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# Language Abilities in Single- and Dual- Language Learners with Autism or other Developmental Disorders

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Language Abilities in Single- and Dual- Language Learners with Autism or other Developmental Disorders

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LANGUAGE ABILITIES IN SINGLE- AND DUAL-LANGUAGE LEARNERS

**Approval Page**

Master of Science Thesis

Language Abilities in Single- and Dual-Language Learners with Autism or other Developmental Disorders

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# LANGUAGE ABILITIES IN SINGLE- AND DUAL-LANGUAGE LEARNERS

## Abstract

Parents and providers worry that exposure to two languages will impair language acquisition in children with autism spectrum disorder (ASD) or other developmental delays (DD). However, limited research to date suggests that language milestones and abilities are unaffected. The current study explored language abilities in toddlers with ASD or DD exposed to one versus multiple languages, prior to any intervention. Results showed slower language acquisition in ASD than DD but no main effect of language exposure group or interaction of language group by diagnosis. This study suggests that bilingual parents can communicate with their children in both languages without harm to their child's language functioning.

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### Language Abilities in Single- and Dual-Language Learners with Autism or other Developmental Disorders

The use of a language other than English in U.S. homes increased by 148 percent between 1980 and 2009, and growth in such diversity of children's language-learning environments is projected to continue (Ortman & Shin, 2011). Children with autism spectrum disorder (ASD) and other developmental disorders (DD; i.e., Intellectual and Developmental Disabilities and Language Disorders) often exhibit impaired language acquisition and functioning. Child-care providers and bilingual parents report concern that exposure to multiple languages will further disrupt language development in children with these disorders (Ijalba, 2016; Kay- Raining Bird, Lamond, & Holden, 2012; Kremer-Sadlik, 2005). Accordingly, providers from a wide range of disciplines recommend that parents only speak one language when communicating with their children (Ijalba, 2016; Kremer-Sadlik, 2005; Yu, 2013). Indeed, in a survey of bilingual parents of children with ASD who were contacted through the Autism Spectrum Disorders—Canadian American Research Consortium, parents indicated that the majority of professionals, including psychologists, social workers, physicians, speech-language pathologists, and teachers, suggested that they only speak to their children in English in order to facilitate language development (Kay- Raining Bird et al., 2012).

Bilingual parents, either independently or through internalizing this message from providers, often believe that learning more than one language is too difficult for their child (Ijalba, 2016; Kay- Raining Bird et al., 2012). Therefore, parents of children with developmental disorders may believe that they must decide between their child mastering one language, or learning two languages less proficiently (Kay- Raining Bird et al., 2012). In most cases, parents decide to speak to their child in the culture's dominant language (e.g., English in the United States), even when this language is not the parents' native or most proficient language (Kremer-

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Sadlik, 2005; Yu, 2013). This decision is further influenced by the limited availability of early intervention services in languages other than the culture's dominant language, and the fact that subsequent school-based instruction and other societal demands will also be in the dominant language (Kay- Raining Bird et al., 2012; Yu, 2013).

Several consequences emerge when parents exclusively communicate with their children in the cultural majority language. Parents provide their children's earliest and initially most important language input. This is particularly so for children with high functioning ASD (Baron-Cohen & Staunton, 1994; Kremer-Sadlik, 2005). Speaking frequently and directly to children significantly improves their language development (Hoff & Core, 2013; Weisleder, & Fernald, 2013). However, if parents speak to their children only in their second, less-proficient language, they are likely to use fewer words and to model inferior grammar. Relying on communication in a language in which one is not fully fluent may have negative consequences for a child's language acquisition (Place & Hoff, 2011; Ross & Newport, 1996). In an extreme example, one parent reported that she stopped communicating with her children for a year after a speech-language pathologist advised that she only speak to them in English, because she felt unable to effectively communicate in English (Ijalba, 2016). Instead, the mother relied on intervention services and television to promote English language development in her children. Additionally, language is a major avenue of socialization. Children with developmental delays are often already excluded from family conversations and interactions because of their unique interests and communication deficits (Kremer-Sadlik, 2005). If children are not taught one of the household languages by parents or by intervention providers, they will inevitably be further excluded from the opportunities that engaged dialogue provides for the enhancement of their social skills (Kremer-Sadlik, 2005). Such a decrease in communication reduces the quality of

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parent-child interactions, which can then cascade into social communication impairments with other communicative partners (Charman, 2003; Kremer-Sadlik, 2005).

In addition to the adverse impacts of this decision on children, parental emotional status is also diminished. First, parents express sadness and a sense of personal loss when they cannot speak with their children in their native language (Fernandez y Garcia, Breslau, Hansen, & Miller, 2012). Second, speaking English is difficult for some bilingual parents, and they worry that channels of communication with their children will be further disrupted if the children do not learn the family's native language (Yu, 2013). Even if parents are capable of speaking in English, many bilingual parents report feeling awkward speaking in English at home, and feel that their conversations in English are not as personal and casual (Yu, 2013). Indeed, adolescents who were not taught the family's native language reported a worse relationship with their parents than peers who learned their parents' native language (Tseng & Fuligni, 2000). Finally, parents of children with developmental delays report high levels of stress (Estes, Munson, Dawson, Koehler, Zhou, & Abbott, 2009), and advising them to avoid speaking their primary language to their children (and to find caregivers who only speak English) is likely to further compound parental stress. This may be particularly true when grandparents partake in childcare, or are perhaps excluded from doing so because they speak their native language exclusively.

Despite the pervasive notion that children with ASD or DD should only be exposed to one language, there is no empirical evidence to support this recommendation. The limited research on language development in children with ASD or DD has not found adverse effects of simultaneous exposure to a second language. Indeed, single language learners (SLL) and dual language learners (DLL) with DD show comparable language abilities in their dominant language (Burgoyne, Duff, Nielsen, Ulicheva, & Snowling, 2016; Feltmate, & Kay-Raining

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Bird, 2008; Gutiérrez-Clellen, Simon-Cereijido, & Wagner, 2008; Korkman et al., 2012; Paradis, Crago, Genesee, & Rice, 2003). However, with respect to second-language proficiency, sequential DLL (i.e., individuals who learn a second language after they learn the first language) who have purely verbal language delays (i.e., Language Disorders) exhibit persistent deficits (Kay-Raining Bird, Genesee, & Verhoeven, 2016; Paradis, Emmerzael, & Duncan, 2010).

Few studies have explored language development in young bilingual children with ASD; these studies unanimously reported that SLL and DLL show a similar timing of language milestone acquisition (Ohashi et al., 2012) and comparable receptive and expressive language abilities when tested in either English (Petersen, Marinova-Todd, & Mirenda, 2012) or in their dominant household language (Hambly & Fombonne, 2012; Ohashi et al., 2012; Reetzke, Zou, Sheng, & Katsos, 2015; Valicenti-McDermott et al., 2013). SLL and DLL also have been found to have similar conceptual language abilities (Hambly & Fombonne, 2012; Petersen et al., 2012). As well, parent reports suggest that older SLL and DLL children and adolescents with ASD do not differ in functional communication (Iarocci, Hutchison, & O'Toole, 2017).

Although previous studies have contributed important findings about language abilities in SLL and DLL with ASD and DD, they have several limitations that may compromise their generalizability. First, other studies may have been underpowered to detect potential differences in language development due to small sample sizes of one to 40 participants in each DLL group (Burgoyne et al., 2016; Feltmate & Kay-Raining Bird, 2008; Gutiérrez-Clellen et al., 2008; Hambly & Fombonne, 2012; Korkman et al., 2012; Ohashi et al., 2012; Paradis et al., 2003; Petersen et al., 2012; Reetzke et al., 2015; Valicenti-McDermott et al., 2013). Second, some of these studies report on language abilities in children who have already received a diagnosis or intervention in the dominant language prior to assessment (Ohashi et al., 2012; Petersen et al.,

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2012; Reetzke et al., 2015). Children often receive speech/language services after receiving a diagnosis, which increases their language functioning (Kremer-Sadlik, 2005). Indeed, in these samples DLL children received more speech/language intervention than SLL children (Ohashi et al., 2012; Petersen et al., 2012), making it difficult to compare outcomes directly. Third, some studies did not report or control for potential confounds, such as socioeconomic status (Burgoyne et al., 2016; Feltmate & Kay-Raining Bird, 2008; Hambly & Fombonne, 2012; Petersen et al., 2012; Valicenti-McDermott et al., 2013) and nonverbal intelligence (Hambly & Fombonne, 2012; Gutiérrez-Clellen et al., 2008; Reetzke et al., 2015; Valicenti-McDermott et al., 2013). Socioeconomic status accounts for differences in parental dialect attributes, which influence the rate of language growth in children (Hart & Risley, 1995; Hoff, 2003), and nonverbal cognitive abilities are also related to verbal abilities (Rosselli, Ardila, Lalwani, & Vélez-Urbe, 2016). Finally, the majority of these studies assessed older children (i.e., preschool and school age rather than children under 3 years), who are expected to have more developed language (Burgoyne et al., 2016; Feltmate & Kay-Raining Bird, 2008; Hambly & Fombonne, 2012; Gutiérrez-Clellen et al., 2008; Iarocci et al., 2017; Korkman et al., 2012; Ohashi et al., 2012; Paradis et al., 2003; Petersen et al., 2012; Reetzke et al., 2015).

The present study aims to enhance the limited literature on this topic by exploring language functioning in SLL and DLL toddlers with ASD or DD before they have experienced any intervention. We will also examine the impact of socioeconomic status and nonverbal intelligence on language development in this population. Finally, since individuals with ASD have considerable variation in their language trajectories (e.g., Tek, Mesite, Fein, & Naigles, 2014), we will explore whether the relationship between language group and language abilities is consistent among different levels of language functioning. To our knowledge, this is the largest

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investigation of language learning in DLL and SLL with ASD and other DD to date. In an examination of the beliefs and recommendations of many child-care providers, we tested two hypotheses: (1) SLL with ASD or other DD will have greater receptive language abilities, when tested in English, than DLL with ASD or other DD and (2) SLL with ASD or other DD will have greater expressive language abilities in English than DLL with ASD or other DD.

### **Methods**

#### **Participants**

Participants were recruited from a larger study on the early detection of pervasive developmental disorders. Children with a parent who was able to read in English or Spanish were screened using the Modified Checklist for Autism in Toddlers (M-CHAT; Robins, Fein, & Barton, 1999) or the Modified Checklist for Autism in Toddlers, Revised (M-CHAT-R; Robins, Fein, & Barton, 2009) during their pediatric wellness visits at either 18 or 24 months of age. Children who failed the M-CHAT-R follow-up phone interview were invited for a free diagnostic evaluation at the approximate age of two years at a university-affiliated clinic. Three hundred and eighty-eight of these children were included in the present study. The remaining children were excluded because they had missing data on primary study measures or did not receive a DSM-IV diagnosis of a pervasive developmental disorder or another developmental delay. We also excluded children who completed the evaluation in Spanish instead of English ( $n = 11$ ) or who were exposed to sign language as their second language ( $n=5$ ); these children form important study groups, with informative developmental trajectories, but the sample size of each group was too small to allow for analysis in the current study.

Participants were 288 males and 100 females who were, on average, 26 months of age (See Table 1). Participants were divided into two diagnostic groups based on DSM-IV-TR

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criteria (APA, 2000). Diagnoses were made based on clinical best estimate judgment of symptoms, incorporating clinician observation, parental report of the child's abilities, and assessment results. The ASD group ( $n = 233$ ) was comprised of children with DSM-IV Autistic Disorder ( $n = 120$ ), Pervasive Developmental Disorder – Not Otherwise Specified ( $n = 95$ ), and Autism Low Mental Age ( $n = 18$ ) (see below for criteria). The DD group was comprised of children with a global developmental delay ( $n = 103$ ) or a developmental language disorder ( $n = 52$ ).

Participants were also divided into two language groups, based on parents' report of the languages spoken to the child. The SLLs ( $n = 282$ ) were only exposed to English. The DLLs ( $n = 106$ ) were exposed to English and at least one other language. In most cases, DLLs were spoken to in English and Spanish ( $n = 68$ ). The remaining children were exposed to 25 different second languages, with one to three children in each group.

### **Procedure**

Children who screened at risk on the M-CHAT-R and follow-up phone interview were offered a free developmental and diagnostic evaluation, which was completed by a licensed clinical psychologist or developmental pediatrician and a doctoral student in clinical psychology. During the evaluation, the clinician conducted a clinical interview with the parent to obtain the child's developmental and family history and to assess parental report of their child's functioning. The doctoral student assessed the child's cognitive abilities and autism diagnostic status and severity using the Mullen Scales of Early Learning (MSEL) and the Autism Diagnostic Observation Schedule (ADOS) respectively. The family was offered a brief summary of testing results at the end of the evaluation, and a full written report including recommendations for intervention was mailed home after the evaluation.

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### Measures

*Mullen Scales of Early Learning (MSEL; Mullen, 1995)*. The MSEL is a developmental assessment of cognitive, motor, and language abilities in young children. For the current study, we administered the visual reception, fine motor, receptive language, and expressive language domains. Internal consistency ranges from .75 to .83 across domain scales and inter-rater reliability is considered strong, ranging from .91 to .99 (Mullen, 1995).

*Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000)*. Module one or two was used to determine diagnostic status for the ASD and DD group and to assess autism severity. The ADOS has strong psychometric properties (Lord et al., 2000). The calibrated severity score was used as an indicator of ASD severity (Gotham, Pickles, & Lord, 2009). Higher scores indicate greater ASD severity.

All other study information was obtained from the History and Demographics form, which was designed by the project principal investigators. Among these questions, we asked parents to report “all languages spoken in the home.” We also used income as a metric of socioeconomic status. Income was determined by asking parents to select the category that best represents their annual household income. Brackets ranged from “less than \$10,000 ” to “greater than \$80,000” and were divided by \$10,000 increments. When annual income was missing, parents’ reported monthly income was converted to yearly income. These categories were then recoded to each bracket’s median dollar amount (e.g., below \$10,000 was recoded to \$5,000 and \$10,000 – \$20,000 was recoded to \$15,000, as in Herlihy et al., 2014). The final income metric consisted of 15 categories, with one representing the lowest annual household income and 15 representing the greatest annual household income. These brackets were not evenly distributed.

### Analytic Plan

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Concerns about data normality were assessed. Histograms revealed that MSEL T scores in each domain were not normally distributed because a large number of children received the lowest possible standard score. As a result, we calculated developmental quotients for each MSEL domain by dividing mental age (i.e., age equivalent domain scores) by chronological age and multiplying by 100 (Reitzel et al., 2013). Tests of normality suggested that the distributions of these transformed outcome variables were normal.

A series of analyses were performed to compare the SLL and DLL groups on characteristics that could potentially influence receptive and expressive language functioning. First, language groups were compared on demographic variables (i.e., age, gender, race/ethnicity, and socioeconomic status) as well as diagnosis (i.e., DD; ASD). Characteristics that did not significantly differ between language groups were not included in further analyses. Independent t-tests were performed to analyze continuous variables and chi-square tests of independence were used to examine categorical data.

Nonverbal (i.e., visual reception and fine motor) and verbal (i.e., receptive language and expressive language) abilities were examined using a series of linear regressions. Each MSEL domain was analyzed using separate models. First, we evaluated the main effect of language group (SLL; DLL) and diagnosis (DD; ASD), as well as the interaction of language group and diagnosis on each MSEL domain. In models evaluating language functioning, the second set of models first covaried for characteristics that are related to language abilities and significantly differed by language group (SLL, DLL) (i.e., socioeconomic status) and then assessed main effects and interactions of language group and diagnosis on receptive language and expressive language. Standardized betas are reported in the text and unstandardized betas are presented in Table 3. Statistical analyses were performed using RStudio, version 3.

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*Exploratory Analyses.* To better capture the potential effect of language group (SLL, DLL) on receptive and expressive language abilities, children were placed in either Low- or High-receptive and expressive language subgroups, based on raw MSEL scores (as in Naigles et al., 2017). For example, it is possible that dual language exposure wouldn't influence children with Low-verbal abilities as much as it would affect children with High-Verbal abilities and standard scores may obscure children's language level. Chi-square tests of independence were used to explore whether language group (SLL, DLL) influenced receptive language ability (Low- and High- receptive language ability) and expressive language (Low- and High- expressive language ability). Children in the Low receptive language group received raw MSEL scores less than 17, indicating limited understanding of language; children in the High receptive subgroup scored 17 or above in the receptive language domain. Similarly, children in the Low expressive and High expressive language subgroups earned MSEL raw scores of 17 or less and 18 to 28, respectively, in the expressive language domain (See Table 4). Children in the Low expressive language group exhibited no language, or very limited language, including producing up to six familiar object labels, possibly including some body parts (Naigles et al., 2017). Children in the High expressive language group had a stable lexicon of nouns, and possibly grammar.

### **Results**

Results of chi-square tests of independence confirmed that the language groups did not differ on gender,  $\chi^2 = .32, p = .57$ , or diagnosis,  $\chi^2 = 2.05, p = .15$ . Similarly, groups did not differ on age,  $t(386) = -1.38, p = .17$ . Autism severity scores were available for 385 participants. Autism severity did not differ by language group,  $t(383) = 0.35, p = .72$ , as shown in Table 2. Race and ethnicity differed by language group, such that Caucasian, non-Hispanic children comprised a greater portion of the SLL group, while minority children were more prevalent in

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the DLL group,  $\chi^2 = 117, p < .0001$ . Income was only available for 256 participants; among these participants, income significantly differed by language group,  $t(254) = 5.25, p < .001$ ; (see Table 1). Independent t-tests and chi-square tests of independence indicate that participants who were missing income data were more likely to be younger,  $t(386) = -2.17, p < .05$ , female,  $\chi^2 = 4.32, p < .05$ , and have lower MSEL receptive language scores,  $t(386) = -2.47, p < .05$ , compared to participants with complete data.

With regard to nonverbal cognitive ability, linear regressions indicated that language groups did not differ in visual reception abilities, ( $\beta = .07, SE = 6.30, p = .66$ ). There was a significant difference for diagnostic group ( $\beta = .23, SE = 2.21, p < .001$ ), with the ASD group having lower scores compared to the DD group (See Tables 2 and 3). There was no interaction of language and diagnostic group ( $\beta = -.08, SE = 4.14, p = .59$ ).

Similarly, for fine motor functioning, there was no main effect of language group ( $\beta = -.09, SE = 5.67, p = .54$ ), while there was a main effect of diagnosis, such that children with ASD performed significantly lower than children with DD ( $\beta = .18, SE = 1.99, p < .01$ ). There was no significant interaction between language group and diagnosis in the prediction of fine motor abilities ( $\beta = .08, SE = 3.73, p = .62$ ).

Turning to receptive and expressive language scores on the MSEL, results indicated no main effect of language group for receptive language ability ( $\beta = -.03, SE = 7.19, p = .86$ ). Diagnosis significantly predicted receptive language, such that children with ASD had lower receptive language functioning than children with DD ( $\beta = .36, SE = 2.52, p < .001$ ); the interaction between diagnosis and language group in the prediction of receptive language was not significant ( $\beta = -.08, SE = 4.73, p = .61$ ). Since annual household income differed by language group, and household income is related to children's language development, we

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explored whether results remained consistent after controlling for income. In the subset of participants who had income data, there was no effect of language group on receptive language after controlling for income ( $\beta = .02$ ,  $SE = 9.75$ ,  $p = .90$ ). Additional model results are presented in Tables 2 and 3.

When children were divided into subgroups based on their receptive language functioning, language group (SLL, DLL) continued not to predict receptive language (Low- or High- receptive language group),  $\chi^2 = .44$ ,  $p = .51$ .

Expressive language did not differ by language group ( $\beta = -.05$ ,  $SE = 6.60$ ,  $p = .76$ ), but did differ by diagnosis, with the ASD group showing lower scores ( $\beta = .22$ ,  $SE = 2.32$ ,  $p < .001$ ). The interaction between diagnosis and language group in predicting expressive language was not significant ( $\beta = -.02$ ,  $SE = 4.34$ ,  $p = .89$ ). After controlling for income, language group remained non-significant in the prediction of expressive language ( $\beta = .19$ ,  $SE = 8.76$ ,  $p = .31$ ).

Similarly, when children were divided into subgroups based on their expressive language functioning, language group (SLL, DLL) did not predict expressive language (Low- or High- expressive language group),  $\chi^2 = .001$ ,  $p = .99$ .

### Discussion

This study compared receptive and expressive language functioning in SLL and DLL toddlers with developmental delays who had yet to experience clinical intervention. A main effect of diagnosis was observed, such that children with ASD performed worse on all domains of cognitive functioning (visual reception, fine motor, receptive language, and expressive language) than children with DD. However, contrary to hypotheses that reflected common professional beliefs about the deleterious effects of dual-language exposure, we did not observe a main effect of language exposure on either nonverbal or verbal cognitive functioning, nor

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significant interactions involving diagnosis and language group. These results were maintained when groups were stratified based on their verbal abilities. With groups matched on gender, age and nonverbal cognitive ability, exposure to more than one language did not appear to diminish children's receptive or expressive English language ability. These results were maintained after controlling for socioeconomic status.

These findings are consistent with the limited research on language development and functioning in preschool- and school-age children with ASD, which have consistently revealed similar language abilities in SLL and DLL children (Hambly & Fombonne, 2012; Ohashi et al., 2012; Petersen et al., 2012; Reetzke et al., 2015; Valicenti-McDermott et al., 2013). Similarly, our results are consistent with the DD literature, which suggests that DLL and SLL with DD perform similarly when their receptive and expressive language abilities are tested in the dominant language (Burgoyne et al., 2016; Feltmate, & Kay-Raining Bird, 2008; Gutiérrez-Clellen et al., 2008; Korkman et al., 2012; Paradis et al., 2003).

The current study expands upon previous studies investigating language functioning in SLL and DLL children in several ways. First, it comprises the largest sample to date, to our knowledge. Second, we assessed children's language functioning at the time of diagnosis, before they received any intervention, permitting an evaluation of their language ability without any confounding effects of services. Third, participants in both language groups were similar in important demographic variables, such as age and gender, and in nonverbal cognitive abilities. One unmatched variable that has been shown to influence language acquisition, socioeconomic status, was statically controlled for in the analyses. Finally, we assessed younger children (toddlers) to determine if there are any potential differences in early language development and functioning. These extensions, and the replication of results that add to a limited literature,

increase the generalizability of the observed results of similar language functioning in SLL and DLL with ASD and other developmental delays.

### **Limitations and Future Directions**

This study had several limitations that warrant comment. We assessed language exposure broadly to enable generalizability. However, we did not obtain information about the frequency of exposure to each language, or the settings in which the child is exposed to each language. Studies suggest that children learn a language better when it is spoken directly to them, rather than when they hear it in the background (Weisleder & Fernald, 2013). Therefore, additional information about the frequency and the context in which each language is spoken to the child will help to determine other important aspects of language exposure that may affect language development in bilingual children with developmental delays. Similarly, we only tested children's language functioning in English. Understanding their language functioning in both their dominant and secondary languages will inform language-learning capabilities of bilingual children with developmental delays. Moreover, verbal ability was assessed with the MSEL, which may not be particularly sensitive to subtle variations in the earliest stages of language acquisition, prior to phrase speech. Still, the current study supported results observed in studies that used more specific and discriminating measures, such as the MacArthur-Bates Communicative Development Inventories.

The present study did not assess whether DLL children were exposed to multiple languages simultaneously or sequentially; however, since children were very young at the time of assessment, it is likely that they were exposed to all languages simultaneously. In contrast to the ASD literature, the existing research on children with DD suggests a meaningful distinction between simultaneous and sequential language learning. Therefore, it is particularly important

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for future research on children with DD to acquire information about the timing of language exposure, as well as the levels of input received from native vs. non-native speakers (Place & Hoff, 2011).

As this remains a clinically significant but underdeveloped area of research, future studies should also explore the influence of learning structurally similar languages (i.e., English and German) versus languages that are structurally different (i.e., English and French), as learning languages of similar semantic and syntactic structure may be easier (Werker and Byers-Heinlein, 2008). Studies with larger groups of heterogeneous language pairings can explore whether the type of language pair affects DLL language functioning. Further, the role of cognitive functioning may be an important area of exploration for future research. Typically developing DLL show less proficient single-language performance than SLL (Hoff, Core, Place, Rumiche, Señor, & Parra, 2012), but similar conceptual vocabulary (Hoff et al., 2012). This difference in single-language performance may exacerbate individuals' expectations that DLL with developmental delays would also demonstrate less proficient single-language functioning. It is also possible that nonverbal cognitive functioning contributed to the lack of difference in observed language performance in DLL and SLL with developmental delays. The majority of the children in the present sample were low in cognitive functioning. Research that includes children with a broader range of cognitive functioning will help to clarify how cognitive ability influences the relationship between the number of languages a child is exposed to and the child's language functioning.

Finally, studies should continue to explore the link between dual language exposure and executive functioning. Despite a lack of observed benefits in some studies (e.g., Paap, Johnson, & Sawi, 2015), most research has cited a striking benefit in attention-switching and other

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cognitive processes in fluent bilingual individuals, compared to SLLs (e.g., Bialystok, Martin, & Viswanathan, 2005; Kovács, & Mehler, 2009). Since individuals with ASD are impaired in domains of executive functioning (Dai & Eigsti, *in press*; Ozonoff, Strayer, McMahon, & Filloux, 1994), the exploration of potential advantages associated with DLL and executive functioning is particularly warranted, as advising parents of children with ASD to only expose their children to one language may exacerbate their children's executive functioning impairments.

### **Conclusion**

Overall, these findings reflect those of the previous literature and suggest that bilingual parents of children who have developmental delays can communicate with their children in both languages without harm to their children's language development. In light of the profound negative effects on both parents and children of limiting parent-child exchanges to one language, and the lack of empirical support to warrant this communication strategy, providers should reconsider the recommendations they provide to bilingual parents of children who have developmental delays. As well, in terms of public health policy, the existing approach of offering intervention services predominately in the culture's dominant language may merit reexamination.

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**Table 1.** Sample demographics

	<b>SLL (N= 282)</b>	<b>DLL (N=106)</b>
<b>Age M(SD)</b>	26 (5)	26 (5)
<b>Income</b>	10	6
<b>Race</b>		
Caucasian	82	23
Hispanic/Latino	5	47
African American	8	10
Asian	1	11
Other	3	5
Missing	1	4

*\*Note.* Age presented in months; SES presented as mean income bracket, with a range of 1-15; Race/ethnicity presented as percentages.

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**Table 2.** Cognitive functioning and autism severity by diagnosis and language group

	ASD		DD	
	SLL M (SD)	DLL M (SD)	SLL M (SD)	DLL M (SD)
<i>Mullen Standard Score</i>				
Visual Reception	66.16 (17.64)	66.74 (20.93)	74.79 (17.41)	73.16 (16.72)
Fine Motor	72.16 (15.79)	70.5 (15.80)	78.15 (16.68)	78.31 (16.98)
Receptive Language	47.55 (21.48)	43.85 (20.50)	63.36 (20.62)	57.26 (16.22)
Expressive Language	49.77 (20.23)	47.14 (18.88)	58.20 (17.75)	54.99 (15.47)
<i>ADOS Severity Score</i>	6.10 (2.32)	6.60 (2.10)	1.92 (1.25)	1.88 (1.29)

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**Table 3.** Model results

	<b>B</b>	<b>SE</b>	<b>P</b>	<b>95% CI</b>	
<b>Visual Reception</b>					
Model 1					
Language Group	2.78	6.30	0.66	-9.61	15.17
Diagnosis	8.63	2.21	< .001	4.28	12.98
Language Group X Diagnosis	-2.21	4.14	0.59	-10.35	5.94
<b>Fine Motor</b>					
Model 1					
Language Group	-3.49	5.67	0.54	-14.64	7.66
Diagnosis	5.99	1.99	< .01	2.08	9.91
Language Group X Diagnosis	1.83	3.73	0.62	-5.51	9.16
<b>Receptive Language</b>					
Model 1					
Language Group	-1.31	7.19	0.86	-15.44	12.82
Diagnosis	15.81	2.52	<.001	10.85	20.77
Language Group X Diagnosis	-2.40	4.73	0.61	-11.69	6.89
Model 2					
Income	0.50	0.30	.96	-0.09	1.09
Language Group	1.19	9.75	0.90	-18.00	20.38
Diagnosis	16.09	3.28	< .001	9.64	22.55
Language Group X Diagnosis	-3.48	6.54	0.60	-16.36	9.41
<b>Expressive Language</b>					
Model 1					
Language Group	-2.04	6.60	0.76	-15.01	10.93
Diagnosis	8.43	2.32	< .001	3.88	12.98
Language Group X Diagnosis	-0.58	4.34	0.89	-9.11	7.95
Model 2					
Income	0.59	0.27	< .05	0.06	1.12
Language Group	9.01	8.76	0.31	-8.26	26.26
Diagnosis	8.06	2.95	< .01	2.26	13.87
Language Group X Diagnosis	-7.61	5.88	.20	-19.20	3.98

*Note:* Model 1 indicates Language Group + Diagnosis + Language Group X Diagnosis; Model 2 indicates Income + Language Group + Diagnosis + Language Group X Diagnosis; CI = confidence interval.

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**Table 4.** Low- and High-Verbal Groups

	REL		EXL	
	Low (n=289)	High (n=99)	Low (n=298)	High (n=90)
<b>Age (M)</b>	25	29	25	29
<b>Age (SD)</b>	4.49	4.32	4.53	4.23
<b>Percent DLL</b>	28	25	28	27

*\*Note.* Age presented in months; Percent DLL calculated as number of DLL children per group divided by the total number of children per group.