrases of monolingual- and bilingual-exposed autistic children (Ohashi et al., 2012). Research on bilingualism in toddlers with autism from English/Spanish speaking households found English language skills to be similar between monolingual English and bilingual English/Spanish toddlers with autism (Valicenti-McDermott et al., 2012). Additional research on a large sample of toddlers (n=388) found no adverse effects of bilingual status on language development (Dai et al., 2018). Through parent report, no differences were found in a sample of bilingual and monolingual Chinese preschool-aged autistic children (mean age of 5 years). No correlations between language development and age of second language exposure were found (Reetzke et al., 2015). Similar patterns of language abilities were also found among an older (4 to 10 years of age) sample of simultaneous Hindi-English bilinguals and English monolingual autistic children (Sen & Geetha, 2011). Gonzalez-Barrero and Nadig (2019) found

that autistic bilingual children show similar language development patterns to non-autistic bilingual children across measures of vocabulary and grammar in the child's dominant language. Beauchamp et al. (2020) also found that bilingual autistic children had similar language to monolingual autistic children. Bilingualism was not found to exacerbate autistic children's deficits in comprehending pronouns (Skrimpa et al., 2021). As a whole, the results of available research suggest that the language development of young bilingual autistic children is not considerably different from the language development of monolingual autistic children, at least when it comes to dominant language development.

Further research has examined the bilingual lexical development of children with autism. Peterson et al. (2012) compared the English and Chinese language scores of the bilingual participants, no significant difference in lexical skills was found across both languages, although English scores tended to be higher than Chinese scores. Sen and Geetha (2011) assessed the language abilities of Hindi/English bilingual autistic children across both languages. The results suggest a similar pattern of language development and deficits in each language. These two studies demonstrate that children with autism appear capable of bilingual language development and that bilingual language exposure does not confer additional vulnerability on development.

Bilingual Advantage in Executive Function

Bilingualism requires using cognitive systems in such a way that it is believed to promote an advantaged development in EF skills (Bialystok et al., 2012). EF refers to a set of higher-order cognitive functions that regulate attention and control thought, behaviour, and emotion (Miyake et al., 2000). Children rely on EF abilities to engage in everyday social and cognitive activities (Young et al., 2017). There have been several studies that have found support for a bilingual cognitive advantage in EF among non-autistic individuals (see Adesope et al. (2010) and Barac et al. (2014) for reviews). A recent meta-analysis with 143 independent group comparisons found a significant, although marginal effect size ($g=$

0.06), bilingual advantage in EF skills, with a significant bilingual advantage in inhibition, shifting and monitoring for children 18 years and under (Gunnerud et al., 2020). Other researchers refute the notion (Paap & Greenberg, 2013; Paap et al., 2015; von Bastian et al., 2016). Additional researchers have questioned the reliability of the evidence to support the benefits of bilingualism for the development of EF (Hilchey & Klein, 2011; Valian, 2015), with evidence of a publication bias favouring studies producing results in support of the bilingual advantage (de Bruin et al., 2015).

From a sociocultural perspective, children's cognitive development stems from their experiences and interactions in their social environment (Bjorklund, 2012). The social environment includes the language environment the child experiences. Based on new experiences, the brain has the ability to reorganize neural pathways through neuroplasticity (Vasile, 2011). Functional neuroplasticity provides a context for examining the bilingual advantage (Bialystok et al., 2012). In this way, bilingualism can be viewed as an enriching cognitive experience that promotes the reorganization of experience-dependent processes. Bilingualism allows for accommodation in cognitive systems used in both linguistic and nonlinguistic tasks as a result of bilingualism's involvement in these processes (Bialystok, 2017). The modification and strengthening of EF skills result from intensive practice in a particular EF process provided by the experience of bilingualism (Morales et al., 2013).

It is widely accepted that both languages are activated within the bilingual mind during language processing. Evidence suggests that there is joint activation for both comprehension and production of language, even in monolingual contexts where one would not expect to require the non-target language (Bialystok, 2011). The joint activation is believed to create a linguistic conflict (Engel de Abreu, 2011; Vínerte & Sabourin, 2019). To resolve the conflict, bilinguals must use their EF skills to attend to their environment, correctly select the appropriate language, inhibit the non-target language, and switch between languages as needed (Bialystok et al., 2012; Vínerte & Sabourin, 2019). The management of joint activation over time is believed to provide opportunities to develop highly practiced EF skills

(Bialystok et al., 2012; Morton & Carlson, 2017; Vīnerte & Sabourin, 2019). Joint activation is also the most distinguishing feature differentiating bilingual language processing from monolingual language processing (Bialystok, 2009), as the attentional problems resulting from joint activation are not present for monolinguals (Bialystok, 2011; Bialystok et al., 2012).

There is no clear consensus on the mechanism responsible for the bilingual advantage resulting from the circumstances provided by joint activation (Treccani & Mulatti, 2015; Vīnerte & Sabourin, 2019). Each hypothesis assumes that the mechanism required to resolve conflict arising from the joint activation provides the opportunity to develop enhanced EF skills, although each disagrees on the mechanism of interest. Several implications follow from this assumption. First, the joint activation creates experience-dependent training for EF skills. Thus, the magnitude of the bilingual advantage should increase with additional experience and practice (Bialystok, 2015; Morton & Carlson, 2017). However, there is evidence that the bilingual advantage is not always present in young adults (Bialystok, 2017; Bialystok et al., 2012). Secondly, if the bilingual advantage requires the management of linguistic conflict, the effect will only be present with bilinguals who have had adequate bilingual development to create competition between linguistic representations (Bialystok, 2015). Therefore, the bilingual advantage should not be found in very young children as they understand few words and produce none, despite bilingual exposure (Morton & Carlson, 2017). Inconsistent with this prediction, Kovács and Mehler (2009) found a bilingual advantage among 7-month-old infants on a task that required infants to learn to respond to a cue before suppressing the learned response to respond to a conflicting cue correctly. All infants learned to respond to the initial cue, but only bilinguals were able to adapt their responses in the post-switch phase. Given that these infants were preverbal and prelexical, the effect of practice from suppressing one language could not have contributed to the bilingual advantage found (Morton & Carlson, 2017). While the joint activation of language processing in bilinguals is widely accepted and assumed to be the condition that provides an opportunity to develop advantaged EF skills,

the assumptions derived from the current understanding of joint activation are not always supported by evidence. Furthermore, there is no agreed-upon mechanism to explain how, from the conditions of joint activation, enhanced EF skills emerge.

Bilingual Advantage in Autistic Children

Given that bilingualism is associated with advantaged EF development among non-autistic children, it seems possible that a bilingual environment would promote advantaged development for autistic children. If so, bilingualism could act as a cost-effective naturalistic intervention to support EF development (Iarocci et al., 2017), which may reduce challenges in adaptive and social development. Despite this possibility, there has been limited research exploring this possibility.

Bilingualism has been found to have a small positive advantage on parent-reported EF skills, specifically working memory and flexibility, for children with autism aged 5 to 17 years of age, even after controlling for socioeconomic status (Ratto et al., 2021). Among a sample of Arabic-English children with autism, parents reported significant advantages in EF skills for bilingual children compared to monolingual children. However, teachers did not report any impact of bilingualism on EF using the same measure (Sharaan et al., 2021). Iarocci et al. (2017) found that bilingual exposure was associated with a mean reduction of the clinical impact of EF challenges on a parent-report measure in autistic youth ($n = 174$), although this difference was not found to be statistically significant. These results suggest that developing fluency in more than one language can benefit the overall EF development in everyday life for autistic children. In contrast, some researchers have not found an advantage in parent-reported EF skills for bilingual children with autism compared to monolingual children with autism (Gonzalez-Barrero & Nadig, 2019).

Researchers have also examined the bilingual advantage in EF among autistic children using direct assessment EF measures and experimental tasks. Bilingual autistic children performed significantly outperformed monolingual autistic children on tasks of shifting (Gonzalez-Barrero & Nadig,

2019; Peristeri et al., 2021), inhibition and working memory (Peristeri et al., 2020; Peristeri et al., 2021). Additionally, Sharaan et al. (2021) found that Arabic-English autistic bilingual children aged 5 to 12 years performed better on sustained attention tasks than monolingual autistic children. However, there was no effect of bilingualism on tasks requiring EF skills.

Current Dissertation Research

The study of bilingual development in autistic children is relatively new, with available research only emerging within the past ten years (Prévost & Tuller, 2022). Clarification of the effect of bilingualism on the EF development of children with autism and examining whether the benefit facilitates an enhancement of social and adaptive functioning remains an important area of study. Current research primarily investigates bilingualism as a two-category construct (i.e., monolingual vs bilingual). This approach to research on bilingualism in autism does not reflect the diversity of language profiles and has been described as ‘unhelpful’ in understanding the influence of bilingualism in autism (Digard & Sorace, 2022). Based on the timing of their exposure to bilingualism, children may be simultaneous bilinguals, who have been acquiring two languages simultaneously from a young age, or they may be sequential bilinguals who learn a second language after the first language has been established (Paradis et al., 2011). The bilingual language profiles can be further defined and understood by individual experiences and differences in age of acquisition, exposure, proficiency level, language use and bilingual environment, among others (Digard & Sorace, 2022; Paradis et al., 2011; Romero & Uddin, 2021). The diversity in bilingualism is further complicated by the heterogeneity among autistic children (Schaeffer & Grama, 2021).

In the current dissertation, I aim to build on previous research to explore the potential benefits bilingualism may confer on the development of autistic children, with a focus on understanding whether language profiles are associated with benefits. Recognizing the relative dearth of research examining the complexity of bilingualism in autism, in the first study, I will use a convergent mixed methods design to

understand the bilingual language development of children with autism in the context of their home and school language exposure. The following research questions will guide me:

1. When exposed to a bilingual home environment, do autistic children acquire bilingual language ability?
2. What are parents' lived experiences and attitudes that support bilingual exposure for their autistic child?
3. How do parental attitudes and behaviours towards bilingualism converge with child characteristics (e.g., age, autism characteristics) to influence the bilingual language development of autistic children?

In the second study, I will examine whether there is a bilingual advantage in EF skills in bilingual autistic children compared to monolingual autistic children and examine whether this effect extends to advantages in adaptive functioning. To address the diversity among bilingual profiles, this research will include both simultaneous and sequential bilingual groups. In addition to the categorical treatment of bilingualism, I will investigate the relationship between bilingual language exposure, language proficiency, and executive and adaptive functioning. The following research questions will guide me:

1. Can exposure to bilingualism mitigate EF difficulties on parent-report EF measures for autistic children, and how does this compare to advantages found in non-autistic bilingual peers?
2. Do autistic children exposed to bilingualism experience an advantage in adaptive functioning compared to monolingual autistic children? How does this compare to advantages found in non-autistic children exposed to bilingualism?
3. Does bilingual language exposure and bilingual language proficiency predict EF skills and adaptive functioning among autistic children, and how does this relationship compare to non-autistic children?

Significance of Dissertation Work

Despite a possible bilingual advantage, parents of autistic children continue to receive recommendations against exposure to a bilingual language environment. Parents may also be apprehensive about bilingualism for their children (Hampton et al., 2017). In spite of evidence that bilingualism is not detrimental to the language development of autistic children, many clinicians continue to advise against exposure to a bilingual environment (Baker, 2013; Kay-Raining Bird et al., 2012; Yu, 2013). The decision to restrict their child's language environment may have significant implications for the child and their family (Howard et al., 2021; Kremer-Sadlik, 2005; Paradis et al., 2018; Yu, 2013). In the present dissertation, I aim to increase our knowledge of the effects of bilingual development on autistic children while addressing the diversity among bilingual profiles. An understanding of the impact of bilingualism on development has both important theoretical implications for our understanding of language and cognitive development and practical implications for the development of educational programming for bilingual children (Barac et al., 2014). It will inform clinical recommendations given to bilingual families raising autistic children.

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Chapter 2. Bilingual language development among autistic children: A mixed-methods study

Abstract

Recent evidence suggests there are diverse bilingual experiences among autistic individuals, with calls for integrative and mixed methods to understand the complexities of bilingual autistic experiences better. In the present study, I take a mixed-methods approach to understand autistic children's bilingual language development in the context of their characteristics and parents' attitudes and behaviours towards bilingualism. Twenty-four parents who self-identified as raising a bilingual autistic child completed parent-report quantitative measures about their child's development and completed interviews capturing their experiences. Quantitative data were analyzed using descriptive statistics and correlational analyses, and qualitative data were coded using thematic analysis before integrating the data using joint displays. Results of quantitative analyses reveal that children's exposure and use of languages across environments were variable, and parent-reported proficiency in speaking and understanding a second language varied. Qualitative analyses revealed four superordinate themes: 1) importance of bilingualism, 2) parental decision making, 3) navigating the education system and accessing support, and 4) child's response. Parents reported receiving a mix of recommendations regarding bilingualism for their children. Despite this, most parents in the sample chose to maintain or introduce bilingualism to their children. The integrated results demonstrate no clear pattern relating the child's autism characteristics to parents' beliefs about bilingualism and decision-making. Bilingualism is not a 'one size fits all' experience for autistic children and their parents.

Introduction

There are many more bilingual and multilingual individuals than monolingual individuals in the world (Saville-Troike, 2012). Many children, including those with autism, must communicate in two or more languages. For bilingual children and families living in bilingual communities, bilingualism is not a choice but a necessity to participate fully in their lives and communities. Using two languages permeates all aspects of life (Katsos & Gibson, 2022). Within Canada, bilingualism and second language learning are often viewed as opportunities for cognitive and economic advantage (Roy & Galiev, 2011). Other proposed benefits of bilingualism include communication, cultural, cognitive, and career advantages (Djumabaeva & Kengboyeva, 2021; Pransiska, 2017).

Among children with autism, exposure to a bilingual environment does not disadvantage children's language development. The results of recently emerging research suggest that the language development of bilingual autistic children is not considerably different from the language development of monolingual autistic children (Hambly & Fombonne, 2012; Ohashi et al., 2012; Valicenti-McDermott et al., 2012; Dai et al., 2018; Reetzke et al., 2015). Further evidence suggests that children with autism are capable of bilingual language development (Peterson et al., 2012). Despite this, many parents and clinicians hold beliefs that bilingualism may further delay language development for children with autism resulting in the insufficient acquisition of either language (Baker, 2013; Beauchamp & MacLeod, 2017; Hampton et al., 2017; Howard et al., 2021; Kay-Raining Bird et al., 2012; Prévost & Tuller, 2022; Yu, 2013). Factors influencing parents' decisions around maintaining bilingual language exposure for

their child with autism include the severity of the child's autism, the professional advice they received, and the importance of English as the dominant societal language (Howard et al., 2021). Family language choices, educational settings, and language competence likely interact differently based on the autism characteristics of the child (Katsos & Gibson, 2022). Given the complexity and heterogeneity of the bilingual and the autistic experience, the current study examines the bilingual language development and experiences of Canadian children with autism using a mixed-methods approach. The linguistic diversity of Canada (Statistics Canada, 2012) provides an opportunity to explore families' experiences raising bilingual children with autism.

Bilingualism and Bilingual Education in Canada

Within Canada, multiculturalism and bilingualism are official federal policies, with English and French given equal status as the official languages (Ricento, 2013). The *Official Languages Act* promotes English and French as languages of work, education and government services in Canada (Statistics Canada, 2019). Beyond French and English, Canada's population is linguistically diverse. More than 200 languages are spoken as home or heritage languages in Canada, and 80 percent of the population reported a heritage language most often at home (Statistics Canada, 2012). Within Canada, the term 'heritage language' refers to any language that is not English, French or an Indigenous language (Dicks & Genesee, 2017).

The introduction of federal multiculturalism and bilingualism policies in Canada allowed for the development of bilingual education programs (Mukan et al., 2017). Canada has a long history of immersion language education programs, specifically French immersion programs, which emerged in the 1970s (Riches, 2014). Immersion education programs function by grouping children with no prior contact with the second language (L2) in an educational environment where the L2 is used as the language of instruction (Mukan et al., 2017). French immersion programs are criticized for low achievement in French proficiency, high attrition rates, difficulty recruiting teachers, and lack of special

education support (Riches, 2014). Students in French immersion programs face difficulty in speaking like native speakers of French (Roy & Galiev, 2011).

Nevertheless, immersion programs exist across Canada and generally include early immersion programs, which begin in kindergarten or Grade 1, middle immersion programs, which start during late elementary school, and late immersion, which begins during the middle school period (Mukan et al., 2017). There has also been an expansion of programs in various heritage languages and Indigenous languages across the country (Dicks & Genesee, 2017). However, the availability and access to these programs are variable, and immersion education programs are not always a recognized right (Cobb, 2015).

In contrast to immersion programs, bilingual Canadian students may experience submersion programs, which place children in educational environments that are different from their home language and include other children who already function in the language of instruction (Mukan et al., 2017). There are various labels used to identify these children, including English (or French) as a Second Language Learner, English Language Learner (ELL) or linguistically diverse students (Conner et al., 2020). These students are often provided with additional support and resources to facilitate the development of their skills in the language of instruction, either English or French depending on the setting (Cummins et al., 2012).

Bilingual Autistic Experience

A rich diversity of bilingual experiences among autistic individuals (Digard et al., 2020). There is no evidence that exposure to a bilingual environment confers a developmental disadvantage for children with autism (Hambly & Fombonne, 2012; Ohashi et al., 2012; Valicenti-McDermott et al., 2012; Dai et al., 2018; Reetzke et al., 2015) with evidence for the advantages of bilingualism emerging. Multilingual autistic adults endorse many benefits of multilingualism in their lives, including education, employment or leisure opportunities, relationships with family and community, self-confidence, and

understanding of other people (Nolte et al., 2021). Among a sample of 297 autistic adults, bilingualism had a modest significant positive relationship with self-rated quality of social life (Digard et al., 2020). Small positive advantages in the development of executive functioning skills have also been found among bilingual children with autism (Gonzalez-Barrero & Nadig, 2017; Iarocci et al., 2017; Peristeri et al., 2020; Peristeri et al., 2021; Sharaan et al., 2021) although these advantages have not been consistently demonstrated in current research (Gonzalez-Barrero & Nadig, 2017; Li et al., 2017). Speaking a heritage language is believed to play an important role in developing a cultural identity for autistic children (Howard et al., 2021; Sher et al., 2021). Furthermore, parents of autistic children also indicate that bilingualism enriches the child's familial and social relationships (Jegatheesan, 2011).

Parents report facing a complex decision-making process related to bilingualism for their children. Language use is complex and unique within each family (Yu, 2013). Factors influencing this decision include communication with extended family, the severity of the child's autism, the importance of English proficiency, and advice received from professionals (Hampton et al., 2017; Howard et al., 2021). Parents most frequently endorse wanting their child to enjoy relationships with extended family members as a reason to favour bilingualism over monolingualism for their child (Howard et al., 2021).

Recommendations against bilingualism can create 'forced monolingualism' where the child is prevented from gaining competence in L2 despite the child's family or culture being bilingual (Sher et al., 2021). Yu (2016) argues that isolating one language from the other does not correspond with the lived experience of bilingualism, and adopting monolingualism in the home is largely unsustainable (Yu, 2013). Parents may be more likely to adopt a monolingual environment if their child with autism has limited verbal ability (Hampton et al., 2017). Parents who restrict the home language tend to promote the child's development of English to facilitate communication for their child (Howard et al., 2021). Yet, restricting the language environment in favour of monolingualism may have a detrimental impact on the child's social relationships (Howard et al., 2021) and understanding of the linguistic and cultural norms

of their community (Beauchamp & MacLeod, 2017). Potentially due to a recommendation to limit their child's language environment, autistic children from newcomer families heard and spoke more English and less of their heritage language than non-autistic peers. As a result, children with autism were found to have similar English abilities and lower heritage language skills compared to their peers with non-autistic development. These results suggest that autistic children risk losing their heritage language based on the limited opportunities provided by their language environments (Paradis et al., 2018). Due to the detrimental impacts of forced monolingualism and a lack of evidence to support the detrimental effect of bilingualism (Peterson et al., 2012), supporting parents' use of the heritage language with their child is recommended within the current literature (Lim et al., 2018).

Bilingual Education of Autistic Students

While parents' language choices influence their autistic child's development, teachers and other educational professionals also effect a child's bilingual outcomes (Sher et al., 2021). Howard et al. (2020) found that educational professionals held beliefs that bilingualism might be possible for some autistic students but not all, depending on the child's language profile. In a separate study, educational professionals tended to view the child's cognitive ability as more influential in making bilingualism recommendations than parents (Sher et al., 2021). Professionals with a similar cultural background as the family are reported to show more understanding toward bilingualism than professionals from different cultures who tend to advocate for a monolingual approach (Sher et al., 2021). Similarly, bilingual professionals working in bilingual education systems tended to endorse bilingualism and its benefits compared to monolingual professionals (Howard et al., 2021). The type of school setting has also been found to influence autistic students' bilingual identities, whereby students who attend school with a higher percentage of bilingual students tend to hold more positive views towards bilingualism than autistic students in more monolingual environments (Howard et al., 2019).

Unfortunately, immersion language programs are often ill-equipped to effectively support

bilingual autistic learners (Baker et al., 2018). Access to special education support is reportedly limited or denied within Canadian French immersion programs, leading to a system of exclusion rather than inclusion (Cobb, 2015; Selvachandran et al., 2022). Although not specific to autism, parents are reported to transfer their child with special education needs from immersion programs to a monolingual program due to anxiety/concern, the child's difficulty learning in L2, and recommendations by educational professionals (Aindriú, 2022). As a result, students with special education needs tend to have lower participation in French immersion programs (Kay-Raining Bird et al., 2021), despite evidence that immersion programs are suitable for students with special education needs (Bourgoin, 2014) and calls to adopt inclusive education practices within immersion language programs (Le Bouthillier, 2020). When educated in submersion programs where the language of instruction differs from their home language, bilingual autistic children have been found to have enhanced math skills and slower reading development, likely related to the development of two linguistic profiles (Vanegas, 2019).

Current Study

Despite emergent evidence showing that bilingualism does not disadvantage the language development of children with autism (Hambly & Fombonne, 2012; Ohashi et al., 2012; Peterson et al., 2012; Valicenti-McDermott et al., 2012), a clinical recommendation against bilingualism reportedly remains along with persisting parental fear that bilingualism may further language delays for children with autism (Hampton et al., 2017). The lived experience of bilingual families raising autistic children has remained largely underexplored, including questions of how autistic children use two languages, how parents make linguistic and educational choices, and the role of bilingualism in their daily lives (Katsos & Gibson, 2022). Given the complexity and heterogeneity of both the bilingual and autistic experience, these questions are well suited for a mixed-methods approach, allowing for a better understanding of the interplay between bilingualism and autism (Katsos & Gibson, 2022). In the present study, I adopt a convergent mixed-methods study design to examine the complexity of bilingual language development

and experiences of autistic children in the context of their parent-guided home language exposure. The following research questions will guide me:

1. When exposed to a bilingual home environment, do autistic children acquire bilingual language ability?
2. What are parents' lived experiences and attitudes that support bilingual exposure for their autistic child?
3. How do parental attitudes and behaviours towards bilingualism converge with child characteristics (e.g., age, autism characteristics) to influence the bilingual language development of autistic children?

Given that the individual differences in bilingual language learning among non-autistic children are influenced by several internal and external factors, including the quality and quantity of language exposure (Paradis et al., 2011), it is hypothesized that parental attitudes and behaviours will influence the bilingual language development of autistic children towards bilingualism. Poor attitudes towards bilingualism are likely associated with limited quantity and quality of bilingual exposure compared to parents with more favourable attitudes towards bilingualism. Finally, the finding that heritage language development is at risk due to limited exposure following recommendations to limit the language environment (Paradis et al., 2018) suggests that parental attitudes and behaviours towards bilingualism will influence the child's bilingual language development.

Method

Research Design

In this study, I use a convergent mixed methods design (Creswell & Plano Clark, 2017) to understand the lived experiences of families raising autistic children in bilingual settings. This underexplored area in the current literature calls for a mixed-method approach (Katsos & Gibson, 2022).

In keeping with the convergent mixed methods design, I first collected quantitative and qualitative data, which were separately analyzed before integrating both strands of data to gain a better understanding (Creswell & Plano Clark, 2017). The same participants were included during the quantitative and qualitative data collection. The quantitative strand of data is comprised of parent-report data on the child's language abilities, autism characteristics, and language exposure and will address research question 1. The qualitative strand of data, comprised of parent interviews, was coded to identify themes (Saldaña, 2009) to answer research question 2. Following these rounds of analysis, the two sets of results will be merged to allow for a synthesis of the results from which conclusions can be drawn to address research question 3.

Participants

Twenty-four parents participated in the study. Participating parents were recruited from across Canada via social media and local autism and cultural community organizations. Parents were located across six Canadian provinces. Parents provided information on their experiences and the development of twenty-five children as one sibling set was included within the sample. Each parent self-identified as a bilingual family or as having chosen bilingual education for their child. All children were diagnosed with autism spectrum disorder by a physician or psychologist. Children were exposed to various language combinations, including English, French, Telugu, Cantonese, Mandarin, Marathi, Urdu and Spanish. Table 2.1 provides demographic information for each parent and child in the sample.

Quantitative Strand

Quantitative data about the language experiences, abilities and autism characteristics of the children in the sample were collected through a series of parent-report questionnaires. Parents completed all quantitative measures over the phone in English.

Measures

Social Responsiveness Scale, Second Edition. The Social Responsiveness Scale, Second Edition (SRS-2) is a standardized questionnaire of common characteristics within the autism spectrum, including social communication differences and restricted and repetitive behaviours. The SRS-2 can differentiate autistic individuals from non-autistic individuals and those with impairments related to other neurodevelopmental conditions. The SRS-2 also indicates the severity of social impairments across the autism spectrum (Constantino & Gruber, 2012).

Child Language Exposure Questionnaire. The Child Language Exposure Questionnaire (Gonzalez-Barrero & Nadig, 2018) is a parent-report measure of a child's language background and language exposure. The questionnaire includes items about the child's current and lifetime language use in different environments (e.g., home, school, daycare, extracurricular activities, etc.). Parents were asked to estimate the amount of exposure to each language their child experiences per day during a typical week, excluding the hours the child sleeps. Parents were also asked to estimate the percent exposure to each language their child experiences for each year of their life—these estimates allowed for average percentage of exposure to each language across the lifetime to be calculated. The questionnaire also includes items asking parents to rate their child's current proficiency in listening and speaking in each language using a four-point scale (i.e., from Limited to Excellent).

Alberta Language and Development Questionnaire. The Alberta Language and Development Questionnaire (ALDeQ; Paradis et al., 2010) captures information about a child's early language milestones, first language abilities, activity preferences, and family history. The parent-report questionnaire assesses the presence of language impairment among dual language learners. Parents' responses yielded a total proportion score ranging from 0 to 1.0, with lower scores being more consistent with what might be expected for children with language impairment and higher scores being more consistent with typical language development.

Quantitative Data Analysis

I performed statistical analyses using SPSS version 27 for Mac. Alpha was set at 0.05 a priori. Before data analysis, I verified the accuracy of the data set and corrected any errors. To address research question 1, I explored the child's bilingual development using descriptive statistics. Mean and standard deviations were calculated for continuous variables, and frequencies were calculated for categorical variables. To further understand the bilingual language development of children in the sample, I then explored the relationship between language proficiency and variables such as the age of L2 exposure, autism characteristics and exposure using correlation analyses.

Qualitative Strand

The qualitative strand represents data from qualitative interviews (Creswell, 2014) with parents. Semi-structured interviews were conducted over the phone and were audio-recorded for accuracy. All interviews were conducted by the researcher and were completed in English. The interviews lasted from 20 to 60 minutes. The interview protocol was modified from the semi-structured interview protocol used by Yu (2013; appendix A). Questions were centred on three themes: 1) life history (e.g., did you have any specific plans for your child's language learning?), 2) recent experiences (e.g., what bilingual education support does your child receive at school?), and 3) reflection (e.g., does it matter to you what language(s) your child speaks in the future?). In addition to these themes, parents were asked to describe their interactions with professionals (i.e., clinicians, educators, etc.) and the impact of language recommendations they may have received.

Qualitative Data Analysis

Before coding, interviews were transcribed with the assistance of Otter AI transcription software. All transcriptions were checked for accuracy, and names were removed for anonymity. I then used a basic interpretive qualitative research approach to reveal and interpret the participants' understanding of their experiences through coding themes and patterns within the data (Merriam &

Tisdell, 2015). Through grouping and labelling ideas to reflect broader themes and perspectives (Creswell & Plano Clark, 2017), several themes and subthemes were identified (Saldaña, 2009). I used an open coding process to code transcripts line by line while labelling data units, followed by grouping codes into categories and superordinate categories based on shared meaning (Merriam & Tisdell, 2015). This type of thematic analysis is appropriate for exploratory studies and has been used in prior research on bilingualism in autism (Hampton et al., 2017).

Background of the Researcher

Qualitative research is interpretative. It is important to identify the biases, values and personal background that shape the interpretations and choices made during the data collection and analysis (Creswell, 2014). I identify as bilingual and was raised as a French/English bilingual. I was born and raised in Sudbury, Ontario, where nearly 40 percent of the population identifies as French/English bilingual (City of Greater Sudbury, 2022). I have been exposed to English and French since birth. My father's first language is French, and the language is deeply rooted in my paternal ancestry. My mother does not speak French fluently. I predominantly spoke English in my home growing up and attend a French-language elementary and secondary school before pursuing post-secondary English language programs. Throughout my undergraduate and graduate training in psychology, I have been exposed to research supporting bilingualism as an enriching experience to promote development. Given my training and personal experiences with bilingualism, I am biased towards a favourable perspective of bilingualism and bilingual education. Additionally, my clinical work with Indigenous communities who have experienced language loss and are actively working to recover their language (McIvor, 2020) has reinforced my personal beliefs that efforts should be made to promote bilingualism and heritage maintenance.

Trustworthiness

Credibility ensures that qualitative findings are accurate from the accounts of the researcher, participants and readers (Creswell, 2014). To enhance the trustworthiness of the thematic analyses, I

incorporated several validity strategies, as described in Creswell (2014) and Brantlinger et al. (2005). The size of the sample allowed for triangulation across participants. Where discrepant information was presented, I aimed to clearly describe the contradictory perspective to further the credibility of the results (Creswell, 2014). Identifying discrepant evidence is important to prevent confirmation bias and overly simplistic analyses and interpretations (Morrow, 2005). In addition to clarifying my biases and situating myself relative to the topic, I engaged in self-reflexivity throughout the coding process. As a solo coder, I discussed my analysis and self-reflections with my supervisor, as recommended by Saldaña (2009). I also employed my supervisor as a 'peer debriefer' to review and ask questions about the thematic coding and analysis, increasing credibility (Creswell, 2014; Morrow, 2005).

Integration Strand

Combining quantitative and qualitative data to gain a more comprehensive understanding is a critical element of mixed-methods research (Creswell & Plano Clark, 2017). In keeping with a convergent design, the integrative analysis of quantitative and qualitative data occurred following the quantitative and qualitative analysis. Quantitative data capturing the child's characteristics and the qualitative data representing the thematic analysis of parental attitudes and experiences were linked using a series of joint displays. Joint displays visually integrate quantitative and qualitative information through tables and figures (Plano Clark, 2019), and are commonly used within mixed methods research to present quantitative and qualitative findings side-by-side to compare findings and generate conclusions (McCrudden et al., 2021).

Results

Quantitative Results

The children in the sample had a variety of language experiences. Table 2.2 provides descriptive statistics on the language experiences of the children in the sample. The mean age of exposure to L2 was 28.28 months, with 12 children exposed to L2 before 12 months. All children were first exposed to

their L2 by the age of 6 years. The lifetime exposure to the first language (L1) ranged from 37.06 percent to 95.15 percent, while lifetime exposure to L2 ranged from 4.85 percent to 62.94 percent. The current exposure to L2 ranged from 3.57 hours to 71.50 hours in an average week. Table 2.3 provides the frequency of language use across settings for children in the sample. Fifteen children were exposed to a bilingual environment at home, and 12 used two languages with their relatives and extended family. Eight children were exposed to a bilingual environment at school. In contrast, 17 were exposed to monolingual language environments at school. However, this was not always the same as their home language (e.g., English as a second language, French as a second language). Eight children used two languages with their friends, while 17 children used one language with their friends. Most media use (TV, music, videogame) was monolingual. Ten children were reported to read books across their languages, and ten were said to read books in only one language.

Table 2.4 provides descriptive statistics for the parent-reported autism characteristics and language abilities within the sample. The SRS-2 results suggest that parents endorsed a range of autism characteristics, with a mean SRS-2 total T score of 75.76 (standard deviation of 9.49). Based on the descriptive ranges of the SRS-2, 5 children fell into the mild group, 6 children fell into the moderate group and 14 children fell in the severe group. The mean ALDeQ total score is 0.61 (standard deviation of 0.18) with a minimum score of 0.24 and a maximum score of 0.90, suggesting that some children within the sample have first language development that aligns with expected language development while others have first language development consistent with language impairment. Sixty-eight percent of children in the sample spoke their first word before 15 months, and 60 percent combined words to make short sentences by 24 months of age. Two children were reported by their parents to speak less than 30 words.

Figures 2.1 and 2.2 display the frequency of parent-reported proficiency for L1 and L2. For L1, most parents reported their child had good or excellent proficiency in speaking and understanding. The

mean rating for proficiency in speaking and understanding L1 fell within the 'good' rating. For L2, there is more variability in proficiency, with ratings for both speaking and understanding ranging from 'limited' to 'excellent'. The mean rating for proficiency in speaking and understanding L2 fell within the 'gets by' rating.

Table 2.5 provides correlations between autism and language variables. Proficiency in speaking L1 was significantly positively correlated with proficiency in understanding L1 and proficiency in speaking L2 was significantly positively correlated with proficiency in understanding L2. Proficiency in L1 was not significantly correlated with proficiency in L2. Average lifetime exposure to L2 was not significantly positively correlated with proficiency in speaking and understanding L2. Current exposure to L2 was not significantly correlated with proficiency in L2, although it was significantly negatively correlated with proficiency in speaking L1 and understanding L1. Age at L2 exposure was not significantly correlated with proficiency in L2 or L1, although current age was significantly correlated with proficiency in speaking L2. Regarding autism characteristics, only proficiency in understanding L1 was significantly correlated with SRS-2 total scores. Proficiency in speaking and understanding L1 significantly correlated with ALDeQ scores, although proficiency in speaking and understanding L2 was not significantly correlated with ALDeQ scores.

Qualitative Results

Parents reported a variety of bilingual experiences for their autistic children. Nine children were born into a bilingual environment and simultaneously developed both languages before three years of age. The largest subset of children in the sample (n=13) experienced bilingualism through bilingual education programs. Two children were educated in a submersion English education program as newcomers to Canada due to a lack of access to schooling in the heritage language. Eleven children attended immersion or French submersion education programs selected by their parents. These children were exposed to L2 sequentially after L1, with their first exposure to L2 occurring after three years of

age. Three parents (Holly, Aishwarya, and Josée) indicated that they opted for a more monolingual approach despite their child being born into a bilingual environment.

Four broad themes along with sub-themes were extracted from the data. The superordinate themes were: 1) importance of bilingualism, 2) parental decision making, 3) navigating the education system and accessing support, and 4) child's response. Each superordinate theme and sub-themes were considered from the perspective of families whose children were exposed to a bilingual environment simultaneously before the age of three years, families whose children were exposed to a bilingual environment sequentially after the age of three years primarily through schooling, and bilingual families who chose to raise their children in a functionally monolingual environment. Table 2.6 outlines the themes and subthemes across groups.

Importance of Bilingualism

Simultaneous Bilingualism. All parents raising children in simultaneous bilingual environments endorsed the advantages of bilingualism for their children. These advantages included connection with family, culture and heritage, economic opportunities, career advantages, and travel opportunities. Lindsey reflected: "I wanted the kids to be able to communicate with their French family, and, although they're also bilingual, I just felt that there, there's a cultural piece that I wanted them to be a part of." For Myra, exposing her child to Arabic was critical to her child's spiritual development in addition to promoting connection to his family. She reflected:

There's something mandatory for me, Arabic, that he needs to learn because holy books don't run without Arabic ... And Urdu I want him to learn that so that he is at least speaking so that he has that connection with his cousins and his grandparents, everybody back home.

Sarah recognized bilingualism for its possibility to promote her son's cognitive development. She shared:

As a parent and knowing that my kids have special needs and knowing how plastic or moldable the brain is... for them to do sports and to be exposed to music and art and more than one language, it just helps to make as many brain connections as possible.

These parents consistently viewed bilingualism as a normal and essential part of their lives. Seema shared, "it's like very normal to us to speak in both languages," while Peter shared, "English and Cantonese are both so embedded within our life and our connection to our parents and family". For Lindsey, bilingualism is so seamless in her family's life that she reflected, "it was never any debate" when reflecting on her choice to raise her child in a bilingual environment. These parents valued their bilingual identity and strongly desired to pass this identity and language to their children. Melissa stated:

I had to make a really huge effort to get my French back up to a francophone level. And there was a whole lot of identity issues that came with that. And I didn't want my kids to have to ask those questions of themselves. I wanted their identity to be more clear.

Other parents reflected on the importance of English in accessing and participating in their community. However, this did not come at the expense of their desire to maintain exposure to L2 for their child. Five of nine parents referenced the notion that English is quickly learned within the community and through exposure to media. Melissa shared, "I made sure that my plan was definitely to put French first, knowing that English can come really easily. In French, there's the saying '*l'anglais s'attrape*,' like you can just catch English".

Sequential Bilingualism. Parents whose children access bilingual exposure through school shared that they viewed bilingual education as a means of enrichment for their children. One that was not always available to them. Kelly shared:

I grew up in a very remote area in northern Saskatchewan; we didn't have any opportunities for anything like that. And so, living in Edmonton, when I started looking into education ... I couldn't

believe all the options that were available. And I want to make sure that we took advantage of that opportunity.

While parents endorsed the same advantages as parents whose children were exposed to two languages simultaneously, parents tended to focus more on career advantages and cognitive enrichment for their children than connection with culture, family and heritage. To this effect, Nicole stated:

It's not just an issue of being able to speak French. It's an issue of learning it in a certain way that runs off into every other subject they're learning and how they move forward learning and their curiosity and their understanding that rules might change because my kids were very rule-driven. But when you are teaching them that there's a different way of saying something. It opens up their mind that there's lots of other ways that things are different too.

Kelly recognized that bilingualism is the norm globally. She indicated:

If you look around the world, like everywhere else in the world, people are multilingual. North America's so unique in that sense that very few people are. So many people are monolingual. And I just don't think if we were living in Belgium, that we would even remotely consider, oh, we should just pull them out of English and just stick with French.

Parents did not view bilingualism as causing additional harm, with Nicole sharing, “no one complains that they know too many languages.”

Functional Monolingualism. Among the three parents who chose to raise their children in a functionally monolingual environment, parents did not consistently endorse any advantages of bilingualism. However, disadvantages of bilingualism were not supported. Holly indicated that she had hoped to have her son attend a bilingual education program and raise him bilingually due to the connection with family and culture, opportunities for travel, and economic opportunities of bilingualism. In contrast, Josée disagreed with the notion that bilingualism (specifically French language) provides a career advantage for her child, indicating, “I think it's bullshit because I think the reality is a lot of jobs

where they want some of the speak French are entry-level, or, you know, they're not those top career jobs". All parents understood the influence of community language, particularly the role that English would inevitably play in their child's life. Aishwarya chose to promote English over maintaining the heritage language for her child, suggesting that "most of the people in most of the parts of the world understand English, so if you know English, most of the things are easy." Although Josée recognized the predominance of English in the larger community, she valued promoting her French minority language even within her community, stating "I'm only looking for things that are in French" in reference to school and services for her son.

Parental Decision Making

Simultaneous Bilingualism. Parents raising autistic children in simultaneous bilingual environments reported receiving a mix of recommendations and support from professionals, family and friends. Some children were developing bilingual language at the time of their diagnosis and did not receive a recommendation to limit the language environment. Sarah recalled that "by the time [Thomas] was diagnosed, he was eight years old and he was already bilingual," while Melissa shared, "I suspected autism really early, but we got brushed off a lot because he's so high functioning. And so, ... by the time we got the diagnosis, he was already fully bilingual." In these cases, it appears that the timing of the autism diagnosis negated the need to make recommendations regarding bilingual language development. Other parents reported receiving recommendations to restrict language exposure to promote the development of one language. Lindsey shared that:

[SLPs] had recommended that we switch to or that we choose one language to focus on. So at that point, we chose English because at least his French family was bilingual, and we felt that he needed English to function in society more easily. So, we never stopped exposing him to French. We just didn't actively teach it the way we taught English with him.

Other parents reported receiving encouragement for bilingualism from professionals. Peter recalls a conversation with his son's doctor, "we asked should we continue, and she was like 'Yeah, I think you need to expose him to as many things as possible so that he gets that experience.'"

Despite receiving these recommendations, many parents reported a lack of information and support from professionals to guide their decision-making regarding bilingualism for their child. Daniel shared:

I saw knowing that [Leo] had autism as just being the key to opening the toolbox. But if you don't do your own research, you'll never learn. And I think that's what a lot of families are lacking is there's not enough information for them.

Many parents continued to endorse positive beliefs about bilingualism for their autistic children, regardless of recommendations against it. Jessica shared, "It could not hurt [Theo] to speak two languages at all; it wouldn't, definitely wouldn't be a bad thing." Sarah's views of bilingualism as an enriching part of life did not change once her son, Thomas, received his autism diagnosis. She shared, "[You] would still do art or music or sports with your autistic kid, and language is one of those things as well." Peter shared that bilingualism continued to be an important skill for his son while recognizing that he may develop languages differently. He shared, "[Autism] doesn't mean they can't learn; it just means that they learn differently. And you really have to understand how they best learn and to equip them with as [many] tools to succeed in life." Even though parents within this category tended to uphold positive beliefs about bilingualism, some parents reflected that the decision to raise their children as bilinguals was not an easy one. Jessica shared, "we struggled; my husband and I disagreed and struggled a lot on whether or not we should put [bilingualism] on [Theo's] plate."

Only one parent shared fears about bilingual language learning for their autistic child. Myra reflected a fear that continuing to expose her son, who was preverbal at the time, to two languages would result in him becoming confused and delaying his language development. Myra then decided to

focus on exposing and teaching her son English. She later changed her perspective after a trip to India, where her son was immersed in Urdu while visiting relatives. During this visit, Myra noticed that he appeared to understand Urdu and was beginning to express himself in the language. Given her experience, Myra adopted a new belief and shared the following when asked to provide advice to other parents. She shared:

They might not respond, or they might not reply, but it gets seeped in their brains, I guess, they pick up really fast. Each child has a different trend but... never stop exposing your child to it, because of autism or any other disability, you know, just give it a try.

Sequential Bilingualism. Parents choosing to expose their autistic child to L2 after three years of age also received a mix of recommendations from professionals, family and friends. Educators were more likely to provide recommendations to these families given that access to bilingualism happened primarily through schooling. Diane recalled, "We were working with the speech pathologist through the school. She was very supportive of us. And what she said made perfect sense that [Cassie is] going to have this no matter what language she's learning in." Kayla recalled receiving support for her daughter's school, stating, "there was never a recommendation that she shouldn't be there." Other families received recommendations against bilingualism and bilingual education. Brenda recalled receiving such advice at the time of her son's diagnosis:

[At his] diagnosis meeting..., they were quite hesitant that, they did not encourage putting him into French Immersion. They thought that because he was officially diagnosed with language impairment, with autism spectrum disorder without cognitive impairment...he couldn't do an immersion program.

During an information session, Amanda recalled receiving recommendations against French Immersion from a school administrator within her son's school district. "I went to an information session for new

French Immersion parents...I asked some questions about children with autism or children with special needs, and [the coordinator for French] strongly recommended that [Ross] not go in French Immersion.”

Like parents raising autistic children with simultaneous bilingualism, parents reported needing more information and discussion with professionals to guide decision-making. Following recommendations against bilingual education for her son, Brenda recalled how information from autistic adults helped guide her decision-making:

So, then we read some books about it, like just research autism in general ... [in] Tony Atwood's *Complete Guide to Asperger's*, he talks about the benefits of a second language increasing flexibility ... He didn't, like, there wasn't specific research that showed it, but he was just saying, in his experience, he knows, because he's from Australia. And he was saying that there's lots of people with Asperger's who live abroad on purpose because then their social missteps can be attributed to being a foreigner, as opposed to having Asperger's ... So that just kind of reinforced that there were some benefits or that it's possible for people with autism to learn a second language and to thrive in that environment. So, we decided to go ahead with it.

Similarly, Nicole reflected that her decision to pursue French Immersion for her son, Jack, was aided by guidelines for special education in French Immersion provided to her by an organization promoting bilingual education. She shared:

I was involved with *Canadian Parents for French*, and I was aware of, you know, kind of the guidelines that it was like, having a learning disability is not going to prevent you from being successful in French immersion, you're going to be just as successful as you would have been otherwise.

Parents seek information beyond respective recommendations to help guide their decision-making for their children.

Despite receiving mixed recommendations, most parents in this category upheld beliefs that their child was capable of L2 learning and that their child's opportunities for education should not be restricted due to their autism diagnosis. Stephanie stated: "For all we know, in six more years, he's going to be completely fluent in both languages ... I don't believe in treating him any differently, just because he has a diagnosis." Diane shared, "[I] never thought that she couldn't do it," and Julie shared that "We didn't think it would be anything insurmountable". Many parents recognized that the challenges of classroom learning would not disappear in a monolingual environment and should not preclude their child's ability to learn in a bilingual environment. Nicole shared, "[Jack's] going to have a learning disability no matter what program they're in. It's not gonna magically disappear." To this effect, some parents viewed bilingual education as an opportunity for an increased cognitive and academic challenge for their child, which suited their child's abilities. Julie shared, "Knowing [Tucker], and what his capabilities are ... he needs to be challenged."

Only one parent in this category reported initial apprehension toward bilingualism for their child. Maria reported initial fear of confusion for her son, Miguel, who was exposed to English at school and Spanish, the family's heritage language, at home. She shared:

I think one of the first fears that you have with a child, [we] had it, ... that you're going to confuse them by using both languages. And so, you feel it's going to make a language harder for them and when they're speaking.

Maria received recommendations and support for bilingualism from resource staff at her son's school, who were bilingual. She recalled that, with the school's help, she understood that Miguel was capable of L2 learning and did not restrict his language environment.

Two parents endorsed that the decision to expose their child to bilingual education was difficult and emotional. Brenda shared her reaction to receiving recommendations against bilingual education for her son, "We were pretty devastated when the psychologist and doctor said that they didn't think

that we should continue in [the bilingual] language program. And yeah, it was pretty upsetting.”

Michelle reported the uncertainty of whether the choice for bilingual education was right for her autistic daughters, Amelia and Isabella, after receiving mixed recommendations and support from professionals, family and friends. Michelle shared, “It’s not an easy decision. I, I’ve definitely lost lots of sleep thinking about it. And I don’t know if it’s the right thing or not.”

Functional Monolingualism. All three of the parents that decided to restrict their child’s language exposure had professionals discourage bilingualism for their children. Josée shared receiving the following recommendation from her son’s pediatrician, “one language before the age of six,” while Holly shared, “when we went for [Jasper’s] diagnosis, like, one of the things that doctors did tell us was, you know, why would you want to put an extra barrier on him?”. Aishwarya received recommendations against bilingual exposure for her son from their speech-language pathologist (SLP). Aishwarya shared:

I have been seeing the SLP since two or three years, and in the beginning, we used to speak Marathi...I had been talking to the SLP, and she said sometimes it's good. But with a starting point, it's better not to speak Marathi, just focus on English so that it becomes easy for him. So, he won't be confused in the words.

None of these parents reported seeking out information in addition to the recommendations received.

Two of the three parents shared beliefs that monolingualism is best for their autistic child. Josée shared, “I do think that parents need to identify which is the dominant language,” referring to her approach to monolingualism for her child’s language development. Additionally, Josée shared her belief that bilingual education would not be appropriate for her autistic son. She shared, “I don’t think research could support, for example, with the French immersion system where they’re constantly turning away children that have any type of slight learning disability or anything like that.” Aishwarya shared her belief that bilingual exposure results in confusion and delays for autistic children, which can be eliminated by reducing language exposure. She shared, “The confusion of the words or the

competition in the words can be reduced as for just one simple language.” The third parent, Holly, did not share any beliefs that her son, Jasper, would not be capable of bilingualism. Instead, she prioritized following Jasper’s lead after receiving recommendations against bilingual education. She recalled, “[they] encouraged us a little bit to not put him in French [language program], which was struggling for me, in a sense, but I, you know, I could also see that he didn't like it.” She prioritized his success in school, upholding the belief that a monolingual English program provided the best environment for this success. She shared:

[Jasper was] starting school, I just wanted things to go smoothly. I wanted him just to fit in and enjoy it. Because at that point, he wasn't wanting to stay. He would run out of school; he would, you know, he was running out of the classroom all the time at that point. So we thought, if he's doing that in English, he probably won't want to be there in French.

Navigating the Education System and Accessing Supports

Simultaneous Bilingualism. All autistic children raised as simultaneous bilinguals attended school in a language that aligned with their home language exposure. Therefore, no parents describe advocating for their child to be included in a school program based on the language of instruction. Lindsey acknowledged that living in a strong French community afforded her son additional educational opportunities. She recalled:

So we had his diagnosis right before we registered him for school. And we chose to put him in a French Catholic school because it's like two blocks from our house. And they have an autism classroom in that school, so the building is full of people who area of expertise of [autism]. So, we felt that it was worth a try. And because we had the French language, right, they couldn't say no. And we were fortunate because this teacher was very supportive ... He wouldn't have had that opportunity for bilingualism in the public French immersion system because they don't get support for second language. So, because he needs an [educational assistant], he would have to

be in an English stream in order to sort of qualify. So that's a problem in the English system here, which is why he's in a French Catholic system.

Some parents who enrolled their children in a French-language system, particularly in geographical areas where French is a minority, indicated that their children experienced smaller class sizes and greater attention from teachers. Melissa recalled, "I think well, being in the French system was helpful because there's fewer of us, so you know, being in a minority situation, he gets a little bit more attention than he may have in the bigger English stream." Sarah indicated:

The French schools are very small, and he always had so much support, and the classes were small. So even in grade nine, there are 16 kids in his grade nine class at the school ... he always had a lot of individual attention and never felt the need to change him for any reason, actually.

When accessing support and services for their children, either at school or in the community, most parents indicated that services were only available in one language, usually English for community services, with the rare exception of families who lived in large Francophone communities. For example, Marleen, who lives in the bilingual province of New Brunswick, indicated, "We've been fortunate to be able to find all of our services in French for the kids." Lindsey was also able to access community-based services in both French and English. She shared, "So I just feel like the services were always available in both if we needed it ... it's because of where we live, I think". For most families, it was the responsibility of the parent to promote and seek out services to support the child's bilingual language development. Seema shared, "it's our effort completely about the languages". Seema shared that she applies techniques shared with her by her daughter's SLP in her own language. "Whatever we learn, during speech therapy hours, we used to apply in our own language ... We do lots of modeling for her to certain sentences in English. Same thing we do in Telugu." Sarah described seeking out a private SLP outside of her local community who could support language development in both French and English for her son,

while Peter enrolled his son in a weekly private Chinese school program to help him develop his Chinese language skills.

Two parents shared frustration with limited access to psychoeducational assessments in their child's dominant language or the language of classroom instruction. Jessica shared:

We had we had a psychologist do like a complete psycho-educational assessment and even that was difficult because she assessed him in English, but he's in 90% French [at school]. So even completing the psycho-educational assessment, we couldn't find a French psychologist to do it. It was, you know, and it does affect the questions and answers.

In reference to her son's psychological assessment, Melissa stated:

They weren't taking into account the fact that he's Francophone. And [English] wasn't his first language. The mistakes that they pointed out, were not mistakes that he would make in French... It was very frustrating because in the report, ... they mentioned something about his sentence structure and a few other things. But they generalized it as if that's a problem with language, but really, it was just in English; he doesn't do those things in French.

Both parents felt that a lack of access to bilingual psychologists, or psychologists with an understanding of bilingual development, led to incorrect conclusions about their child's skills and abilities.

Sequential Bilingualism. Most parents indicated that parental advocacy was required for their child to be included in bilingual educational programs where the language of instruction differs from the home language. Some parents noted a culture of exclusion within French Immersion programs. Nicole said, "I think they don't know what to do with kids with disabilities in the French Immersion program here because we [are] very quickly diverting them out." Kayla compared the exclusion of students with autism to the exclusion of wheelchair-using students.

"It's like if you had a child in a wheelchair, you'd install a button on the door so the door opened. You wouldn't say 'Oh, well, there's a special wheelchair school. Please go there,

because we don't want to install any button'. ... We know with autism is pretty much the same thing. You know, their body is different; it works differently. And instead of installing buttons that kids can use, we group them all together and get them out of the system. Even though a lot of them are very bright in different areas and don't get the opportunity to explore that.

Some parents gained information on their child's rights to help their advocacy for inclusion in French Immersion programs. Stephanie shared:

I kind of had to push for it saying, no, this is what I want to do and it's my right. And, you know, I had to get back up from some of the other parents on the board to find out what exactly are my rights and found out that yeah, they have to provide education in whatever language he chooses.

Michelle stated, "I don't feel like [Amelia and Isabella] should lose their right to a French education. They shouldn't lose their right to a French education, and they shouldn't lose the right to go to school with their sister just because of [autism]."

Despite sometimes encountering a culture of exclusion in immersion language programs, many parents shared that they felt their child was welcomed in their bilingual education program. Brenda shared:

Right after his diagnosis, I took him to the principal, or I took him to the school and said, like, gave him the diagnosis paper and said, you know, we're already registered [and] this is his diagnosis. This is my kid. And they're like, 'oh, you know, we're happy to have him.

Michelle shared, "They've never said no; we shouldn't send [Amelia and Isabella] there." Further, Julie shared, "We have a great school and a great community that supports [Tucker] and accept him and works with his quirks and corks."

Parents reported mixed perceptions on the availability and access to support and accommodations within bilingual education programs. Several parents described that their children

received support, as needed, from an SLP through their school and an EA in the classroom. Brenda perceived that her son's support is comparable to English language programs. She shared:

There seems to be this belief that there is more support in English than in bilingual [programs] ... but what it comes down to is there's not very much support in English either. So it's not like English is better; it's just not less worse or whatever.

Several parents perceived their children to receive more support and attention due to smaller class sizes and fewer students with autism requiring limited resources in the bilingual education program.

Stephanie shared:

The other benefit I saw with him being a French Immersion is they tend to be smaller class sizes, which he may get, what more one-on-one support, or if he needs an aid, he's less likely to have to share an aid.

Similarly, Julie shared "I think we are afforded more support and opportunities being at the French immersion school because most people with autistic children don't put them in a French immersion stream." Michelle received similar recommendations from a friend who works in education. She shared:

I have a friend that works in the OT office, and she used to work as an EA for many years. And she was the one that said, 'if you move [Amelia and Isabella] to an English school, you're going to have to fight for services because they can toilet on their own and they can eat on their own'. Like, I just, there's such a demand in the English schools that because there's so many more kids, like, so I think that they might be better off in a French school.

Other parents perceive educators within bilingual education program lack the necessary knowledge and resources to support students with autism. Kelly shared, "I think they just don't have the knowledge about autism to provide the support." Amanda recalled not being offered support for her son. She shared:

I think they just had so little experience ... in the French immersion classroom that they didn't even, nothing was offered. ... [The] English program teachers are super well prepared for children with special needs, but French immersion teachers seem even less. So, it's like they haven't even really contemplated, you know, making accommodations.

Julie shared, "I don't think that in the French Immersion system, that these teachers [and] administrators are not used to thinking outside the box ... they just need to be taught in a different way." Kayla recalls receiving warnings that her daughter's learning needs will not be able to be supported as she ages. She shared, "The message that we have been receiving is, if we choose to continue down this path, just be prepared, there'll be a day where they can't support her anymore." For Alexandra's son, Parker, the lack of support he received in the classroom resulted in a decision to leave the French Immersion program. She recalled how difficult the decision to switch out of French Immersion was for her as a parent. She shared:

Like I know that year, when we decided to switch him over, that was the hardest decision I had ever made. Because I knew he was capable of it. I knew, but I wasn't getting the support. Because he didn't have the diagnosis. And that's where it was very hard to make the decision to take to pull him out from there.

Most parents recognized navigation and accessibility issues in bilingual immersion programs. Notably, parents recognized a need to access bilingual immersion programs early in their child's education journey with opportunities to switch to monolingual programs as needed. Stephanie shared:

You can't start in English and switch to French. But you can start French, and if you don't do well, you can switch back to English. So, you know what I always say, take that chance; there's no harm in doing that. If you end up having to switch back to English in grade two, or whatever year, they provide you with the additional supports to catch [the child] up in English.

For parents, the ability to expose their child to L2 through immersion programs was recognized as time limited. Kayla shared, "So if you don't get in kindergarten and grade one, you don't have a chance it's over." Julie shared, "You can't three years into schooling go, jeez, I you know, I want my kid to be in a French Immersion school and put them in it doesn't work that way." Only one child, Ross, had access to a late-entry French Immersion program.

Despite mixed perceptions regarding the inclusion and support of autistic students in bilingual education programs, most parents endorsed success and inclusion for their children at school. For Nicole, her son's success felt like a challenge to the status quo. She shared, "They're not supposed to make it that far ... I feel they were never supposed to make it that far." Several parents felt that immersion language programs provided a learning environment that best suited their child's learning needs. Kayla shared:

What I noticed is because she's learning in another language, instructions are often given multiple ways. So, they'll be given one way in French, [it] will be reinforced in English, and then they'll be given a different way in French. So, she has three opportunities for the expectation to click.

Kelly perceived that her son's literacy instruction in Mandarin has facilitated his English literacy skills. She shared:

He knew all his letters, but he couldn't understand how to put them together to make words. Whereas Chinese, each character is a word. And so, he actually excelled in Chinese before he started to get the hang of English. Because it was just a different way for his brain to process this kind of language information.

Functional Monolingualism. All three parents in this category indicated that their children attended school in their dominant language, aligning with their choice to restrict their language exposure to a monolingual environment. Aishwarya revealed that her son's heritage language was not

discussed with the school. She shared, "In the school, everyone talks in English. It doesn't make a difference for them if he has a second language or not." Additionally, all three parents accessed support and services for their child in their dominant language. Josée shared that she seeks support and services in French, despite this being a minority language, as it is challenging for her son to engage safely in English programs. She shared, "It could be a safety issue for [Luca] if someone doesn't speak some French."

Child's Response

Simultaneous Bilingualism. Several parents raising autistic children through simultaneous bilingualism reflected on how their child's bilingual language development was different than initially expected. Parents reported that they were pleased with their child's bilingual language development. Daniel said his son is "functional in English and bilingual, and it's just going to get better." Lindsey recalled that her son's facilities with language learning were not apparent until he began talking. Similarly, Melissa reflected the following about her son's bilingual language development.

It may have been that he was learning all that time and just didn't use it. Because he has a profile [where it] looks like he can't do something at all ... and then mastery. English kind of happened like that as well, where, you know, we thought he didn't speak barely a word, and then all of a sudden he was blabbing away.

Myra reflected on how her son's ability to learn Urdu and Arabic surprised her initially. She shared:

The way he picked up Urdu, it was really surprising. I was so happy. I mean, I didn't expect he would catch it, really or that he would improve fast in that language. Also Arabic too, he exceeded my expectations.

These parents reflected that their children's bilingual language development may have progressed in a manner that surprised them and was different from other children. Yet, their autistic children are capable of bilingual language development. One parent, Melissa, perceived bilingualism to carry over a

benefit on the development of cognitive flexibility and social communication for her son. Regarding his cognitive flexibility, she reflected that:

[Eric] does have a very fixed mindset. And I think maybe if we didn't, maybe if he wasn't bilingual, then it may be harder to conceive of things in different ways. Because he's got the practice of already knowing that there's different words for different things.

Regarding his social communication skills, Melissa reflected the following:

When it comes to subtleties, you know, like the difference between like afraid or anxious or freedom can make him impatient you know, it can be difficult to distinguish those things. So having the two languages can kind of have more examples and help [Eric] at least understand that the subtle differences are important.

Sequential Bilingualism. All parents raising their autistic children with sequential bilingualism reflected that their child was successful and not burdened by L2 learning. Brenda reflected:

I kept checking in with the teacher... and she's like ... 'he's in love with Spanish, he's like one of the strongest English students we have, like, he totally memorize all these words and he's really good at copying the sounds' and like she's giving all this positive feedback.

Maria reflected on her son's L2 learning, "they are capable of understanding both even if they are nonverbal ... what he's understanding, he's understanding in both". Kayla reflected that her daughter's L2 learning was "above and beyond expectations" while Julie indicated that her son is "thriving in school." Two parents recalled that their child's interest and willingness to engage with the language facilitated L2 learning. Miriam shared that "[my son] knows that he is not the best. But he [tries to use the language]", and Alexandra shared that "if I would start speaking French to him, [Parker] would like it."

Functional Monolingualism. Two of three parents who chose to restrict their child's language environment reflected their child's interest and development reinforced their choices. Holly reflected

that her son's disinterest and rigidity around using French have continued to influence her decision not to increase his exposure to the language. She reflected, "There was no interest...He was very rigid about it...Maybe if he had been more open to it, we would have pushed it more." Josée also shared that her son resists engaging with anyone who communicates with him in English, his L2. She shared, "If somebody looks at him and says something in English, [Luca will] completely ignore him. Usually, like nine out of 10 times. Whereas I find he's more likely to respond to somebody talks in French." Josée further stated that restricting language exposure led to her observing language development for Luca, which validated her choices. She recalled:

When we started [to] repeat, we did stick to just the French, like just one language, because language started developing. So, we stuck with that, and his language continued to develop at his pace. Whereas like, we weren't seeing progress until we did that.

For these parents, their child's disinterest in the L2 and subsequent language development after restricting exposure further validated their choice of monolingualism for their child.

Integrative Results

The three approaches (simultaneous bilingualism, sequential bilingualism, and functional monolingualism) described by parents in their qualitative interviews were used to guide a series of joint displays and additional analyses. Table 2.7 provides children's age, autism characteristics (SRS-2 total score), and language development (ALDeQ score) organized by the bilingual exposure approach taken by parents. There were no significant differences in child characteristics across bilingual exposure groups. The two children who reportedly spoke less than 30 words were represented in the simultaneous and sequential bilingualism groups, respectively. Figure 2.3 and Figure 2.4 display the distribution of average lifetime exposure and current lifetime exposure separated by exposure approach. Children in the simultaneous bilingualism exposure group were currently exposed to their L2 for 40.26 hours on average (standard deviation of 14.52). They had a mean average lifetime exposure to their L2 of 41.42

percent (standard deviation of 12.92). Children in the sequential bilingualism exposure group were currently exposed to their L2 for 27.65 hours on average (standard deviation of 20.17). They had a mean average lifetime exposure to their L2 of 16.11 percent (standard deviation of 7.58). Children in the functional monolingualism group were currently exposed to their L2 for 9.45 hours on average (standard deviation of 5.24). They had a mean average lifetime exposure to their L2 of 12.43 percent (standard deviation of 4.84). An analysis of variance (ANOVA) revealed a significant difference in the amount of current exposure ($F(2, 22) = 3.79, p = 0.04$) and lifetime exposure ($F(2, 22) = 20.85, p < 0.001$).

Figure 2.5 and figure 2.6 display the frequency of proficiency in speaking and understanding L2 across bilingual exposure approaches. A Kruskal-Wallis test was performed to examine whether the distribution in proficiency ratings (i.e., Limited, Get by, Good, or Excellent) differed significantly across bilingual exposure categories. No significant difference was found in the distribution of ratings for proficiency in speaking L2 ($\chi^2(2, n=23) = 4.88, p = 0.09$), while a significant difference in the distribution of ratings for proficiency in understanding L2 was found ($\chi^2(2, n=23) = 6.31, p = 0.04$). Pairwise comparisons revealed a significant difference (after Bonferroni correction) between children exposed to simultaneous bilingualism and those exposed to functionally monolingual environments ($p = 0.04$).

A joint display (Table 2.8) was created to merge quantitative data of the child's autism characteristics, using the SRS-2 descriptive ranges and qualitative themes to examine whether a pattern of autism characteristics influenced parental attitudes and behaviours. Among children whose autism characteristics were rated within the SRS-2 Mild range ($n=5$), there was clear convergence of parental belief in their child's ability for bilingual language acquisition and a positive attitude towards bilingualism. These parents received a mix of recommendations regarding bilingualism for their children. Except for one parent who switched their child from bilingual education, children received support and services to facilitate their bilingual language development. Among children whose autism characteristics were rated within the SRS-2 Moderate range ($n=6$), there was a clear convergence of parental belief in

their child's ability for bilingual language acquisition and a positive attitude towards bilingualism. All parents held views that their child is capable of bilingual language learning. Several parents felt they lacked access to information to guide their decisions, and one parent initially feared that bilingualism might lead to confusion. Parents deliberately sought out services and support to facilitate their child's bilingual development (e.g., Chinese school on weekends). Among children whose autism characteristics were rated within the SRS-2 Severe range (n=14), there was a lack of convergence as the three parents who chose to restrict their child's language exposure to promote monolingualism had children within this group. Most parents did not endorse a fear or apprehension toward bilingualism for their child. When bilingual education was selected, either immersion or submersion programs, parents described a need for advocacy for their child's inclusion. Parents valued a supportive school community and felt their child's inclusion in these programs to be positive.

Discussion

Given the complexity and heterogeneity of the bilingual and the autistic experience, the current study aimed to examine bilingualism in autistic children using a mixed-methods approach. To my knowledge, this is the first mixed-methods study examining the complexity of bilingual language development of children with autism in the context of their parent's attitudes and behaviours toward bilingualism.

Diverse Bilingual Experiences

The quantitative results reveal a wide range of bilingual exposure and language use among children with autism raised in bilingual settings. Of the 25 children in the sample, 15 lived in homes where more than one language was spoken and 10 children experienced exposure to L2 outside of their homes. Children's interactions with media primarily occurred in one language. Most children attended monolingual education programs in a language spoken at home or through a submersion program. Eight children had experiences with immersion language programs, with only one child switching from the

immersion program to English due to a reported lack of support. These results add to prior literature suggesting a diversity of bilingual experiences among the autistic population (Digard et al., 2020), similar to the diversity existing within non-autistic populations (Paradis, 2019).

When exposed to a bilingual home environment, do autistic children acquire bilingual language ability? There was variability in parent-reported proficiency in speaking and understanding L2 among the sample, with many parents reporting their child's ability to speak and understand their L2 to be good or excellent. This result is in keeping with previous research suggesting that children with autism are capable of bilingual language development (Peterson et al., 2012). The average lifetime exposure to L2 was variable across the sample, ranging from 4.85 to 62.94 percent exposure per year. The average lifetime exposure to L2 was not significantly correlated with parent-reported proficiency in L2. This result is inconsistent with prior findings suggesting heritage language exposure was positively correlated with expressive vocabulary among bilingual autistic children (Hambly & Fombonne, 2014) and bilingual non-autistic children (Thordardottir, 2011). The age of L2 exposure was also not correlated with proficiency in L2. Further research is required to understand the role of exposure and the age of first exposure in the bilingual language development of children with autism.

As expected, parent's decision to maintain, select or restrict bilingualism for their child contributed to the overall level of exposure to L2, with children exposed to simultaneous bilingualism having the largest mean average lifetime exposure, followed by children exposed to sequential bilingualism and then by children who experienced functional monolingualism. There were no significant differences in proficiency in speaking L2 across language exposure approaches taken by parents, while proficiency in understanding L2 did differ significantly across language exposure approaches. Pairwise comparisons revealed a significant difference between simultaneous bilinguals and function monolinguals.

Parent's Choices and Beliefs about Bilingualism

Parents in this study display diverse perspectives and experiences in raising a child with autism

within a bilingual environment. Advice and recommendations from professionals have been noted to impact parents' beliefs and decision-making regarding bilingual maintenance, with a range of recommendations noted in prior research (Hampton et al., 2017; Sher et al., 2021). Most parents in the current study reported receiving a mix of recommendations and advice from professionals and family or friends. Only three parents opted for a more functionally monolingual approach. Nine children were born into a bilingual environment and continued to receive bilingual language exposure. For these children, their bilingual language development is simultaneous with exposure to two languages before three years. Three years is the accepted cut-off for differentiating simultaneous bilinguals from sequential bilinguals exposed to L2 after developing a first language (Paradis et al., 2011). Thirteen children experienced sequential bilingualism with their first exposure to their L2 through immersion or submersion education programs where the language of instruction differed from their home language.

Parents upheld positive attitudes toward bilingualism and largely viewed bilingualism as an important part of their life and the life of their children. Parents highlighted various advantages of bilingualism for their child, including connection with culture and family, economic and career advantages, cognitive enrichment, and travel opportunities. Some parents noted advantages of bilingualism specific to autism, including enhanced cognitive flexibility and advantaged social communication skills. These advantages and beliefs are similar to those reported in other studies of parents who maintain bilingualism for their children with autism (Hampton et al., 2017; Howard et al., 2021; Paradis et al., 2018).

Unlike other research that has reported substantial parental concerns about confusion leading parents to opt for monolingualism (Hampton et al., 2017; Howard et al., 2021), only two parents endorsed fear of bilingualism confusing their child, and only one of these parents chose to restrict their child's language environment. The two other parents who opted for a functionally monolingual approach upheld beliefs that focusing on one language would promote linguistic and academic success

for their child. Unlike Howard et al. (2021), parental attitudes towards bilingualism tended to align with their decisions and language practices for their children. Parents who opted for functional monolingualism for their child tended to emphasize the need for dominant language proficiency, received recommendations against bilingualism, and believed that monolingualism would best facilitate language development. Their child's response to bilingualism (e.g., perceived rigidity, disinterest) or monolingualism (e.g., a perceived increase in communication) tended to reinforce their decisions. Importantly, no parent indicated a negative impact of their decision on their child's wellbeing, a concern noted in past research (Hampton et al., 2017; Howard et al., 2021).

In contrast, parents who decided to expose their child to bilingualism upheld a variety of advantages for their child, including bilingual identity, connection to culture, relationship with family, economic and career opportunities, and cognitive development. Parents who chose to expose their child to bilingualism through bilingual education tended to place a greater emphasis on cognitive and career advantages, likely because the use of the second language was not tied to their family, culture or personal identity. Most parents tended to maintain that bilingualism would positively impact their child and that their child was capable of bilingual development, even when faced with recommendations against bilingualism. One parent reported fear of confusion for her child and began restricting language exposure until her child was exposed to L2 with extended family and began to show signs of communicative development in L2. Parents reported that their child's positive response to bilingualism had validated their choices.

Influence of Autism Characteristics

Prior research on parents' perspectives and experiences raising bilingual autistic children has found that autism-specific constraints, such as the nature of autism characteristics and verbal ability, influence parental choices regarding bilingualism for their child (Hampton et al., 2017; Howard et al., 2021). Howard et al. (2021) found the severity of the child's autism to influence the decision to restrict

the child's language environment. Within the current sample, many parents understood that monolingual and bilingual development would be different for their autistic child compared to their non-autistic peers, which is supported by the current literature (Schaeffer & Grama, 2022). Many parents referred to their perceptions of their child's autism characteristics and overall skills (e.g., "high functioning," "facility with languages") as justifications for maintaining or selecting bilingualism for their child. However, the presence and level of the child's autism characteristics did not significantly correlate with parent-reported proficiency in speaking and understanding L2. Integrating quantitative and qualitative data revealed no significant difference in the nature of autism characteristics across the bilingual approaches taken by parents. While all three parents who chose a functional monolingual approach reported their child's autism characteristics to fall in the 'severe' range of the SRS-2, nine other children who fell into the 'severe' range were raised in families where bilingualism was maintained or selected. No parents of children described in the 'mild' range of the SRS-2 noted apprehension or fear of bilingualism for their child. A mix of recommendations, both for and against bilingualism, were noted across all descriptive categories of the SRS-2, suggesting that professionals who provide recommendations may not consider the individual strengths and challenges of the child.

Parents of children with limited verbal ability have expressed more concern about bilingualism for their children (Hampton et al., 2017). While 'minimally verbal' and 'nonverbal' are not well-defined in the current literature (Koegel et al., 2020), parents reported whether their children used 30 or more words to indicate current verbal ability. Children with a spoken vocabulary of fewer than 30 words do not meet the minimum criteria for the word combination stage of language development as set forth by Tager-Flusberg et al. (2009), suggesting limited verbal development. Two children within the sample were reported to speak less than 30 words and were exposed to bilingualism in the home and through submersion education, respectively. Early language development consistent with language impairment was not significantly correlated with parent-reported proficiency in speaking and understanding L2. The

ratings of early language development did not differ significantly across the bilingual approaches taken by parents. Unlike Hampton et al. (2017), adopting a monolingual approach was not more likely among parents whose children have minimal verbal language or who demonstrate early language development consistent with language impairment.

Parents in the sample did acknowledge their child's abilities as a consideration for their decision-making. However, there is no clear pattern of influence of specific characteristics, such as minimal verbal abilities or high level of reported autism characteristics, that influence parents towards either monolingualism or bilingualism for their child. There does not appear to be a clear pattern of specific child characteristics influencing professional recommendations. Further research is required to understand the influence of the child's individual characteristics on parents' decision-making, professional recommendations, and the need for ongoing support for families.

Bilingual Education and Supports

Eleven parents in the sample chose bilingual education for their children, despite exposure to English at home. Despite being monolingual, these parents placed a high value on bilingualism for their children. These parents did not identify English as the most important language for their child to learn, as has been found in prior research (Yu, 2013). This is likely due to the prominence of bilingualism within Canadian education systems. Similar perspectives have been found among parents in Wales, integrating bilingualism into their educational system (Howard et al., 2021).

Parents reported the need to advocate for their child to be included, including information on their child's right to access submersion and immersion programs. Some parents reported feeling welcomed and supported by their child's school, while others noted a culture of exclusion, particularly within French Immersion programs. Only one child within the sample switched out of French Immersion due to a lack of support for his learning in his French Immersion program, although he did not yet have a diagnosis of autism to guide support. This type of difficulty accessing diagnosis and support within

French Immersion programs has been reported by other parents of students with special education needs (Kay-Raining Bird et al., 2021). Some parents perceived educators within bilingual education programs as lacking knowledge and experience in teaching students with autism, and many parents received a mix of recommendations about bilingualism from educators. Previous research has found that educators hold various beliefs about bilingualism for autistic students (Howard et al., 2021). Some parents believed their children had access to comparable support in their bilingual program. In contrast, other parents felt their child benefited from small class sizes and fewer demands on limited educational resources compared to English language education programs. Most parents recognized the need to navigate the education system, particularly regarding entry points for bilingual education. Many parents viewed switching to English as a safety net should their child's educational needs not be met in their bilingual program. Despite mixed perceptions regarding the inclusion and support of autistic students in bilingual education programs, most parents reported that their child was successful at school. Overall, bilingualism through immersion or submersion education programs was not perceived to hinder access to support, service or academic success. This finding differs from previous research, which has reported that parents fear bilingualism would prevent access to intervention and educational support for their children (Yu, 2016; Yu, 2013).

Limitations

It is important to recognize that most parents in the sample were navigating decisions around using English and French, the country's national languages. Most parents could access schools, services and support in English or French, with French services having some geographic restrictions. Several families lived in communities with sizeable French minority communities. The predominance of English and French and their value as national languages likely impacted families' decisions to persist with bilingualism in the face of recommendations against bilingualism. Many parents acknowledged the importance of English and French within their communities as a supportive factor in their child's

bilingual language development. This is in contrast to parents from other minority communities who may hold different cultural and linguistic beliefs (Ijalba, 2016), or who may experience difficulty navigating professionals who do not support heritage language maintenance for their child (Jegatheesan, 2011) or lack an understanding of the importance of bilingual ability within the family and culture (Sher et al., 2021). In particular, newcomer autistic children are more at risk of losing their heritage language than newcomer non-autistic children (Paradis et al., 2018). Only four families within the sample were newcomers to Canada. Further research is required to understand the interplay between parents' attitudes and behaviours and children's bilingual language development for families new to Canada or of various cultural and linguistic backgrounds.

Additionally, the sample was a small non-probabilistic sample of convenience. Although convenience samples are commonly used in research, they restrict the ability to generalize the results (Elfil & Negida, 2017). During participant recruitment, parents were asked to self-identify as a bilingual family or as raising a bilingual autistic child. Families who decided against bilingualism for their child, mainly through bilingual education, were limited within the sample. While the current study offers perspectives on the diversity of bilingual experiences, the views of parents who chose against bilingual education require further research, particularly given that students with special education needs are less likely to be enrolled in immersion language programs (Kay-Raining Bird et al., 2021).

The study was conducted entirely during the COVID-19 pandemic, with the data collected from March 2020 to August 2020. The COVID-19 pandemic rapidly changed children's language exposure as schools closed in favour of home isolation. The prolonged effect of social distancing, virtual learning and masking on child development will only be revealed over time as the COVID-19 pandemic progresses. However, negative impacts on speech and language development have been suggested (Charney et al., 2021). In addition to the potential impact of the COVID-19 pandemic on the development of the children in the sample, I had to rely entirely on parent-report measures to allow for social distancing. Parent

reports are frequently used to obtain information on a child's language exposure (Paradis, 2016). Parent exposure estimates are moderately correlated with naturalistic audio recording (Marchman et al., 2017), suggesting that parent-report can produce a valid estimate of a child's language exposure. Correlations have also been found between parent reports and direct child language skills assessment (Ebert, 2017; Marchman & Martínez-Sussmann, 2002). While parent reports have a place in understanding children's bilingual exposure and experience, this study lacked a direct assessment of language proficiency skills. Future research should include direct language assessment and parent-report of language exposure and experience to conceptualize bilingual language development. Direct assessment will also allow for additional factors related to bilingual language development (Paradis, 2019), such as cognitive skills, to be explored with autistic populations.

Conclusion

Overall, the results of this mixed-methods study add to the small body of literature on the diversity of bilingualism among autistic individuals. This is the first study to use mixed methods to understand the complexities of bilingual autistic experiences. Integrative and mixed methods have been called for among researchers in the field (Digard & Sorace, 2022; Katsos & Gibson, 2022). The integrated results demonstrate that bilingualism is not a 'one size fits all' experience for autistic children and their parents. Children's exposure and use of languages were variable, as was their proficiency in speaking and understanding L1 and L2. As expected, parents' choice to maintain bilingualism, restrict language to monolingualism or introduce bilingualism through education did influence the amount of exposure to L2 for children in the sample. Children's proficiency in understanding L2 significantly differed across language exposure approaches. Parents reported facing a complex decision-making process related to bilingualism for their autistic child. Parents received a mix of recommendations regarding bilingualism and reported positive attitudes towards bilingualism in keeping with prior research (Hampton et al., 2017; Howard et al., 2021; Paradis et al., 2018; Sher et al., 2021). Fear of confusion due to bilingualism

was not a predominant experience across parents in the sample. Unlike other findings suggesting that parents of minimally verbal children and children with higher levels of autism characteristics are more likely to select monolingualism (Hampton et al., 2017; Howard et al., 2021), there was no clear pattern relating the child's autism characteristics with parent's beliefs about bilingualism for their child and their ultimate decisions. As suggested by Sher et al. (2021), most parents in the sample upheld the notion that a child's autism diagnosis does not diminish the importance of or their ability to acquire bilingualism. Future research should continue to focus on the external and internal factors influencing the bilingual experience of children with autism in order to best support bilingual families raising autistic children.

Tables

Table 2.1. Demographic information of participating parents and children.

Parent	Child	Child's Gender	Child's Age in Years	Location	Language Exposure/Experiences	Born in Canada
Holly	Jasper	Male	8	Alberta	English and French	Yes
Melissa	Eric	Male	9	Alberta	English and French	Yes
Daniel	Leo	Male	9	Quebec	English and French	Yes
Sarah	Thomas	Male	16	Ontario	English and French	Yes
Seema	Sahana	Female	6	Ontario	English and Telugu	No
Peter	Jacob	Male	5	Alberta	English and Cantonese	Yes
Marleen	Benjamin	Male	10	New Brunswick	English and French	Yes
Aishwarya	Arnav	Male	6	Ontario	English and Marathi	No
Josée	Luca	Male	9	Ontario	English and French	Yes
Jessica	Theo	Male	10	Alberta	English and French	Yes
Lindsey	Alex	Male	11	Ontario	English and French	Yes
Myra	Salaam	Male	8	Alberta	English and Urdu	Yes
Stephanie	Liam	Male	7	Alberta	French Immersion	Yes
Brenda	Evan	Male	7	Alberta	Spanish Immersion	Yes
Amanda	Ross	Male	12	British Columbia	French Immersion	Yes
Diane	Cassie	Female	13	British Columbia	French as a Second Language Education	Yes
Nicole	Jack	Male	16	Manitoba	French Immersion	Yes
Miriam	Jose	Male	10	Ontario	English as a Second Language Education	No
Kayla	Emily	Female	7	British Columbia	French Immersion	Yes
Kelly	Jiro	Male	7	Alberta	Mandarin Immersion	Yes
Julie	Tucker	Male	8	Manitoba	French Immersion	Yes
Maria	Miguel	Male	6	Alberta	English as a Second Language Education	No
Alexandra	Parker	Male	12	Alberta	French Immersion	Yes
Michelle**	Amelia	Female	9	Ontario	French as a Second Language Education	Yes
Michelle**	Isabella	Female	9	Ontario	French as a Second Language Education	Yes

Note: Pseudonyms are used

**Parent provided information about both children in one interview

Table 2.2.

Descriptive statistics across language exposure measures.

Variable	N	M	SD	Min	Max
Age of Second Language Exposure (in months)	25	28.28	26.66	0	66
Current Exposure L1 (hours per week)	25	69.70	20.37	25.25	103
Current Exposure L2 (hours per week)	25	30.00	19.27	3.57	71.50
Mean Lifetime Exposure L1 (%)	25	75.22	15.81	37.06	95.15
Mean Lifetime Exposure L2 (%)	25	24.78	15.81	4.85	62.94

Table 2.3.***Frequency of language use across settings.***

Setting	Bilingual	Monolingual	Missing
Home	15	10	0
Relatives	12	10	3
Friends	8	17	0
School	8	17	0
Watching Television	11	14	0
Listening to Music	8	16	1
Playing videogames	4	20	1
Books read to child	8	13	4
Reading books	10	10	5

Table 2.4.***Descriptive statistics for autism and language development measures.***

Variable	N	M	SD	Min	Max
SRS-2 Total T Score	25	75.76	9.49	59	90
SRS-2 Social Communication T Score	25	74.48	9.67	58	90
SRS-2 Restricted and Repetitive Behaviours T Score	25	77.48	10.19	55	90
ALDeQ Total Score	25	0.61	0.18	0.24	0.90

Table 2.5.***Correlations among autism and language variables.***

	SRS-2 Total	Age (in months)	ALDeQ Total	Age at L2 Exposure	Current Exposure L2	Lifetime Exposure L2	Proficiency Speaking L1	Proficiency Understanding L1	Proficiency Speaking L2
SRS-2 Total	-								
Age (in months)	-0.44*	-							
ALDeQ Total	-0.16	0.26	-						
Age at L2 Exposure	-0.14	0.02	0.37	-					
Current Exposure L2	0.25	-0.06	-0.50*	-0.23	-				
Lifetime Exposure L2	0.00	0.23	-0.37	-0.61**	0.64**	-			
Proficiency Speaking L1	-0.28	0.35	0.62**	0.07	-0.69**	-0.36	-		
Proficiency Understanding L1	-0.49*	0.38	0.53**	0.12	-0.56**	-0.32	0.75**	-	
Proficiency Speaking L2	-0.11	0.47*	0.09	-0.12	0.26	0.36	0.09	0.24	-
Proficiency Understanding L2	-0.17	0.41	0.00	0.00	0.27	0.31	0.15	0.31	0.84**

*Correlation is significant at the 0.05 level

**Correlation is significant at 0.01 level

Table 2.6.

Themes and subthemes organized by exposure types.

	Simultaneous Bilingualism	Sequential Bilingualism	Functional Monolingualism
Importance of Bilingualism	<p>Advantages of Bilingualism</p> <ul style="list-style-type: none"> • Various, consistently endorsed <p>Part of Life</p> <ul style="list-style-type: none"> • Normal part of family's life and identity <p>Heritage Language Maintenance</p> <ul style="list-style-type: none"> • Heritage language valued in the home and English in community 	<p>Advantages of Bilingualism</p> <ul style="list-style-type: none"> • Greater emphasis on cognitive and career advantages over connection to heritage and culture <p>Part of Life</p> <ul style="list-style-type: none"> • Positive views towards bilingualism 	<p>Advantages of Bilingualism</p> <ul style="list-style-type: none"> • Not consistently endorsed <p>Part of Life</p> <ul style="list-style-type: none"> • Recognition that English is needed to access community <p>Heritage Language Maintenance</p> <ul style="list-style-type: none"> • Some parents valued English over heritage language maintenance while some parents valued minority (French) language maintenance
Parental Decision Making	<p>Recommendations and Support</p> <ul style="list-style-type: none"> • Mixed support for bilingualism <p>Parental Beliefs about Bilingualism</p> <ul style="list-style-type: none"> • Positive beliefs 	<p>Recommendations and Support</p> <ul style="list-style-type: none"> • Mixed support for bilingualism <p>Parental Beliefs about Bilingualism</p> <ul style="list-style-type: none"> • Positive beliefs 	<p>Recommendations and Support</p> <ul style="list-style-type: none"> • Recommendations against bilingualism <p>Parental Beliefs about Bilingualism</p> <ul style="list-style-type: none"> • Beliefs that monolingualism is best
Navigating the Education System and Accessing Support	<p>Education System</p> <ul style="list-style-type: none"> • Included in classrooms with language of instruction aligning with home language <p>Access to Supports</p> <ul style="list-style-type: none"> • Not always available in both languages 	<p>Education System</p> <ul style="list-style-type: none"> • Advocacy for inclusion in bilingual programs is often required <p>Access to Supports</p> <ul style="list-style-type: none"> • Usually accessible • Not always available in both languages 	<p>Education System</p> <ul style="list-style-type: none"> • Attendance of school in dominant language <p>Access to Support</p> <ul style="list-style-type: none"> • Supports in dominant language
Child's Response	<p>Bilingual Development</p> <ul style="list-style-type: none"> • Capable of bilingual learning 	<p>Bilingual Development</p> <ul style="list-style-type: none"> • Capable of bilingual learning 	<p>Bilingual Development</p> <ul style="list-style-type: none"> • Monolingualism promotes success

Table 2.7.

Child quantitative data per parental approach to bilingual exposure.

Child Characteristic	Simultaneous Bilingualism					Sequential Bilingualism					Functional Monolingualism					Analysis
	N	M	SD	Min	Max	N	M	SD	Min	Max	N	M	SD	Min	Max	
Age (in years)	9	9.33	3.16	5	16	13	9.46	2.99	6	16	3	7.67	1.53	6	9	F (2, 22) = 0.46, p = 0.63
SRS- Total	9	75.67	8.41	60	88	13	74.69	11.09	59	90	3	80.67	4.04	76	83	F (2, 22) = 0.46, p = 0.64
ALDeQ Total	9	0.54	0.20	0.24	0.84	13	0.66	0.17	0.38	0.90	3	0.57	0.18	0.44	0.77	F (2, 22) = 1.13, p = 0.34

Table 2.8.***Joint display of qualitative results by SRS-2 descriptive level.***

SRS-2 Descriptor	Qualitative Themes
Mild 5 children	<ul style="list-style-type: none"> • Importance of Bilingualism: All parents endorsed several advantages & noted a strong value and presence of bilingualism in family and/or community • Parental Decision Making: All parents received a mix of recommendations and support for bilingualism. All parents held beliefs that their child is capable of bilingual language learning • Navigating the Education System and Accessing Supports: 4 parents had access to services and support to facilitate bilingual communication in school and/or community. 1 parent decided to switch their child out of bilingual education due to a lack of support
Moderate 6 children	<ul style="list-style-type: none"> • Importance of Bilingualism: All parents endorsed several advantages and noted a strong value and presence of bilingualism in family • Parental Decision Making: <ul style="list-style-type: none"> ○ All parents held beliefs that their child is capable of bilingual language learning. ○ Three parents felt they lacked access to information from professionals to help guide their decisions. ○ One parent held initial apprehension and fear towards bilingualism. • Navigating the Education System and Accessing Supports: All parents took responsibility to seek out support and services to facilitate bilingual development where available
Severe 14 children, including all 3 children raised in functional monolingual environments	<ul style="list-style-type: none"> • Importance of Bilingualism: <ul style="list-style-type: none"> ○ Majority of parents endorsed some advantages ○ Not consistently endorsed as a key part of life • Parental Decision Making <ul style="list-style-type: none"> ○ Mix of recommendations received ○ 1 parent held a belief that bilingualism would lead to confusion and 1 parent felt initial apprehension before receiving a recommendation in support of bilingualism • Navigating the Education System and Accessing Supports <ul style="list-style-type: none"> ○ 3 parent restricted supports to L1; belief that dominant language learning should be focus of supports and services and in the best interest of ○ 2 parents took responsibility to seek out supports and services to facilitate bilingual language acquisition where available ○ Parents with children in bilingual education programs (immersion or submersion report need for advocacy and value of inclusion and supportive school environment.

Figures

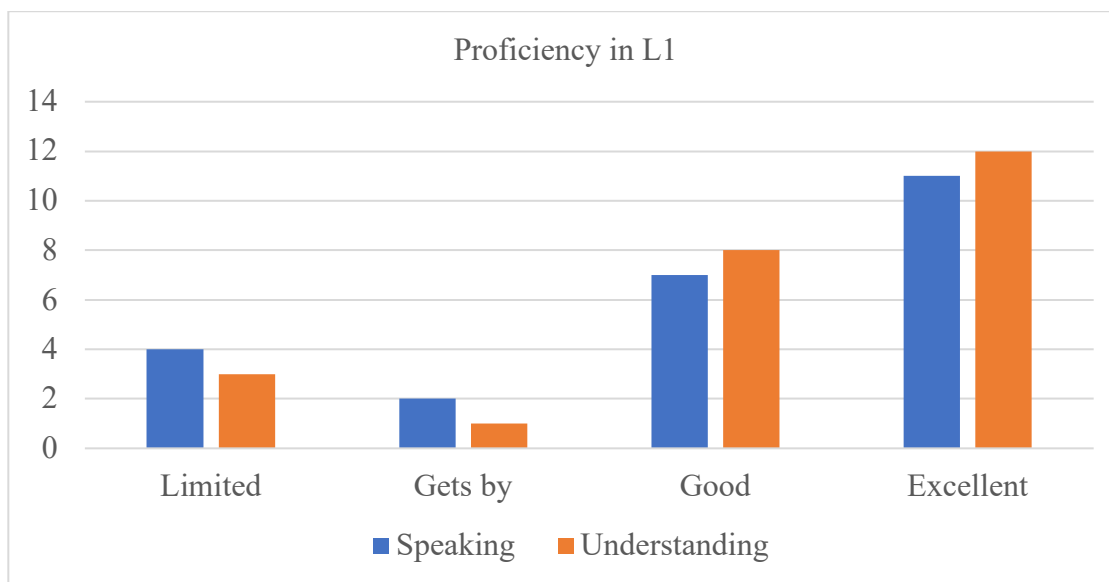


Figure 2.1. Frequency of proficiency in L1

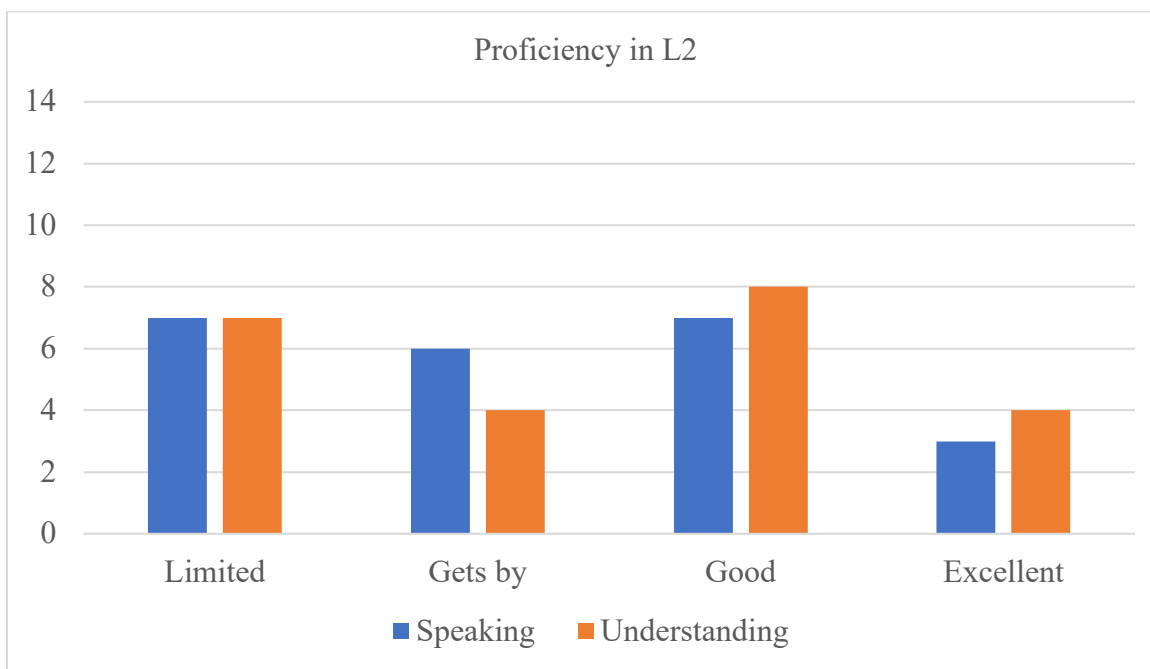


Figure 2.2. Frequency of proficiency in L2

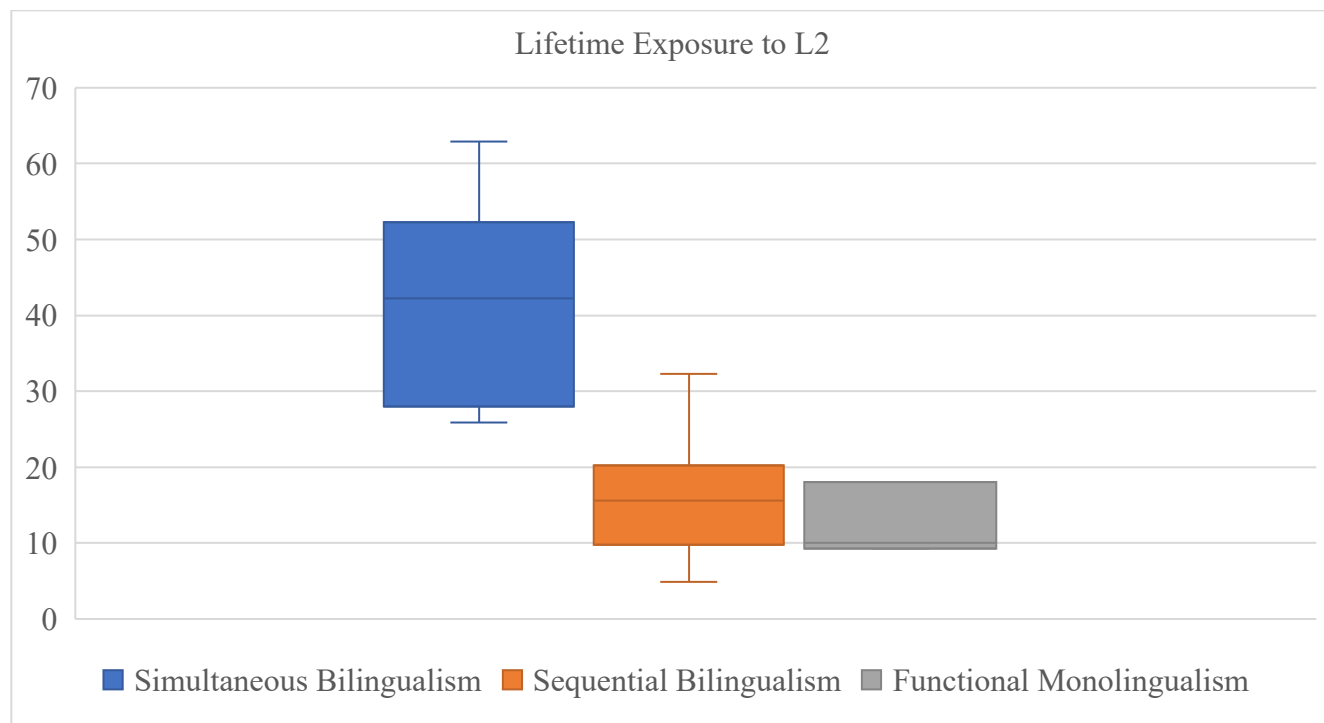


Figure 2.3. Average L2 lifetime exposure per bilingual approach described by parents.

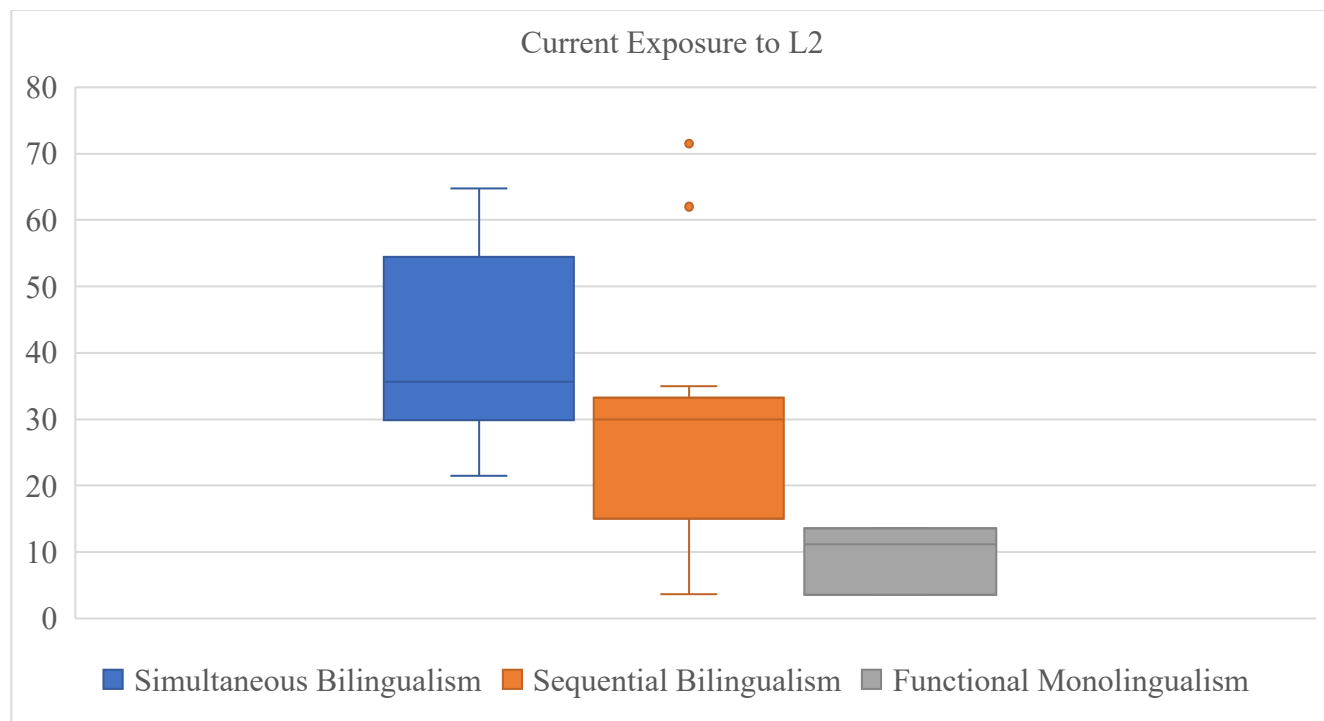


Figure 2.4. Current lifetime exposure per bilingual approach described by parents.

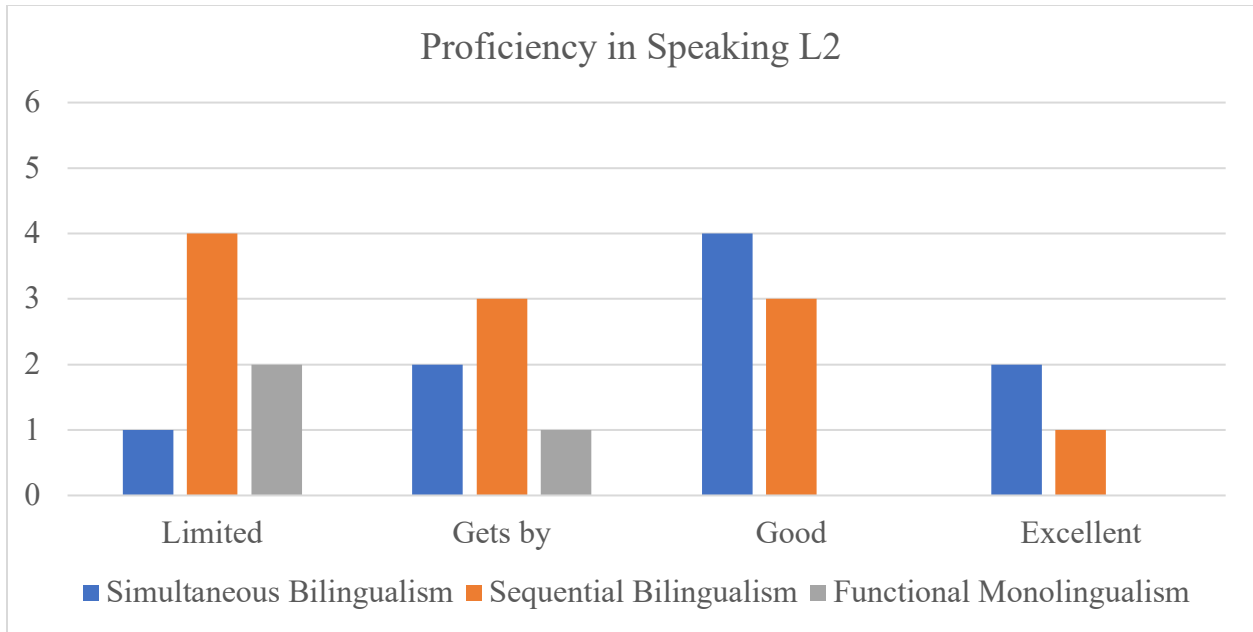


Figure 2.5. Frequency of proficiency in speaking L2 per bilingual exposure approach.

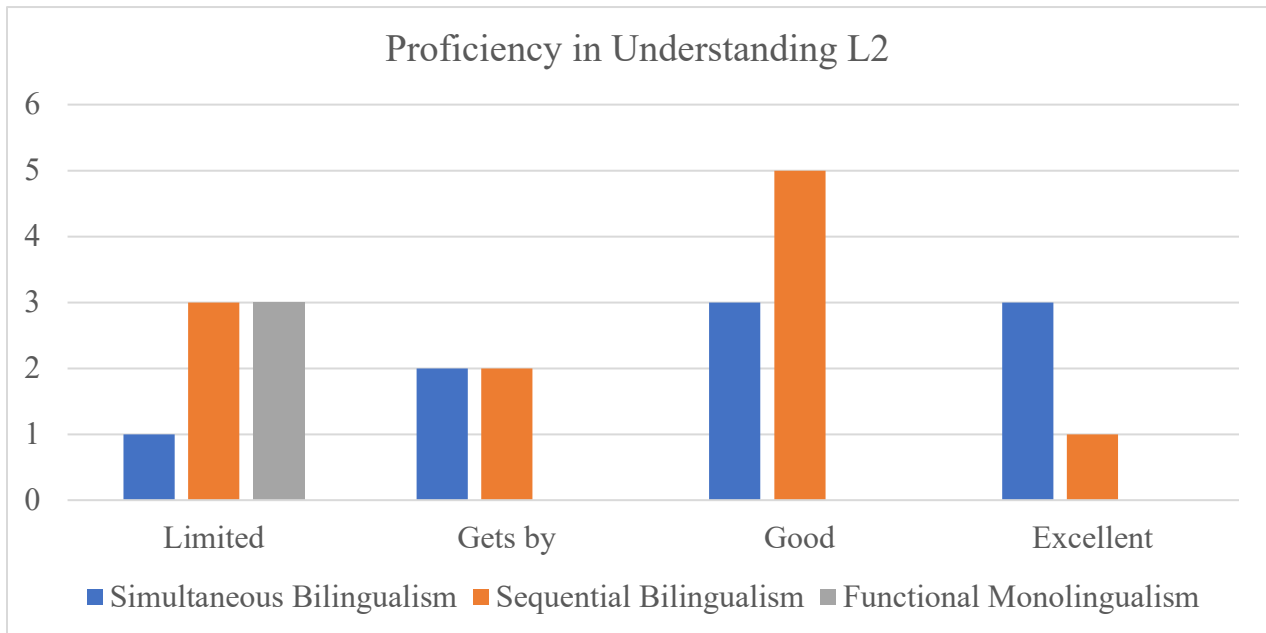


Figure 2.6. Frequency of proficiency in understanding L2 per bilingual exposure approach.

Appendix A

Parent Interview Protocol

Adapted from Yu (2013)

Life History

1. Before we talk about your child, I want to first get a sense of your background. What have been your personal experiences with bilingualism?
2. Did you have any specific plan for your child's language development?

Recent Experiences

3. After your child received their autism diagnosis, did you receive any recommendations regarding language learning?
4. Were there ever concerns, from you or others, regarding bilingualism for your child?
5. How has your child's school been able to support your child's language learning? What has your experiences been with your child's school?
6. Has there been support or services outside of school available to your child? How have these services supported your child's language learning?

Reflection

7. How do you feel about your child's current language learning?
8. Does it matter to you what language(s) your child speaks in the future?
9. What would be the ideal language situation for your child as they grow? Why is that?
10. What do you feel would be the advantages of speaking those languages for your child?
11. What advice do you have for other parents in your situation?

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Chapter 3: Examining the bilingual advantage in children with autism

Abstract

Could bilingualism be an advantage for children with autism? The present study examined the bilingual advantage in executive functioning (EF) and adaptive functioning skills using parent-report measures among a sample of 121 autistic and non-autistic children. Children within the sample were exposed to various bilingual conditions, including simultaneous bilingualism, sequential bilingualism and functional monolingualism. When taking a categorical approach to understanding bilingualism, the results of MANOVA did not support a bilingual advantage on parent-reported EF and adaptive functioning for either autistic or non-autistic groups. Children with autism were found to have significantly weaker EF and adaptive skills compared to non-autistic peers when controlling for age and social-economic status. In taking a continuous approach to understanding bilingualism, the results of multiple regression analyses revealed significant predictive models with age, autism characteristics, maternal education, parent-reported early language development, age at second language (L2) exposure, current L2 exposure, lifetime L2 exposure, parent-reported proficiency L2 speaking, and parent-reported proficiency L2 understanding predicting EF and adaptive skills. Bilingualism variables did not consistently make unique contributions to the models. While the findings do not support a bilingual advantage, there was no evidence that bilingualism negatively influences the development of EF and adaptive functioning skills. The results support recommendations that bilingual families should not be discouraged from exposing an autistic child to their heritage language.

Available research has shown that bilingualism does not confer a developmental disadvantage on the language development of autistic children (Beauchamp et al., 2020; Gonzalez-Barrero & Nadig, 2018; Hambly & Fombonne, 2012; Ohashi et al., 2012; Skrimpa et al., 2021; Valicenti-McDermott et al., 2012). Could bilingualism be an advantage for children with autism? The bilingual advantage refers to evidence concluding that bilingualism requires the use of cognitive systems in such a way that executive functions (EF) and related skills are advantaged in bilinguals compared to monolinguals (Adesope et al., 2010; Barac et al., 2014). Peal and Lambert (1962) were the first researchers to identify the cognitive benefits of bilingualism for children. In their sample of 75 monolingual and 89 English-French bilingual 10-year-old children, Peal and Lambert demonstrated a bilingual group performance advantage on a test of general intelligence. Since then, there have been several studies that have found support for a bilingual cognitive advantage (see Adesope et al. (2010) and Barac et al. (2014) for reviews), whereas other researchers refute the notion (Paap & Greenberg, 2013; Paap et al., 2015; von Bastian et al., 2016).

EF refers to a set of information-processing abilities used to regulate attention and goal-oriented behaviour to engage in complex social and cognitive activities (Miyake et al., 2000; Riggs et al., 2006). Using confirmatory factor analysis and structural equation modelling, Miyake et al. (2000) narrowed EF to three core components, updating working memory (WM), shifting between mental sets and inhibiting responses that are distinctly separable constructs and share some degree of underlying commonality. Updating WM involves monitoring and manipulating information held in mind over a short period of time. Shifting is the ability to switch between tasks, operations, or mental sets. Inhibition involves the deliberate suppression of automatic responses or interfering information. This model suggests that EF is a set of correlated but dissociable components that are both unified and diverse and can be measured independently. An integrative EF organization has been found to develop after the age of three years (Garon et al., 2008), with data to support the model among children (Huizinga et al., 2006;

Lehto et al., 2003) and young adults (Miyake et al., 2000). Evidence linking EF capabilities to behavioural control, social-emotional competence and school readiness implies that children with EF deficits may be less equipped to learn and benefit from intervention and other educational opportunities than children without EF difficulties (Riggs et al., 2006).

While autistic individuals are a heterogeneous group with many talents and outstanding skills (Meilleur et al., 2015), they are commonly found to have challenges with EF skills (see Demetriou et al., 2017; Lai et al.; 2017 for reviews). For children with autism, EF deficits are associated with a range of outcomes, including impaired social competence (Berard et al., 2017), difficulties with social communication skills (Hutchison et al., 2019; McEvoy et al., 1993; Tsermentseli et al., 2018), deficits in theory of mind (Jones et al., 2018), repetitive behaviours (Boyd et al., 2009), and reduced adaptive behaviour (Bertollo & Yerys, 2019; Gardiner & Iarocci, 2018; Pugliese et al., 2015; White et al., 2017). Given the evidence of a bilingual advantage in EF skills among non-autistic individuals (Adesope et al., 2010; Barac et al., 2014), it seems possible that bilingualism could promote advantaged EF development for autistic children. If so, bilingual autistic children should perform significantly better or have reduced challenges than their monolingual peers (Prévost & Tuller, 2022). In this way, bilingualism could act as a cost-effective naturalistic intervention to support EF development (Iarocci et al., 2017), which may reduce challenges in other areas such as adaptive functioning.

Bilingual Advantage in Non-autistic Development

Among non-autistic individuals, the topic of the bilingual advantage in EF across the lifespan and the inconsistency of results found have been extensively discussed and reviewed in current literature (e.g., Adesope et al., 2010; Barac et al., 2014; Bialystok et al., 2012; Hilchey & Klein, 2011; Kaushanskaya & Prior, 2015; Paap & Greenberg, 2013; Valian, 2015). A recent meta-analysis with 143 independent group comparisons found a significant, although marginal effect size ($g = 0.06$), bilingual advantage in EF skills, with a significant bilingual advantage in inhibition, shifting and monitoring for children 18 years

and under (Gunnerud et al., 2020). In an additional meta-analysis, Adesope et al. (2010) found an overall bilingual advantage ($d=0.41$) across various EF components. In the area of WM, a meta-analysis examining the effect of bilingualism on WM across 27 independent studies with 2,901 participants of all ages revealed a small to medium effect size favouring a bilingual advantage in WM. Moderator analysis revealed that the bilingual advantage was largest among children compared to other age groups (Grundy & Timmer, 2017). Other researchers report null results (Paap & Greenberg, 2013; Paap et al., 2015; von Bastian et al., 2016). Additional researchers have questioned the reliability of the evidence to support the benefits of bilingualism for the development of EF (Hilchey & Klein, 2011; Valian, 2015), with evidence of a publication bias favouring studies producing results in support of the bilingual advantage (de Bruin et al., 2015). Bilingualism, at best, appears to be an experience capable of positively influencing EF abilities and, at worst, has little to no effect on EF skills.

Evidence of a publication bias (de Bruin et al., 2015) favouring studies with favourable results makes a general conclusion on the overall state of the literature nearly impossible. Additionally, the range of methodological approaches across studies may account for the inconsistencies in study results (Hilchey & Klein, 2011), including small sample sizes (Arizmendi et al., 2018; Valian, 2015), task variation and complexity (Barac et al., 2014; Bialystok, 2015; Paap & Greenberg, 2013), and outcomes measures (accuracy vs. reaction time; Valian, 2015), the definition of bilingualism (Barac et al., 2014), measurement of bilingual proficiency (Bialystok, 2009) and features of the monolingual group (Valian, 2015), among other challenges identified. Additionally, many individual difference factors may contribute to bilingual development and the development of EF arising from social, economic, and cultural conditions in a child's life (Hilchey & Klein, 2011).

Bilingual Advantage in Autism

Bilingualism has been found to have a slight positive advantage on parent-reported EF skills, specifically working memory and shifting, for children with autism aged 5 to 17 years, even after

controlling for socioeconomic status (Ratto et al., 2021). Among a sample of Arabic-English children with autism, parents reported significant advantages in EF skills for bilingual children compared to monolingual children. However, this effect was not found for teacher-reported EF using the same measure (Sharaan et al., 2021). Iarocci et al. (2017) found that bilingual exposure was associated with reducing the clinical impact of EF challenges on a parent-report measure in autistic youth ($n = 174$). However, this difference was not found to be statistically significant. These results suggest that developing fluency in more than one language can benefit the overall EF development in everyday life for autistic children. In contrast, some researchers have not found an advantage in parent-reported EF skills for bilingual children with autism compared to monolingual children with autism (Gonzalez-Barrero & Nadig, 2019).

Researchers have also examined the bilingual advantage in EF among autistic children using performance-based and experimental EF tasks. Bilingual autistic children significantly outperformed monolingual autistic children on tasks of shifting (Gonzalez-Barrero & Nadig, 2017; Peristeri et al., 2021), inhibition (Peristeri et al., 2020; Peristeri et al., 2021), and working memory (Peristeri et al., 2020; Peristeri et al., 2021). Additionally, Sharaan et al. (2021) found that Arabic-English autistic children aged 5 to 12 performed better on sustained attention tasks than monolingual autistic children, suggesting less impulsivity among autistic bilingual children. However, there was no effect of bilingualism on tasks requiring EF skills. Li et al. (2017) failed to find a bilingual advantage across various EF tasks, except for positive results on the Japanese Stroop task, which was not replicated with the English Stroop task, among a sample of 67 bilingual and monolingual children with autism and with non-autistic development (Li et al., 2017). There have been no studies demonstrating a detrimental effect of bilingual exposure.

The limited amount of existing research on the bilingual advantage in autism has produced mixed results. The mixed results are challenging to interpret due to methodological variability across

studies, including differences in measurement and sample characteristics (Prévost & Tuller, 2022).

Current literature has used performance-based and rating measures to investigate the bilingual advantage in EF skills for autistic children. Performance-based measures involve tasks administered in a standardized fashion by an examiner. With these tasks, accuracy and response time are considered to draw conclusions about EF ability and efficiency (Toplak et al., 2013).

In contrast, rating measures assess EF skills required during the demands and decisions of daily life using standardized questionnaires completed by a rater, such as a parent (Gioia et al., 2002; Toplak et al., 2013). Rating scales have consistently been observed to be poorly correlated with performance-based measures of EF (Isquith et al., 2013). Toplak et al. (2013) suggest that performance-based and rating measures assess different aspects of EF. Performance-based measures are suggested to assess the efficiency of EF abilities while rating measures are suggested to assess the extent an individual can engage in goal-oriented behaviours across environments. Therefore, rating measures provide greater ecological validity than performance-based measures (Gioia et al., 2002).

Extending beyond EF skills, researchers have explored a bilingual advantage in adaptive functioning and social skills using parent-report measures such as the Vineland Adaptive Behaviour Scales (VABS). Using the VABS, Hastedt et al. (2022) found a bilingual advantage in children's adaptive social skills for bilingual Spanish-English speaking autistic toddlers compared to monolingual English-speaking autistic children. However, this effect was not found when compared to monolingual Spanish-speaking autistic toddlers, suggesting that these effects may reflect a shared experience common to Spanish-speaking families (e.g., cultural factors) rather than bilingualism. Valicenti-McDermott et al. (2019) did not find a significant difference between bilingual and monolingual autistic children on overall adaptive skills as measured by the Vineland Adaptive Behaviours Scale (VABS). When the age of bilingual acquisition was considered, simultaneous bilingual autistic children (i.e., children who are exposed to a bilingual language environment early in development) were found to have significantly stronger

adaptive social skills on the VABS compared to sequential bilingual autistic children (i.e., children who are exposed to a second language after the development of a first language) (Hambly & Fombonne, 2012). No significant difference in adaptive interpersonal skills was found between bilingual and monolingual children with autism (Hambly & Fombonne, 2014). Siyambalapitiya et al. (2022) found bilingual autistic children to have significantly lower parent-reported adaptive social skills on the VABS than monolingual autistic children. No differences were found between bilinguals and monolinguals in parent-reported adaptive communication skills (Siyambalapitiya et al., 2022). Across available studies measuring adaptive functioning, considerable variability in results exists, with some supporting a bilingual advantage in adaptive skills while others suggest a bilingual disadvantage in adaptive social skills. Furthermore, several studies have produced null findings, suggesting that bilingualism has no effect on adaptive functioning for autistic children.

Current Study

The limited amount of existing research on the bilingual advantage in EF and adaptive functioning among autistic children has produced mixed results. Current research primarily defines bilingualism using a categorical approach (i.e., monolingual vs bilingual). Yet, bilingualism can be best conceptualized as a continuum rather than a discrete category (Prévost & Tuller, 2022). Bilingual language profiles can be understood through a continuum of individual experiences defined by the age of acquisition, exposure, proficiency level, language use, and bilingual environment (Digard & Sorace, 2021; Paradis et al., 2011; Romero & Uddin, 2021).

Using the Miyake et al. (2000) integrative model of EF as a guide, I further examine the effect of bilingualism on parent-reported EF skills and adaptive functioning among children with autism using both a categorical by distinguishing between children who are exposed to bilingual language environments early in development (i.e., simultaneous bilingualism) from those who are exposed to a second language after the development of a first language (i.e., sequential bilinguals) and compare

these bilingual groups who are exposed to a functionally monolingual environment, and a continuous approach based on parent estimated levels of exposure to a bilingual environment. The following research questions guide me:

1. Based on parent-report EF measures, can exposure to bilingualism mitigate EF difficulties for autistic children, and how does this compare to advantages found in non-autistic bilingual peers?
2. Do autistic children exposed to bilingualism experience an advantage in adaptive functioning compared to monolingual autistic children? How does this compare to advantages found in non-autistic children exposed to bilingualism?
3. Does bilingual language exposure and bilingual language proficiency predict EF skills and adaptive functioning among autistic children, and how does this relationship compare to non-autistic children?

Some existing research has found a bilingual advantage in parent-reported EF among bilingual children with autism (Ratto et al., 2021; Sharaan et al., 2021), while other studies have failed to find statistically significant differences in parent-reported EF for bilingual autistic children compared to monolingual autistic children (Gonzalez-Barrero & Nadig, 2017; Iarocci et al., 2017). Given these results, I hypothesize that bilingualism will not have detrimental effects on EF skills for children with autism and that bilingual exposure will, among other variables, predict EF skills. Mixed results have also been found when the bilingual advantage has been extended to examine adaptive functioning among autistic children (Hambly & Fombonne, 2014; Hambly & Fombonne, 2012; Hastedt et al., 2022; Siyambalapitiya et al., 2022). Longitudinal research on autistic children has found that EF skills predict future adaptive functioning after controlling for age and IQ (Pugliese et al., 2016). Therefore, I hypothesize that any effect of bilingualism on EF skills will also extend to adaptive functioning.

Method

Participants

One hundred twenty-one children aged six to sixteen participated in the study. Two children were removed from the sample as they discontinued data collection before completing any outcome measures. Ten children were removed as they did not meet the inclusion criteria. The final sample comprised 54 autistic children and 55 non-autistic children, for a total of 109 participants. Children were exposed to a bilingual environment simultaneously from a young age, to a bilingual environment sequentially after considerable exposure to the first language, or to a functionally monolingual environment. Of the children with autism, 21 children were exposed to bilingual environments simultaneously (AUT-SM), 16 children were exposed to sequential bilingual environments (AUT-SQ), and 17 children were exposed to functionally monolingual environments (AUT-M). Of the children with non-autistic development, 22 children were exposed to sequential bilingual environments (NT-SM), 16 children were exposed to sequential bilingual environments (NT-SQ), and 17 children were exposed to functionally monolingual environments (NT-M).

Inclusion/Exclusion Criteria

To be included within the simultaneous bilingual category, children must have been exposed to two or more languages regularly before the age of three years. Many researchers have accepted this cut-off as the point for differentiating simultaneous bilinguals from second language learners or sequential bilinguals. After the age of three years, the first language is well established, and the effects of already knowing and speaking one language can be visible (Paradis et al., 2011). Additionally, children in the simultaneous bilingual groups were required to have a current or history of lifetime exposure to the second language (L2) greater than twenty percent, meaning that the average percent of exposure to the L2 across total years of life is greater than twenty percent. This cut-off is commonly used in

bilingualism research as there is little evidence that bilingual development will occur with any less exposure to L2 (Gonzalez-Barrero & Nadig, 2019).

To be considered within the sequential bilingual category, children must have been exposed to two or more languages regularly after the age of three years. Children in the second language learning groups have a current or history of average lifetime exposure to L2 after the first exposure greater than 20 percent and less than 20 percent average exposure to L2 before regular exposure to L2.

Children raised in monolingual environments were considered functional monolinguals. Children must have a current or lifetime exposure to a second language of less than 20 percent, regardless of age, to be included in the functional monolingual category. Exposure to a second language of less than 20 percent is believed to be insufficient for developing language skills (Gonzalez-Barrero & Nadig, 2019).

Within the sample, a child's diagnosis of autism by a psychologist, pediatrician or psychiatrist was self-reported by a parent. The Social Responsiveness Scale, Second Edition (SRS-2), was then used to confirm the presence of autism characteristics. To be recognized as non-autistic, children must not have had any prior diagnoses of neurodevelopmental disorders (e.g., autism, ADHD, intellectual disabilities) or language disorders (e.g., language impairment). The absence of autism characteristics among the non-autistic group was confirmed using the SRS-2.

Demographics

Table 3.1 outlines participants' demographic information by autism status and language exposure. The average age did not differ across groups. The gender of the groups differed significantly, with the autism groups having a higher percentage of males. This is unsurprising given that males are more frequently identified as being on the autism spectrum. The relative proportion of males to females being diagnosed with autism is estimated to be three males to one female, with a diagnostic gender bias leading to the under-identification of autistic girls (Gould, 2017; Loomes et al., 2017). As expected, the autism groups demonstrated significantly more characteristics of autism compared to the non-autistic

groups. Across groups, there were no significant differences in age or percentage of children born outside Canada. Participating parents were asked to report the mother's highest level of educational attainment, from which the total years of schooling were calculated (Peristeri et al., 2022). There was no significant group difference in maternal education, which was used as a proxy for social-economic status (Desai & Alva, 1998).

Children were exposed to various language combinations, with 19 individual languages represented. All 109 participants were exposed to English. Children were also exposed to French (n=64), Spanish (n=13), Chinese (Mandarin and/or Cantonese; n=7), Portuguese (n=3), and Tagalog (n=2). Each of the following languages was represented by one child: Indonesian, Malayalam, Telugu, Finnish, Marathi, Hungarian, Haitian Creole, Arabic, Dutch, Jamaican Patwa, Urdu and Croatian. Within the sample, 15 children had some exposure to three languages, and one child had exposure to four languages.

Table 3.2 presents language development information for participants by autism status and language exposure. The percentage of children who speak more than thirty words was not significantly different across groups. Thirty spoken words are the minimum criteria for a child to be in the word combination stage of language development set forth by Tager-Flusberg et al. (2009). The mean Alberta Language and Development Questionnaire (ALDeQ) score, which provides a measure of a child's early language milestones, first language abilities, activity preferences and family history of language impairment and developmental delays (Paradis et al., 2010), was significantly different across groups, with the autism groups having a higher prevalence of language delays. Significant differences were also found in parent-reported proficiency in speaking and understanding their first language (L1) across groups, with the autistic groups having higher percentages of limited proficiency.

Procedure

Participating children were recruited from across Canada via social media and local autism and cultural community organizations. Parents of participating children completed a series of questionnaires over the phone. All questionnaires were administered in English. Most participating parents were mothers (n=104). Four fathers and one grandparent also participated. A summary of the results was provided to parents following participation if desired.

Measures

Social Responsiveness Scale, Second Edition

The Social Responsiveness Scale, Second Edition (SRS-2) is a standardized measure that identifies common characteristics within the autism spectrum, including social communication differences and restricted and repetitive behaviours. The SRS-2 can differentiate individuals on the autism spectrum from non-autistic individuals and those whose impairments are related to other neurodevelopmental conditions (Constantino & Gruber, 2012). The cut-off T score of 60 was used to confirm a clinical diagnosis of autism within the sample.

Child Language Exposure Questionnaire

The Child Language Exposure Questionnaire (Gonzalez-Barrero & Nadig, 2018) captured the child's language background and estimated language exposure. The questionnaire includes items about the child's current and lifetime language use in different contexts. Parents reported the amount of exposure their child received in each language and estimated the amount of exposure to each language per day during a typical week, excluding the hours when the child was asleep. Parents were also asked to estimate the child's exposure to languages for each year of their life, allowing for average lifetime exposure to each language to be calculated. When making these estimates, parents were encouraged to consider their child's exposure across all environments (e.g., home, school, daycare, extracurricular

activities, etc.). Parents indicated their child's current proficiency in listening and speaking in each language on a four-point scale (i.e., from Limited to Excellent).

Alberta Language and Development Questionnaire

The Alberta Language and Development Questionnaire (ALDeQ; Paradis et al., 2010) is a parent-report questionnaire of a child's early language milestones, first language abilities, activity preferences, and family history. The questionnaire was developed to assess the presence of language impairment among English language learners. Parents' responses were scored on rating scales which yielded a total proportion score ranging from 0 to 1.0. Lower scores are more consistent with what might be expected for children with language impairment, whereas higher scores are more consistent with typical language development. The ALDeQ was used to screen children whose first language development is more consistent with children with language impairments than typical language development. It is expected that some autistic children would present with language development consistent with language impairment.

Comprehensive Executive Function Inventory

Parents completed the Comprehensive Executive Function Inventory (CEFI; Naglieri & Goldstein, 2013), a standardized parent-report rating scale of EF appropriate for use with children from 5 to 18 years of age. The CEFI measures global EF as well as multiple sub-components of EF. Scores on the CEFI are represented as standardized scores with a mean of 100 and a standard deviation of 15. In keeping with the Miyake et al. (2000) integrative model of EF, the CEFI scales corresponding to working memory, shifting and inhibition were used in the analysis.

Behavior Rating Inventory of Executive Function, Second Edition

The Behavior Rating Inventory of Executive Function, Second Edition (BRIEF-2; Gioia et al., 2015) is a standardized parent-report questionnaire of EF skills used daily. The questionnaire measures how much a person has difficulty regulating their behaviours in everyday environments. The BRIEF-2 contains

63 items that form nine scales, three indexes and one global EF score. The BRIEF-2 produces T scores, with larger scores representing greater difficulty with EF-related behaviours. In keeping with the Miyake et al. (2000) integrative model of EF, the BRIEF-2 scales corresponding to working memory, shifting and inhibition were used in the analysis.

Vineland Adaptive Behaviour Scales, Third Edition

Parents completed the Vineland Adaptive Behaviour Scales, Third Edition (VABS-3; Sparrow et al., 2017). VABS-3 measures adaptive behaviour and daily functioning in individuals from birth to 90 years of age. The VABS-3 produces an adaptive behaviour composite score to indicate overall adaptive skills across three domains: communication, daily living, and socialization.

Analytic Approach

I performed statistical analyses using SPSS version 27 for Mac. Alpha was set at 0.05 a priori. Before data analysis, I verified the accuracy of the data set, and any errors were corrected. I checked the assumption of statistical tests as appropriate before analysis. In assessing normality, an alpha of 0.01 was adopted to evaluate skewness and kurtosis, which is suitable with small to moderate samples (Tabachnick & Fidell, 2014). Accordingly, the Vineland Adaptive Scales (VABS) composite score was transformed using a reflect and square root transformation (Tabachnick & Fidell, 2014).

The Miyake et al. (2000) integrative model of EF narrows EF to three components (working memory, shifting and inhibition) that are distinctly separable constructs and share some degree of underlying commonalities. In keeping with this model, I included the BRIEF-2 and CEFI scales corresponding to working memory (WM), shifting and inhibition within the analysis (i.e., BRIEF-2 Inhibit, BRIEF-2 Shift, BRIEF-2 WM, CEFI Flexibility, CEFI Inhibitory Control and CEFI WM).

Research questions 1 and 2 align with a categorical examination of the bilingual advantage based on study groups defined by the nature of bilingual exposure (i.e., simultaneous, sequential, or

monolingual) and autism status. I conducted a between-groups multivariate analysis of variance (MANOVA) to examine the influence of autism and bilingual exposure on EF skills and adaptive skills.

To address research question 3, I examined bilingualism as a continuous variable based on the age of first exposure, current and lifetime exposure to and proficiency (high or low) in a second language (L2). I conducted a series of multiple linear regressions to examine the effects of age of first exposure, language exposure, and language proficiency, among other variables, on the outcome variables. Only participants with bilingual exposure were included in the analysis. Multiple linear regressions were completed separately for the autistic and non-autistic groups to compare the relative contributions of bilingualism on EF and adaptive functioning in each group.

Results

Bilingualism as a Categorical Variable

Table 3.3 provides descriptive statistics for each outcome measure across groups. Table 3.4 provides the correlation analysis among outcome variables. Examination of the means and standard deviations for the EF scales reveals that the autism groups tend to have greater difficulty with EF and lower levels of adaptive skills. Correlation analyses revealed that the scales of the BRIEF-2 and CEFI are all significantly moderately correlated. Correlations between EF scales were all negatively correlated. For the BRIEF-2 scales, a high score reflects greater difficulty with EF skills while lower scores on CEFI scales reflect greater difficulty with EF skills. All EF scales were also moderately correlated with the VABS scores. The VABS scales were all highly positively correlated with one another. Examination of the correlations suggests the data is appropriate for multivariate analysis except for the VABS scales, which were highly correlated (Pallant, 2001). As a result, the VABS overall adaptive behaviour composite was selected over individual VABS scales in subsequent analyses.

A two-way MANOVA of the EF scales and overall VABS adaptive composite score revealed a statistically significant main effect of autism status, $F(7, 92) = 58.47$, $p < 0.001$, Wilks' Lambda = 0.18;

partial eta-squared = 0.82. Post hoc t-tests revealed a significant difference between autistic and non-autistic groups across all EF scales and overall adaptive functioning (see Table 3.5). The language status was not statistically significant, $F(14, 184) = 0.72, p=0.75$; Wilks' Lambda = 0.90. The interaction between autism status and language status was also not statistically significant, $F(14, 184) = 1.18, p=0.30$; Wilks' Lambda = 0.84. Figures 3.1 to 3.6 provide estimated marginal means for EF skills across scales by autism and language group. Figure 3.7 provides estimated marginal means for overall adaptive skills by autism and language groups. These results did not change when total ALDeQ score and years of maternal education were added as covariates, with only a significant effect of autism, $p<0.001$, in respective analyses.

Bilingualism as a Continuous Variable

Executive Function Skills

Table 3.6 provides the correlation analysis for the independent variables of interest for the regression analyses. No two variables were highly correlated, indicating no concerns with multicollinearity. A linear multiple regression model was run for each EF scale. All regression models were found to be significant. The regression model results for each EF scale are found in Table 3.7. Table 3.8 provides the regression coefficients for each significant model.

The EF inhibition domain was examined using the BRIEF-2 Inhibit and CEFI Inhibitory Control scales. For BRIEF-2 Inhibit, the significant model explains 65 percent of the overall variance, with only the SRS-2 Total score making a significant unique contribution to the overall model. SRS-2 Total Score explains 37.70 percent of the overall variance in BRIEF-2 Inhibit scores, based on the part correlation coefficient. For CEFI Inhibitory Control, the significant model explains 51 percent of the overall variance, with only the SRS-2 Total score making a significant unique contribution to the overall model. SRS-2 Total Score explains 22.94 percent of the overall variance in the CEFI Inhibitory Control scores.

The EF shifting domain was examined using the BRIEF-2 Shift and CEFI Flexibility scales. In BRIEF-2 Shift, the significant model explains 78 percent of the overall variance in BRIEF-2 Shift scores. In this model, the SRS-2 Total score and ALDeQ scores make significant unique contributions. The SRS-2 Total score explains 43.56 percent of the overall variance, and the ALDeQ scores explain 2.56 percent of the overall variance in BRIEF-2 Shift scores. For CEFI Flexibility, the significant model explains 61 percent of the overall variance in scores. In this model, several variables make significant unique contributions, with the SRS-2 total score explaining 17.14 percent of the total variance, with ALDeQ Total score explaining 4.04 percent of the total variance, the age of L2 exposure explaining 3.2 percent of the total variance, and with proficiency in speaking L2 explaining 2.34 percent of the total variance.

The EF domain of working memory (WM) was examined using the BRIEF-2 WM and CEFI WM scales. For BRIEF-2 WM, the significant model explains 60 percent of the overall variance in scores. Only the SRS-2 Total score makes a significant unique contribution in this model, with the SRS-2 Total score explaining 18.92 percent of the overall variance in BRIEF-2 WM scores. For CEFI WM, the significant model explains 52 percent of the overall variance in scores. In this model, both the SRS-2 Total score and proficiency in understanding L2 make significant unique contributions. The SRS-2 Total scores explain 24.11 percent of the overall variance, and proficiency in understanding L2 explains 4.04 percent of the overall variance in CEFI WM scores.

Adaptive Skills

The overall linear multiple regression model significantly predicted overall adaptive skills among bilingually exposed children, $F(9, 60) = 17.54, p < 0.001$. The model explained 68.3 percent of the variance in adaptive skills (Adjusted R^2 of 0.683). An examination of the standardized coefficient of each included variable reveals that both total SRS-2 score and total ALDeQ scores make significant unique contributions to the regression equation. As indicated by the part correlations, the SRS-2 score uniquely explains 8.64 percent of the variance in adaptive skills, and the total ALDeQ score uniquely explains 10.5

percent of the variance in adaptive skills. Table 3.9 provides the standardized coefficient for each independent variable.

Discussion

This study extends prior work on the influence of bilingual exposure on the development of EF and adaptive skill in children with autism by examining bilingualism using both a categorical approach and a continuous approach that accounts for the age of acquisition, exposure, and proficiency. Prior research on the bilingual advantage in EF among autistic children has produced mixed results (Gonzalez-Barrero & Nadig, 2017; Iarocci et al., 2017; Ratto et al., 2021; Sharaan et al., 2021), in keeping with the mixed results found among non-autistic samples (Adesope et al., 2010; Barac et al., 2014; Bialystok et al., 2012; Hilchey & Klein, 2011; Kaushanskaya & Prior, 2015; Paap & Greenberg, 2013; Valian, 2015). Extending beyond EF skills, prior studies have found considerable variability, with some studies finding support for a bilingual advantage in adaptive skills for children with autism (Hastedt et al., 2022; Hambly & Fombonne, 2012) and others finding no support for a bilingual advantage (Hambly & Fombonne, 2014; Siyambalapitiya et al., 2022; Valicenti-McDermott et al., 2019).

Our categorial examination of the bilingual advantage did not support a bilingual advantage in either the autism or non-autistic groups. Bilingualism does not mitigate EF difficulties for children with autism in our sample. While the findings do not support a bilingual advantage, there is no indication that exposure to a bilingual environment leads to a disadvantage in the development of EF and adaptive functioning skills for children with autism. Furthermore, there was no evidence that the timing of bilingual development (i.e., simultaneous versus sequential bilingual development) negatively influenced the development of EF and adaptive functioning skills. This finding counters the belief that bilingualism will overwhelm the developmental capacities of autistic children leading to more significant challenges, which is reported to be upheld by some clinicians (Baker, 2013; Beauchamp & MacLeod, 2017; Howard et al., 2021; Kay-Raining Bird et al., 2012; Kremer-Sadlik, 2005) and some parents

(Hampton et al., 2017; Sher et al., 2021; Yu, 2013), and supports recommendations that bilingual families should not be discouraged from exposing an autistic child to their heritage language (Beauchamp & MacLeod, 2017). Encouraging parents to expose children to their heritage language will allow autistic children from bilingual households to fully participate in their lives and communities.

Using a two-way MANOVA, a main effect of autism status across all EF and adaptive functioning scales was found. The examination of EF skills, guided by the Miyake et al. (2000) model of EF, focused on inhibition, shifting and WM skills using two parent-report measures. Across all EF scales, large effect sizes were found when comparing the autistic group to the non-autistic group. In the area of inhibition, autistic children were reported to have significantly more difficulty with tasks requiring inhibition on the BRIEF-2 Inhibit scale and less inhibitory control skills on the CEFI Inhibitory control skills than non-autistic children. In shifting, autistic children were reported to have significantly more difficulty with tasks requiring shifting skills on the BRIEF-2 Shift scale and significantly less strong shifting skills on the CEFI Flexibility scale than non-autistic children. In working memory, autistic children were reported to have significantly more difficulty with tasks requiring working memory skills on the BRIEF-2 WM scale and significantly weaker working memory skills on the CEFI WM scale than non-autistic children. These findings align with previous studies that have found a global executive functioning deficit across EF domains in individuals with autism (Demetriou et al., 2017; Lai et al.; 2017).

Additionally, when it comes to adaptive functioning, children with autism were reported to have significantly lower overall adaptive functioning skills on the VABS-3 compared to children with non-autistic development. The difference between groups reveals a large effect. Previous research has documented impairments across adaptive functioning domains for autistic children without intellectual disabilities (Tamm et al., 2022). Regardless of intellectual disability, adaptive functioning has been observed to be weaker than cognitive functioning among autistic children (Matthews et al., 2015). The group-level difference in adaptive functioning between autistic and non-autistic children is in keeping

with these previous findings of reduced adaptive functioning in children with autism (Matthews, et al., 2015; Tamm et al., 2022).

Prior research on the bilingual advantage has been criticized for relying on categorical definitions of bilingualism even though bilingualism can be best conceptualized as a continuum of individual experiences (Prévost & Tuller, 2022). While bilingual profiles can be defined in many ways, I examined the influence of age of first bilingual exposure, current exposure to L2, lifetime exposure to L2, and parental rating of proficiency in understanding and speaking L2 on the development of EF and adaptive skills among bilingual children. Age, maternal education as a proxy for SES, total ALDeQ score as an indicator of L1 development, and SRS-2 Total score as a measure of the extent and presence of autism characteristics and behaviours were also included due to their known influence on EF and adaptive skill development in both autistic children and non-autistic children within the bilingual advantage literature (Hilchey & Klein, 2011; Huizinga et al., 2006; Meir & Novogrodsky, 2019; Morton & Harper, 2007).

Multiple regression analyses revealed significant models across all EF scales. The collection of variables significantly explains some proportion of the variance of the respective EF scales, with the percentage of variance explained ranging from 51 to 78 percent. Across all EF scales, the SRS-2 score made significant unique contributions to the model, suggesting that autism characteristics predict parent-reported skills in inhibition, shifting, and working memory. ALDeQ scores, which indicate early L1 language development, uniquely predicted parent-reported shifting across the BRIEF-2 and CEFI scales. Regarding the bilingual variables, only certain variables were unique contributions to predicting two parent-report EF scales, the CEFI Flexibility scale and the CEFI WM scale. The CEFI Flexibility scale was uniquely predicted by the age of first L2 exposure and parent-reported proficiency in speaking L2. In contrast, the CEFI WM scale was uniquely predicted by parent-reported proficiency in understanding L2.

Further research is needed to understand the unique predatory contributions of bilingual variables both across EF scales and across available EF measures.

The multiple regression model was also significant at predicting adaptive functioning skills. Both SRS-2 and ALDeQ scores uniquely predicted adaptive functioning among bilingual children. Due to the transformation of the VABS-3 scores, the standardized coefficients can be interpreted as an increase in the SRS-2 score, decreasing overall adaptive functioning and increasing ALDeQ score (which implies less impairment in early language development) overall adaptive functioning. Similarly, previous research has found that adaptive functioning skills are negatively associated with autism characteristics and behaviours (Kenworthy et al., 2010; Liss et al., 2001). Furthermore, language tests have been found to predict adaptive behaviours among some children with autism (Liss et al., 2001). Our findings align with previous research on the influence of autism characteristics and language abilities on adaptive functioning. Variables related to bilingualism do not appear to uniquely predict adaptive functioning among bilingual children.

Limitations

The study has many limitations. The study was conducted entirely during the COVID-19 pandemic, with the data collected from March 2020 to August 2020. The COVID-19 pandemic brought a high degree of stress and disruption to daily life for all families, including autistic children (Manning et al., 2021). All participating children were experiencing the collective experience of the COVID-19 pandemic at the same time. However, individuals with autism were more vulnerable to the negative impacts of the COVID-19 pandemic due to the differences and challenges present in autism (Baweja et al., 2022; Bellomo et al., 2020; Latzer et al., 2021). In the context of the study, the COVID-19 pandemic rapidly changed children's language exposure as schools closed in favour of home isolation. The prolonged effect of social distancing, virtual learning and masking on child development will only be

revealed over time as the COVID-19 pandemic progresses, although negative impacts on speech and language development have been suggested (Charney et al., 2021).

In addition to the potential COVID-19 pandemic on the development of the children in the sample, I had to rely entirely on parent-report measures to allow for social distancing. Parent-report measures can provide an ecologically valid measurement of EF as they assess EF skills during the demands and decisions of daily life (Gardiner et al., 2017; Gioia et al., 2002; Toplak et al., 2013; Wallace et al., 2016). However, confirmatory factor analysis findings have questioned the BRIEF questionnaire's validity with autism populations (Granader et al., 2014) and the clinical utility of available EF measures (Demetriou et al., 2017). Rating scales have consistently been observed to be poorly correlated with performance-based measures of EF (Isquith et al., 2013). Toplak et al. (2013) suggest that performance-based and rating measures assess different aspects of EF. Performance-based measures are suggested to assess the efficiency of EF abilities while rating measures are suggested to assess the extent an individual can engage in goal-oriented behaviours across environments. The difference between performance-based measures and rating scales may explain the discrepancy in the present findings from studies that used alternative measures. Further research should tend to the multiple methodological components of assessing EF skills.

In addition to relying on parent-report measures for EF and adaptive functioning, the COVID-19 pandemic required that I rely solely on parent reports to measure language exposure and language skills for the children in the sample. Parent reports are frequently used to obtain information on a child's language exposure, and they may be the only feasible option for collecting information about language input and experience (Paradis, 2016). Parent estimates of exposure are moderately correlated with naturalistic audio recording (Marchman et al., 2017), suggesting that parent-report can produce a valid estimate of a child's language exposure. Correlations have also been found between parent reports and direct child language skills assessment (Ebert, 2017; Marchman & Martínez-Sussmann, 2002). While

parent reports have a place in understanding children's bilingual exposure and experience, this study lacked a direct assessment of language proficiency skills. Future research should include direct language assessment and parent reports of language exposure and experience to conceptualize bilingualism in examining the bilingual advantage.

Due to social distancing requirements, I could not use an intelligence measure to collect information on participants' cognitive functioning. General ability measures, such as IQ measures, are commonly used as a covariate or controlled by matching procedures within autism research (Dennis et al., 2009; Jarrold & Brock, 2004; Mottron, 2004). Group matching within designs aims to "rule out 'noncentral' explanations of group differences" (p.81, Jarrold & Brock, 2004). However, the difficulties inherent in autism may confound the measurement of cognitive abilities. Matching cognitive abilities can create scenarios where neither the autism sample nor the non-autistic control group is representative of their larger population (Roa et al., 2015). Using IQ as a covariate can produce overcorrected and counterintuitive findings when conducting neurocognitive research in autism (Dennis et al., 2009). Instead of relying on IQ as a covariate, Jarrold and Brock (2004) suggest "to match groups for performance on a task that is explicitly designed to share as many noncentral features of the key experimental task as possible and which is equally sensitive to variation in ability" (p. 85, Jarrold & Brock, 2004). The lack of matching on IQ may have contributed to the differences found in the current results compared to other studies. We cannot be sure how much IQ differences may have influenced the results.

Lastly, the sample was a non-probabilistic sample of convenience. Although convenience samples are commonly used in research, a non-random sample restricts the generalization of the results (Elfil & Negida, 2017). Further research on the bilingual advantage is required to replicate and generalize the results.

Conclusion

The present study adds to the small body of literature on the bilingual advantage in autistic children. Using parent-report measures of EF and adaptive functioning, the study contributes to the literature by examining the bilingual advantage using both a categorical and continuous approach to defining bilingualism. To my knowledge, this is the first study to distinguish between simultaneous and sequential bilinguals. The findings do not support a bilingual advantage on parent-reported EF and adaptive functioning for autistic and non-autistic children. These results align with previous studies using parent-reported EF measures that reported no autistic bilingual advantage (Gonzalez-Barrero & Nadig, 2017; Iarocci et al., 2017) and contrasts the results of other studies using parent-reported EF measures that have reported an autistic bilingual advantage (Ratto et al., 2021; Sharaan et al., 2021). Some variables related to bilingualism may predict certain EF skills, although further research is needed to clarify these results and address methodological challenges. The findings do not support any EF and adaptive functioning disadvantage for autistic children and contribute to the growing body of literature that exposure to bilingualism does not negatively impact the development of EF and adaptive skill

Tables

Table 3.1.

Demographics by autism status and language exposure.

Variable	AUT-SM (N=21)	AUT-SQ (N=16)	AUT-M (N=17)	NT-SM (N=22)	NT-SQ (N=16)	NT-M (N=17)	Test Statistic
Mean age in months (Standard Deviation)	118.95 (36.01)	115.94 (35.23)	131.76 (26.58)	106.19 (37.34)	114.25 (38.37)	98.35 (35.83)	F (5, 102) = 1.84, $p = 0.11$
Gender (% male)	71.4	68.8	94.1	40.9	62.5	52.9	$\chi^2(5, n=109) = 0.35, p = 0.02, \phi = 0.35$
Mean SRS-2 Total T Score (Standard Deviation)	75.71 (8.71)	74.13 (10.44)	75.59 (7.58)	45.82 (5.09)	44.31 (3.34)	45.65 (4.42)	$\chi^2(5, n=109) = 81.41, p < 0.001$
Born Outside Canada (%)	14.3	12.5	11.8	18.2	0	0	$p = 0.28$ (Fisher- Freeman- Halton Exact Test)
Mean maternal education in years (Standard Deviation)	17.43 (1.99)	16.06 (1.88)	15.05 (2.25)	16.36 (2.98)	16.13 (0.88)	16.18 (2.56)	$\chi^2(5, n=109) = 10.43, p = 0.06$

Table 3.2.

Language development by autism status and language exposure.

Variable	AUT-SM (N=21)	AUT-SQ (N=16)	AUT-M (N=17)	NT-SM (N=22)	NT-SQ (N=16)	NT-M (N=17)	Test Statistic
>30 Words (%)	90.5	93.3	94.1	100	100	100	$p = 0.46$ (Fisher- Freeman- Halton Exact Test)
Mean ALDeQ Score (Standard Deviation)	0.52 (0.19)	0.67 (0.17)	0.64 (0.19)	0.85 (0.08)	0.87 (0.06)	0.91 (0.05)	F (5, 102) = 23.51, $p = < 0.001$
Speaking L1 (% Limited)	23.8	20.0	11.8	0	0	0	$p = < 0.001$ (Fisher- Freeman- Halton Exact Test)
Understanding L1 (% Limited)	14.3	6.7	11.8	0	0	0	$p = 0.01$ (Fisher- Freeman- Halton Exact Test)

Table 3.3.

Descriptive statistics for each measure and scales of interest across groups.

	AUT-SM		AUT-SQ		AUT-M		NT-SM		NT-SQ		NT-M	
	N	M (SD)	N	M (SD)	N	M (SD)	N	M (SD)	N	M (SD)	N	M (SD)
BRIEF-2 GEC	21	71.95 (4.75)	16	68.38 (10.88)	17	71.24 (8.53)	22	50.68 (7.82)	16	49.94 (6.14)	17	47.88 (7.41)
BRIEF-2 Inhibit	21	64.86 (8.40)	16	64.50 (9.67)	17	63.53 (12.19)	22	50.59 (9.28)	16	49.19 (6.22)	17	49.35 (9.27)
BRIEF-2 Shift	21	68.62 (7.53)	16	70.69 (13.89)	17	75.41 (9.65)	22	48.32 (7.18)	16	50.06 (6.60)	17	49.71 (10.58)
BRIEF-2 WM	21	68.62 (7.53)	16	63.50 (11.14)	17	67.41 (8.68)	22	50.14 (9.61)	16	48.56 (7.35)	17	45.24 (5.71)
CEFI Total	20	83.60 (9.59)	16	85.25 (9.53)	16	82.62 (10.14)	21	107.24 (12.70)	16	107.56 (9.08)	17	108.18 (13.48)
CEFI Inhibitory Control	20	86.55 (15.18)	16	88.31 (12.93)	16	82.94 (12.81)	21	106.95 (15.71)	16	109 (12.25)	17	106.24 (18.38)
CEFI Flexibility	20	83.05 (10.93)	16	85.38 (8.83)	16	83.38 (11.81)	21	111.76 (12.45)	16	105 (9.23)	17	107.59 (14.98)
CEFI WM	20	85.80 (9.83)	16	86.50 (14.92)	16	72.94 (20.69)	21	107.67 (13.18)	16	108.75 (9.21)	17	110.24 (13.12)
VABS-3	20	79.10 (15.01)	16	84.50 (14.50)	16	74.88 (14.36)	20	109.25 (8.42)	16	108.19 (10.50)	17	109.06 (7.74)
VABS-3 Communication	20	77.40 (16.74)	16	83.81 (20.07)	16	72.94 (20.69)	20	105 (9.00)	16	104.06 (10.53)	17	104.76 (9.71)
VABS-3 Daily Living	20	83.05 (20.45)	16	88.69 (15.49)	16	80.69 (17.37)	20	109.50 (9.54)	16	108.81 (10.47)	17	108.18 (7.73)
VABS-3 Socialization	20	79.10 (17.37)	16	85.06 (13.06)	16	74.63 (15.54)	20	109.60 (9.54)	16	108.81 (10.47)	17	110.76 (6.69)

Table 3.4.*Correlation among executive functioning and adaptive functioning scales.*

	BRIEF-2 Inhibit	CEFI Inhibitory Control	BRIEF-2 Shift	CEFI Flexibility	BRIEF-2 WM	CEFI WM	VABS Communication	VABS Daily Living
BRIEF-2 Inhibit	-							
CEFI Inhibitory Control	-0.76**	-						
BRIEF-2 Shift	0.73**	-0.65**	-					
CEFI Flexibility	-0.62**	0.73**	-0.63**	-				
BRIEF-2 WM	0.70**	-0.62**	0.68**	-0.70**	-			
CEFI WM	-0.66**	0.69**	-0.56**	0.76**	-0.82**	-		
VABS Communication	-0.50**	0.65**	-0.54**	0.65**	-0.65**	0.63**		
VABS Daily Living	-0.52**	0.67**	-0.51**	0.65**	-0.60**	0.60**	0.86**	-
VABS Socialization	-0.64**	0.73**	-0.67**	0.67**	-0.614**	0.58**	0.81**	0.84**

** Correlation is significant at the 0.01 level

Table 3.5.*T-test results comparing autism to non-autistic groups across outcome measures.*

Scale	Group	<i>n</i>	M	SD	df	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
BRIEF-2 Inhibit	AUT	54	64.33	9.91	107	8.28	<0.001	1.59
	NT	55	49.80	8.37				
CEFI Inhibitory Control	AUT	52	85.98	13.71	104	-7.51	<0.001	-1.46
	NT	54	107.33	15.46				
BRIEF-2 Shift	AUT	54	74.33	11.24	107	13.37	<0.001	2.56
	NT	55	49.25	8.12				
CEFI Flexibility	AUT	52	83.87	10.47	104	-10.91	<0.001	-2.12
	NT	54	108.44	12.59				
BREIF-2 WM	AUT	54	66.72	9.16	107	11.24	<0.001	2.15
	NT	55	48.16	8.06				
CEFI WM	AUT	52	85.98	13.22	104	-9.33	<0.001	-1.81
	NT	54	108.80	11.95				
VABS Adaptive Composite	AUT	52	6.88	1.10	103	12.37	<0.001	2.4
	NT	53	4.24	1.09				

Table 3.6.*Correlations among independent variables for regression analyses among bilingual sample.*

	Age (in months)	Age at L2 Exposure	Maternal Education (in years)	SRS-2 Total	ALDeQ Total	Current Exposure L2	Lifetime Exposure L2	Proficiency Speaking L2 (High or Low)
Age (in months)	-							
Age at L2 Exposure	0.02	-						
Maternal Education (in years)	-0.15	-0.18	-					
SRS-2 Total	0.01	-0.08	0.14	-				
ALDeQ Total	0.03	0.25*	-0.13	-0.68**	-			
Current Exposure L2	-0.15	-0.34**	0.05	0.21	-0.22	-		
Lifetime Exposure L2	0.18	-0.71**	0.03	0.08	-0.19	0.63**		
Proficiency Speaking L2 (High or Low)	0.21	0.07	0.01	-0.25*	0.37**	0.27*	0.16	-
Proficiency Understanding L2 (High or Low)	0.18	-0.05	-0.187	-0.42**	0.41**	0.23*	0.27*	0.72**

*Correlation is significant at the 0.05 level

**Correlation is significant at 0.01 level

Table 3.7.*Regression model results for each executive function scale.*

Scale	<i>n</i>	df	F	<i>p</i>	Adjusted R ²
BRIEF-2 Inhibit	73	9, 62	15.76	<0.001	0.65
CEFI Inhibitory Control	71	9, 61	9.17	<0.001	0.51
BRIEF-2 Shift	73	9, 62	29.09	<0.001	0.78
CEFI Flexibility	71	9, 61	13.35	<0.001	0.61
BRIEF-2 WM	73	9, 62	13.14	<0.001	0.61
CEFI WM	71	9, 61	9.25	<0.001	0.52

Table 3.8.**Regression coefficients for significant models for executive function scales.**

	BRIEF-2 Inhibit			CEFI Inhibitory Control			BRIEF-2 Shift			CEFI Flexibility			BRIEF-2 WM			CEFI WM		
	Beta	<i>p</i>	Part	Beta	<i>p</i>	Part	Beta	<i>p</i>	Part	Beta	<i>p</i>	Part	Beta	<i>p</i>	Part	Beta	<i>p</i>	Part
Age	-0.04	0.66	-0.03	0.1	0.33	0.08	0.01	0.87	0.01	0.12	0.18	0.10	0.09	0.30	0.08	-0.02	0.85	-0.02
Age at L2	-0.14	0.20	-0.09	0.11	0.40	0.07	-0.05	0.54	-0.03	-0.28	0.02	-0.18	0.02	0.84	0.02	-0.01	0.93	-0.01
SRS-2 Total	0.90	<0.001	0.61	-0.70	<0.001	-0.48	0.97	<0.001	0.67	-0.61	<0.001	0.41	0.64	<0.001	0.44	-0.72	<0.001	-0.49
Maternal Education	-0.09	0.21	-0.09	0.08	0.39	0.07	0.08	0.15	0.08	0.01	0.93	0.01	-0.05	0.56	-0.04	-0.03	0.77	-0.03
ALDeQ Total	0.16	0.12	0.11	-0.02	0.90	-0.01	0.23	0.01	0.16	0.29	0.01	0.20	-0.17	0.12	-0.12	0.16	0.19	0.11
L2 Current Exposure	-0.04	0.70	-0.03	-0.02	0.89	-0.01	0.03	0.71	0.02	0.22	0.06	0.14	-0.16	0.18	-0.10	0.06	0.66	0.04
L2 Lifetime Exposure	-0.12	0.40	-0.06	0.11	0.49	0.06	-0.02	0.88	-0.01	-0.26	0.08	-0.13	0.21	0.15	0.11	0.04	0.81	0.02
Proficiency L2 Speaking	0.01	0.88	0.01	-0.03	0.78	-0.02	0.07	0.35	0.05	-0.20	0.04	-0.15	-0.08	0.42	-0.06	0.12	0.30	0.09
Proficiency L2 Understanding	-0.10	0.27	-0.08	0.13	0.22	0.10	-0.12	0.09	-0.10	0.13	0.20	0.10	-0.02	0.81	-0.02	-0.26	0.02	-0.20

Table 3.9.***Regression coefficients for significant adaptive functioning model.***

	Beta	<i>p</i>	Part
Age	0.06	0.45	0.05
Age at L2	0.01	0.95	0.00
SRS-2 Total	0.43	<0.001	0.29
Maternal Education	-0.11	0.12	-0.11
ALDeQ Total	-0.47	<0.001	-0.32
L2 Current Exposure	-0.00	0.98	-0.00
L2 Lifetime Exposure	-0.02	0.86	-0.01
Proficiency L2 Speaking	0.10	0.30	0.07
Proficiency L2 Understanding	-0.14	0.13	-0.11

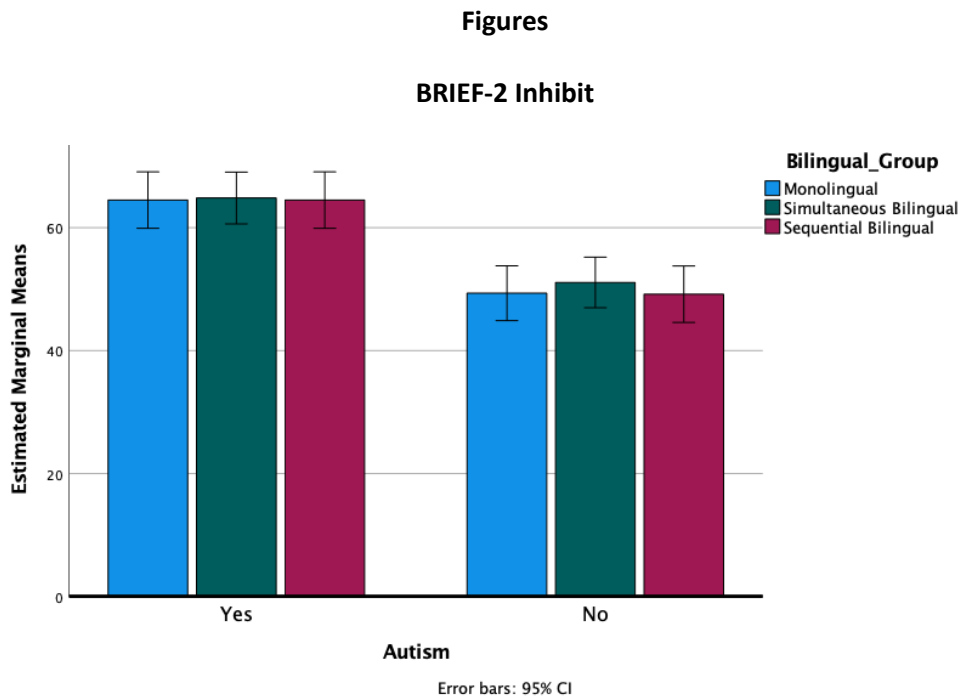


Figure 3.1. Estimated marginal means for BRIEF-2 Inhibit scores by autism status and language exposure group.

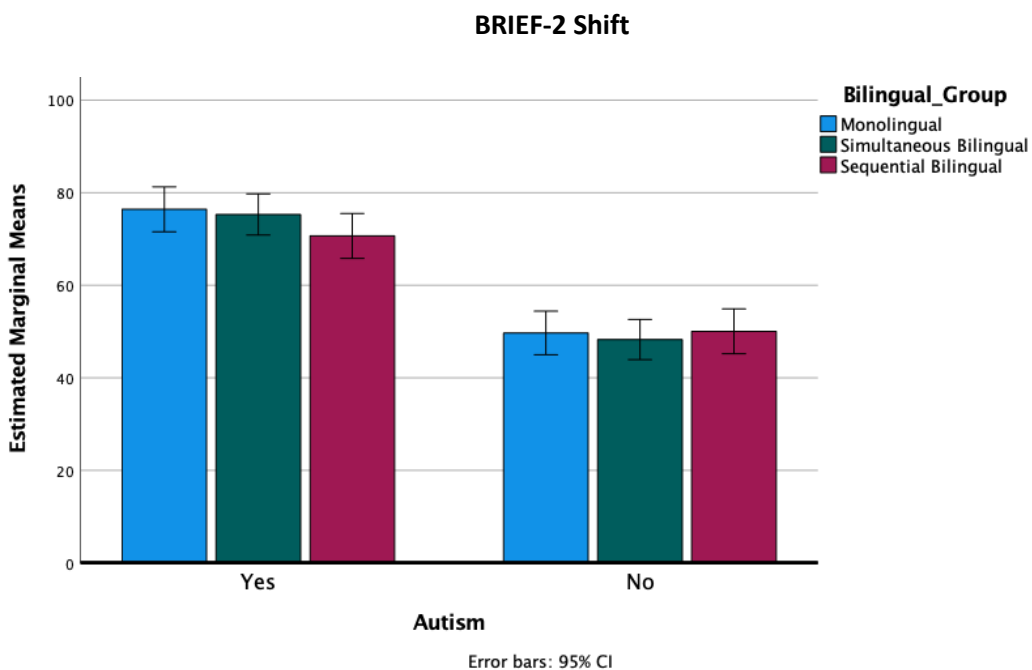


Figure 3.2. Estimated marginal means for BRIEF-2 Shift scores by autism status and language exposure group.

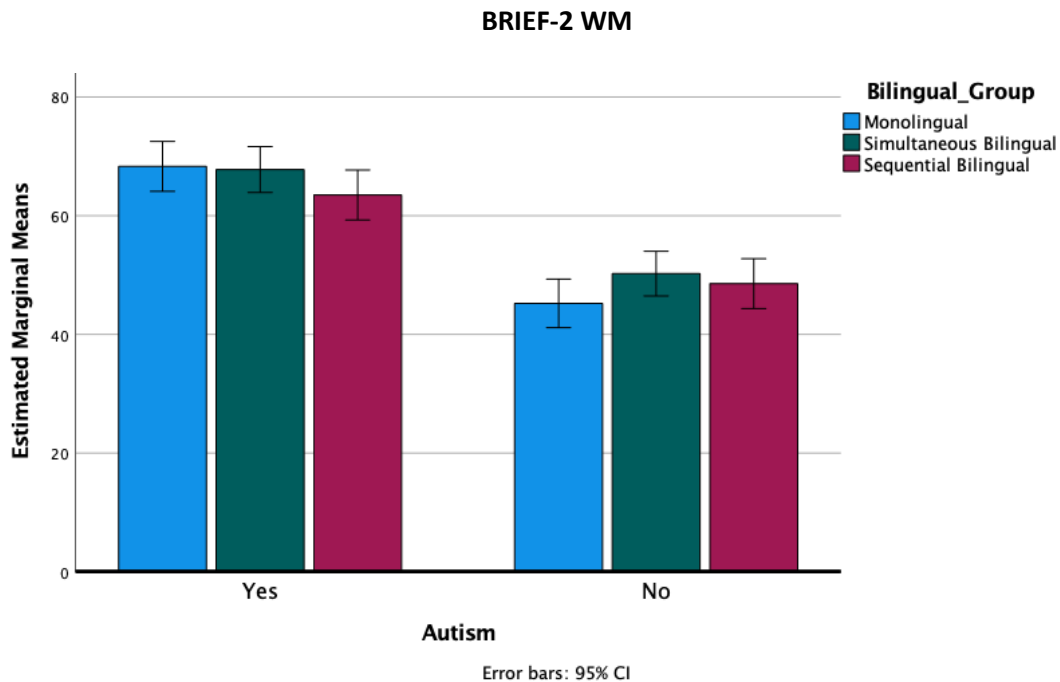


Figure 3.3. Estimated marginal means for BRIEF-2 WM scores by autism status and language exposure group.

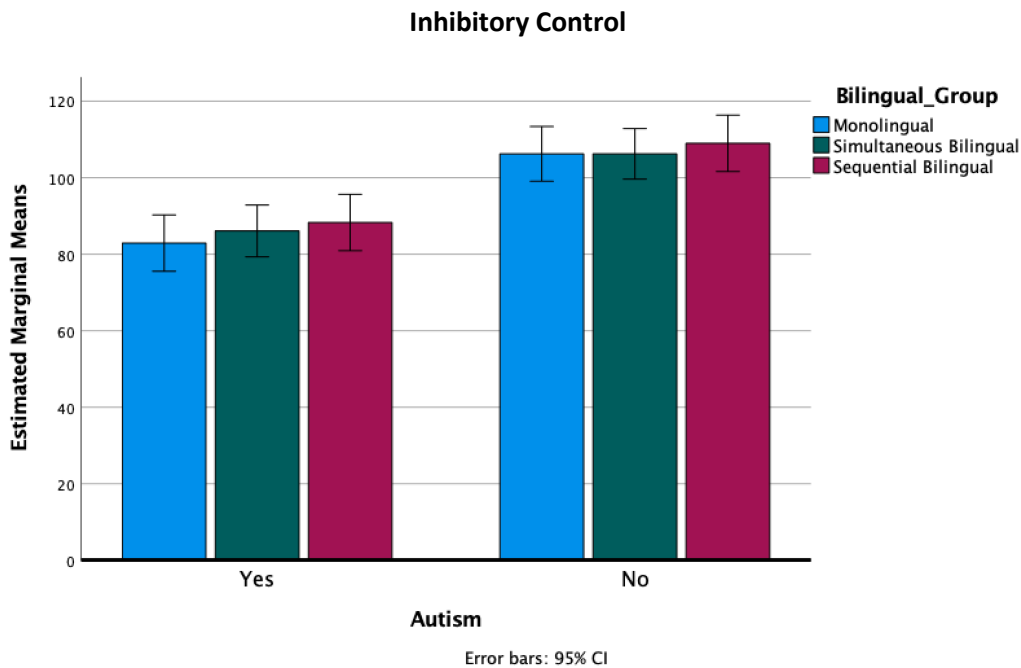


Figure 3.4. Estimated marginal means for CEFI Inhibitory Control by autism status and language exposure group.

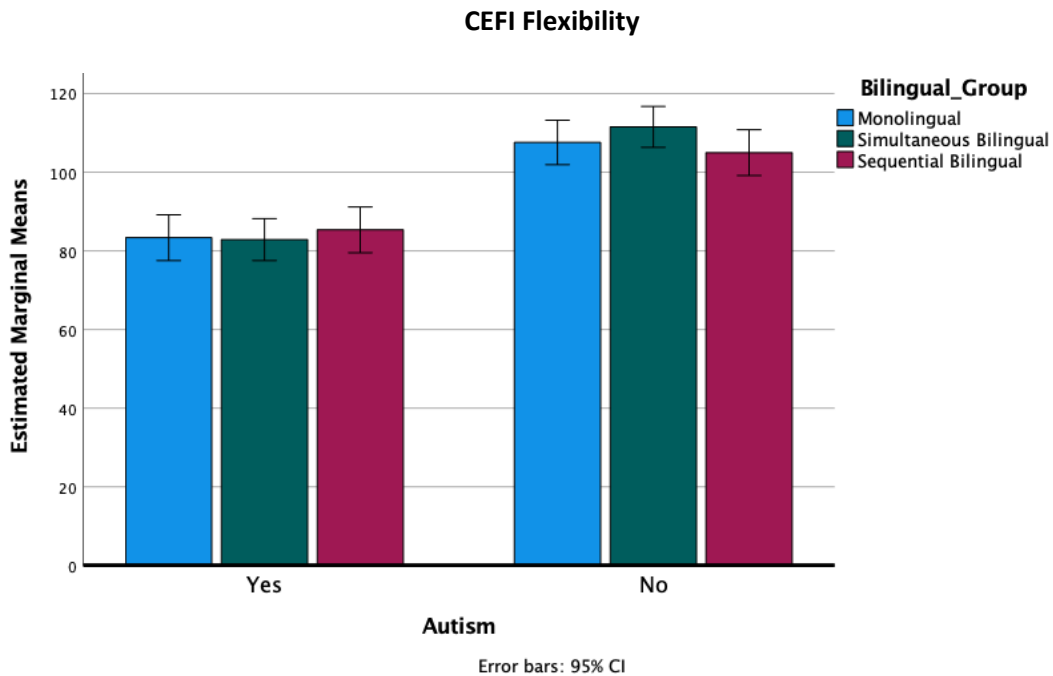


Figure 3.5. Estimated marginal means for CEFI Flexibility skills by autism status and language exposure group.

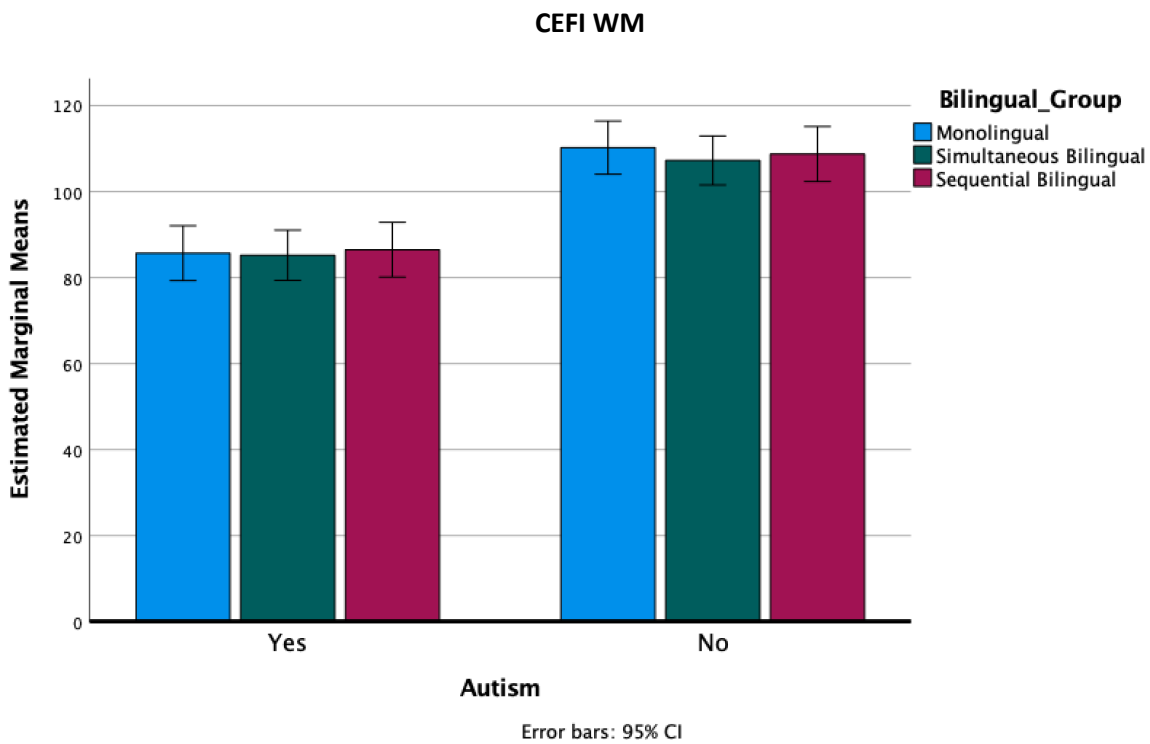


Figure 3.6. Estimated marginal means for CEFI WM by autism status and language exposure group.

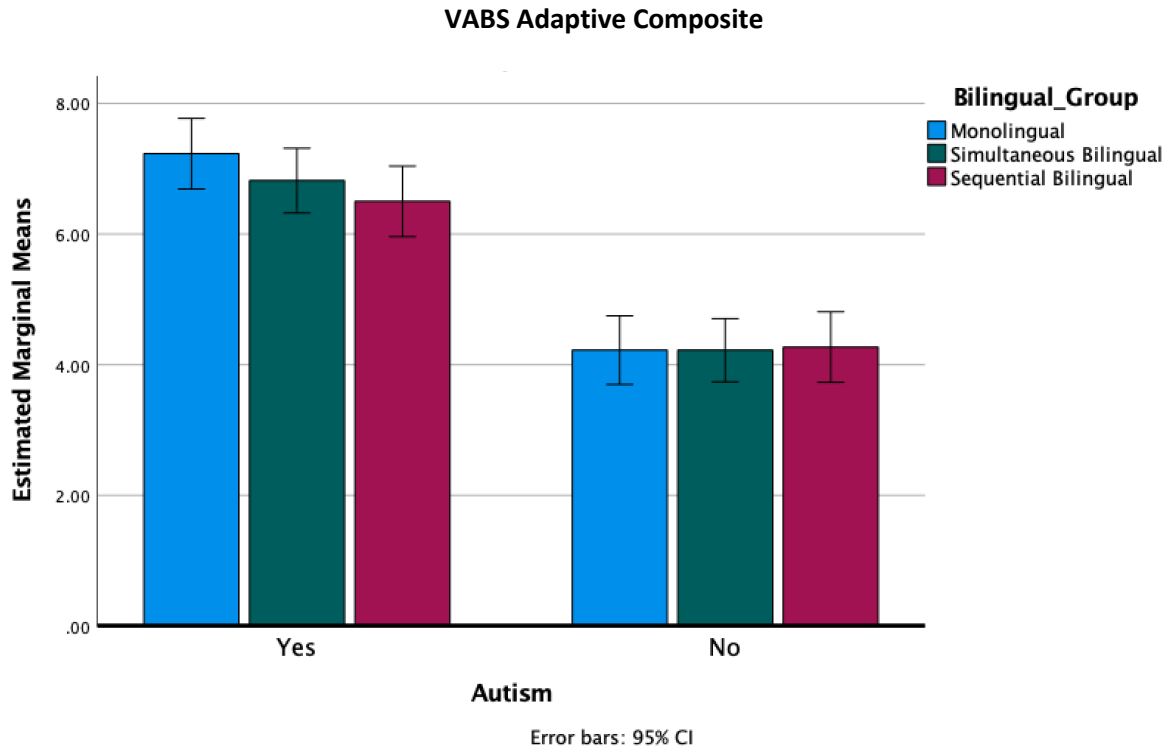


Figure 3.7. Estimated marginal means for adaptive skills by autism status and language exposure group.

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Chapter 4. Conclusion

For autistic children, bilingualism can be a choice, but it is often a necessity to participate fully in their lives and communities. In Canada, bilingualism is also a right (Kay-Raining Bird et al., 2016). The benefits of bilingualism include cultural, cognitive, and career advantages (Djumabaeva & Kengboyeva, 2021; Pransiska, 2017; Roy & Galiev, 2011). For autistic adults, the benefits of bilingualism in their lives include education, employment and leisure opportunities, relationships with family and community, increased self-confidence, and greater understanding of other people (Nolte et al., 2021). Bilingualism can play an important role in developing a cultural identity for autistic children (Howard et al., 2021; Sher et al., 2021). Bilingualism enriches autistic children's familial and social relationships (Jegatheesan, 2011). Furthermore, bilingualism has been found to have an advantage on executive function (EF) skills, albeit with mixed results (Gonzalez-Barrero & Nadig, 2019; Iarocci et al., 2017; Peristeri et al., 2021a; Peristeri et al., 2021b; Ratto et al., 2021) and adaptive skills (Hastedt et al., 2022; Hambly & Fombonne, 2012), which are both skills that are common challenges among children with autism (Demetriou et al., 2017; Lai et al., 2017; Matthews et al., 2015; Tamm et al., 2022).

Despite these possible advantages, parents of children with autism are reported to receive recommendations against bilingualism for their children (Baker, 2013; Beauchamp & MacLeod, 2017; Howard et al., 2021; Kay-Raining Bird et al., 2012; Kremer-Sadlik, 2005; Yu, 2013) due to a concern that bilingualism will overwhelm developmental capabilities (Prévost & Tuller, 2022). The decision to restrict an autistic child's language environment may have significant implications for the child's ability to communicate with the family and participate in their communities (Howard et al., 2021; Kremer-Sadlik, 2005; Paradis et al., 2018; Yu, 2013). In the current dissertation, I examined bilingual development and advantage among autistic children while addressing the diversity among bilingual profiles through two studies. In the first study, I examined autistic bilingual development in the context of language exposure and parents' attitudes towards bilingualism. Mixed method approaches to understanding the

complexities of the bilingual and autistic experience are lacking in current literature (Katsos & Gibson, 2022). In the second study, I investigated the bilingual advantage in EF and adaptive functioning skills using a categorical approach (i.e., monolingual vs bilingual) and a continuous approach to defining bilingualism. Past literature has been criticized for defining bilingualism categorically while it can be best conceptualized as dimensional and dynamic (Kay-Raining Bird et al., 2016; Prévost & Tuller, 2022), defined by the age of acquisition, exposure, proficiency level, language use, and bilingual environment (Digard & Sorace, 2022; Paradis et al., 2011; Romero & Uddin, 2021). The results of both studies have important practical and clinical implications for autistic children and contribute to the small and growing body of literature on bilingualism among autism populations.

Bilingual Language Experiences

The results of study one reveal a wide range of bilingual exposure and language use among children with autism raised in bilingual settings, adding to prior literature documenting the diversity of bilingual experiences among the autistic population (Digard et al., 2020). The sample included children exposed to simultaneous bilingual, sequential bilingual, and functional monolingual environments. Parent-reported proficiency in speaking and understanding varied across the sample, with many parents reporting their child as having a good or excellent ability to speak and understand their second language (L2). Children with autism are capable of bilingual language development, a finding that is consistent with prior research (Peterson et al., 2012).

According to Kay-Raining Bird et al. (2016), the timing and amount of bilingual exposure, interventions, and education outcomes are crucial to understanding and supporting bilingual development among autistic children. The results revealed no relationship between the age of first exposure to L2 and parent-reported language abilities, although all children in the sample were exposed to their L2 before the age of 6 years. This result is consistent with prior research (Reetzke et al., 2015). Among non-autistic populations, bilingual children achieved language development comparable to

monolingual speakers, with 40 to 60 percent lifetime exposure to each language (Thordardottir, 2019, 2011). Among the sample, neither current nor lifetime percent exposure was positively correlated with proficiency in L2. In contrast, prior findings have suggested that language exposure positively predicts language skills among bilingual autistic children (Hambly & Fombonne, 2014).

In study one, parents also reported diverse perspectives and experiences raising a child with autism in a bilingual environment. Consistent with prior research (Hampton, Rabagliati, Sorace, & Fletcher-Watson, 2017; Howard et al., 2021; Kay-Raining Bird et al., 2012; Sher et al., 2021), parents noted receiving a variety of recommendations about bilingualism from clinicians and educators. As expected, parents' decision to maintain, select or restrict bilingualism did influence the level of exposure to L2 experienced by their children. Children raised with simultaneous bilingualism had significantly greater L2 proficiency than children raised with functional monolingualism. Most parents did not restrict their child's language environment following these recommendations. They held positive attitudes toward bilingualism for their child that aligned with their decisions and language practices with their child. Unlike other research (Hampton et al., 2017; Howard et al., 2021), parents tended not to endorse fears that bilingualism would confuse their children. Parents reported a range of support and services for the child through bilingual education programs (e.g., immersion or submersion programs) and in the community, although these were not consistently accessible to families. Parents reported a need to advocate for their child's inclusion and access to support in bilingual education programs. Importantly, no parent indicated a negative impact of their language decision on their child's overall wellbeing, despite concerns noted by Hampton et al. (2017) and Howard et al. (2021).

Parents have reported that autism-specific constraints, such as the nature of autism characteristics and verbal ability, influence their choices to raise their autistic child as a bilingual (Hampton et al., 2017; Howard et al., 2021). In study one, many parents related their language exposure decisions to their perceptions about their child's ability. They felt validated when they observed their

child's development success, regardless of the choice to maintain, introduce or restrict bilingual exposure for their child. Despite these qualitative reports, no clear pattern of influence of specific characteristics, such as minimal verbal abilities or high level of reported autism characteristics, on parents' decision-making or clinician's recommendations for or against bilingualism emerged.

Bilingual Advantage

The results of study two do not support a bilingual advantage on parent-reported EF and adaptive functioning for autistic and non-autistic children. Variables related to bilingualism do not appear to uniquely predict adaptive functioning among bilingual children, and only certain bilingualism variables uniquely predicted two EF parent-report scales. These findings are in keeping with prior studies that reported no significant autistic bilingual advantage of parent-reported EF (Gonzalez-Barrero & Nadig, 2019; Iarocci et al., 2017). Although bilingualism did not mitigate difficulties with EF and adaptive functioning for autistic children in the sample, the results add to growing evidence suggesting that children with autism do not experience a developmental disadvantage when exposed to a bilingual environment, regardless of the timing of bilingual development. This stands in contrast to the literature reporting that clinician and parents hold beliefs that bilingualism will overwhelm the developmental capabilities of autistic children (Baker, 2013; Beauchamp & MacLeod, 2017; Howard et al., 2021; Hampton et al., 2017; Kay-Raining et al., 2016; Kremer-Sadlik, 2005; Sher et al., 2021; Yu, 2013).

Clinical Implications

The diversity in bilingual language use and exposure, along with the diversity of parents' perspectives on their children's ability to acquire bilingualism, suggests that bilingualism is not a 'one-size-fits-all' experience for autistic children. There is no evidence that children with autism are incapable of bilingual development or that exposure to bilingualism results in a developmental disadvantage. As with non-autistic children (Paradis, 2019; Paradis et al., 2011), a range of internal and external factors contribute to developing proficiency in two languages. Clinicians should not discourage bilingualism or

bilingual education for autistic children. Within the field of school and clinical child psychology, psychologists have an ethical and professional responsibility to respect cultural and linguistic differences (Canadian Psychological Association, 2017). Psychologists are expected to develop respect and understanding of cultural and linguistic differences and refrain from imposing cultural expectations upon clients while providing culturally responsive services (Truscott & Crook, 2013). For bilingual families, language use between parents and children is complex and unique for each family (Yu, 2013). Given the results of this dissertation, psychologists and other clinicians are responsible for supporting families in raising bilingual children with autism in a fashion congruent with the family's values and needs, which acknowledges the heterogeneity inherent in both autism and bilingualism (Katsos & Gibson, 2022).

Despite growing evidence that children with autism are not hindered by bilingual exposure, there is a continued need to provide parents, educators and other professionals with information to guide decision-making and support for bilingual families raising children with autism. Calls for greater dissemination of evidence are not new (Kay-Raining Bird et al., 2016), although greater access to evidence-based information was a noted need among many parents in study one. Culturally and linguistically diverse parents may have misconceptions about autism in addition to lacking knowledge (Papoudi et al., 2021).

Parents reported a variety of access and experiences with bilingual services and special education support in bilingual education. The results of the two studies in the current dissertation support autistic students' suitability for bilingual education, although some parents report a continued culture of exclusion, particularly in French Immersion. Based on the review of current literature and the present findings, there is no evidence to support policies that exclude or limit support for autistic students in immersion or submersion bilingual education programs. Improving the inclusion of autistic children in bilingual education may require using various accommodations, including more time to

process information, multimodal teaching practices, facilitating social interactions, and highlighting strengths, among others (Howard et al., 2021b). Parents also reported that a supportive school team helped to facilitate inclusion. Teachers should be provided with adequate resources and training to support the inclusion of autistic students.

The present dissertation attempts to address the topic of bilingualism in autism in a manner sensitive to the complexity and diversity of the bilingual experience. As Digard and Sorace (2022) said, “this new research field has its whole history left to write” (p.46). Much remains unknown regarding the lived experiences of autistic bilinguals. Furthermore, the specific factors promoting bilingual language development for autistic children have received little attention. I believe that researchers should move past questions of whether autistic individuals’ bilingual development ‘should’ be supported to ask questions about ‘how’ to best support autistic bilingual development. This would allow for greater availability of resources and interventions for bilingual children with autism and their families. Ideally, this research can occur in partnership with stakeholders from the autistic bilingual communities (Digard & Sorace, 2022), a limitation of the current research.

Conclusion

This dissertation adds to the limited and growing body of evidence that counters recommendations against bilingualism for children with autism. Children with autism are capable of bilingual language development and have diverse, bilingual experiences. Bilingualism does not contribute any disadvantage to the development of bilingual autistic children. Parents report positive attitudes toward bilingualism, receive a mix of recommendations regarding bilingualism for their autistic children and make decisions about language exposure that are congruent with their beliefs. Parents report that their child’s characteristics and developmental response to their language environment validated their choices. However, when parent qualitative data was integrated with child autism characteristics, no clear pattern of influence emerged. Psychologists, educators and other professionals

are responsible for providing evidence-based recommendations, information, and support to bilingual families raising autistic children. Bilingualism permeates all aspects of life and is often necessary for full participation in the child's family and community. By supporting bilingualism, children with autism may experience numerous benefits, including educational and employment opportunities, relationships with family and community, greater self-confidence, increased understanding of other people, and the development of cultural identity (Nolte et al., 2021; Howard et al., 2021; Sher et al., 2021).

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