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# Language of Intervention in a Bilingual Child with Autism

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LANGUAGE OF INTERVENTION IN A BILINGUAL  
CHILD WITH AUTISM

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Master's Program in Speech-Language Pathology

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Charles Ambler, Ph.D.  
Dean of the Graduate School

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2017

## **Dedication**

This thesis is dedicated to my loving family. To my parents' unconditional support and my brothers' encouragement and admiration. The unceasing faith and belief you have in me has played a great role in my accomplishments.

LANGUAGE OF INTERVENTION IN A BILINGUAL  
CHILD WITH AUTISM

by

AMELIE MUZZA, B.A.

THESIS

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## **Abstract**

This study was conducted to address language of intervention for the rapidly-growing bilingual population of children with Autism Spectrum Disorder (ASD) in the United States. The purpose of this study was to determine whether a monolingual English or bilingual Spanish/English condition would yield a greater number of request types in a 3-year-old bilingual participant with autism. A single-subject, rapid alternating treatments design with baseline and a final maintenance phase was used to alternate between monolingual English and bilingual Spanish/English interventions. Results did not meet the criteria set for continuation of treatment in either condition; therefore, both monolingual and bilingual interventions were alternated through the end of the study. Treatment outcomes for types of requests were determined to be moderately effective in the monolingual condition and highly effective in the bilingual condition when interpreted using Percentage of Non-Overlapping Data (PND). Two sessions conducted without feedback after treatment concluded that treatment outcomes in the bilingual condition had better maintenance compared to those in the monolingual condition. In conclusion, not only did the bilingual Spanish/English intervention not have negative effects on the participant's language, it also provided support to yield greater gains and generalization than the monolingual English intervention.

## Table of Contents

Acknowledgements .....	v
Abstract .....	vi
Table of Contents .....	vii
List of Tables .....	ix
List of Figures .....	x
Introduction .....	1
Bilingual children with Autism.....	1
Current evidence about bilingualism in children with ASD.....	2
Professional advice .....	3
Language of intervention .....	6
Bilingual advantages.....	6
Purpose of study.....	7
Methods .....	8
Recruitment of Participant.....	8
Informed consent .....	8
Participant.....	8
Assessment .....	9
Hearing screening .....	9
Oral mechanism examination .....	9
Speech evaluation .....	10
Behavioral evaluation .....	10
Language evaluation .....	11

Assessment conclusions .....	12
Procedures .....	13
Treatment design .....	13
Baseline .....	13
Treatment .....	14
Scoring .....	15
Continuation of treatment .....	16
Maintenance .....	16
Reliability .....	17
Results .....	18
Baseline phase .....	18
Treatment phase .....	18
Types of requests .....	18
Total number of requests .....	20
Maintenance phase .....	20
Effect size .....	21
Discussion .....	23
Limitations of study .....	24
Clinical implications .....	25
Future research.....	25
References .....	26
Vita .....	30

## **List of Tables**

Table 1: Diagnostic results .....	12
Table 2: Alternating patterns of treatment .....	14
Table 3: Scoring Convention Examples .....	15
Table 4: Percentage of Non-Overlapping Data.....	21

## List of Figures

Figure 1: (a) Participant's number of *types of requests* and (b) *total number of requests* made during 5-minute conversational speech samples elicited through play situation in each treatment condition .....20

## **Introduction**

The United States is home to individuals from a wide variety of culturally and linguistically diverse backgrounds. There is an especially large and rapidly growing Hispanic population. According to the United States Census Bureau, the percentage of Hispanics made up 16.3% of the population in 2010 (Ennis, Rios-Vargas, & Albert, 2011). A more recent investigation by the American Community Survey (ACS) estimated that the number of people with Hispanic or Latino origin grew by almost 4.8 million between 2010 and 2014.

Among the increasing number of individuals from Hispanic and Latino origins are children with Autism Spectrum Disorder (ASD). The Center for Disease Control (CDC; Baio, 2016) reported that 14.6 out of every 1000 children had autism in 2012. The prevalence of Hispanic children with autism was estimated to be 10.2 out of every 1000 (Baio, 2016). In a descriptive study, Jo, et al. (2015) suggested that Hispanic children in the United States whose home language was not English may be under-identified for autism as a result of differences in culture and limited access to services. Therefore, the prevalence of Hispanic children with autism may be higher than reported by existing investigations.

### **Bilingual Children with Autism**

Some of the Hispanic children living in the United States, including those with autism, will grow up to be bilingual. There is misunderstanding that children with autism who are exposed to or speak more than one language at home may have lower language levels than that of their monolingual counterparts. However, many descriptive studies that compare language competencies in matched groups of monolingual and bilingual children with autism have discredited this belief. Hambly and Fombonne (2012) compared social and language abilities of bilingual and monolingual children with ASD. Bilingual children with ASD demonstrated no

additional delays compared to monolingual children with ASD. Another exploratory study conducted by Ohashi, et al. (2012), matched a group of monolingual children with autism to a group of bilingual children with autism to compare effects of language development between the two groups. No disadvantages associated with bilingualism in children with autism were found. This there are no additional disadvantages in cognitive functioning in bilingual children with autism compared to monolingual children with autism has been confirmed by many other studies as well (Hambly & Fombonne, 2012; Petersen, Marinova-Todd, & Miranda, 2012; Reetzke, Zou, Sheng, & Katsos, 2015; Valicenti-McDermott, et al., 2013).

### **Current Evidence about Bilingualism in Children with ASD**

Bloom and Lahey (1978) reported that children could easily acquire language because of their brain's ability to change and adapt. The younger the child is, the easier the task of acquiring a second language; young children can usually acquire a second language with little input (Snow, 1977). Current evidence supports that if the first language is well established, transfer between languages could occur (Kohnert, Yim, Nett, Kan, & Duran, 2005; Lopez & Greenfield, 2004).

The linguistic interdependence theory proposed by Cummins (1979) best supported the idea of cross-linguistic transfer. In other words, information and words learned in one language will carry over when learning a second language. For example, establishing a good foundation in Spanish in an individual whose first language is Spanish, can help facilitate English language acquisition (Cummins, 1979; Lopez & Greenfield, 2004). This model suggests that children who do not receive enough support learning their first language will have trouble acquiring a second language even with intensive instruction.

Despite the prevalence and increasing numbers of children with autism exposed to more than one language, the literature for evidence-based treatment in this population is limited. Yu

(2013) noted that research focuses on the “monolingual, English speaking, White middle-class populations” (p.10). Specifically, there is a lack of literature that centers on language of intervention in children with autism that speak a language other than English at home. There are not enough studies available to supply clinicians with evidence to provide best practice when selecting the language of intervention for treatment of bilingual children with ASD.

**Professional advice.** As a result of the lack of evidence, professionals may not be prepared to provide intervention that addresses, much less supports, the child’s native language. Advice given to parents contradicts current research regarding neuroplasticity in young children. Some professionals not only limit the child to English during therapy sessions, but also wrongly advise parents to limit their child to English entirely (Kremer-Sadlik, 2005; Yu, 2013; Yu, 2016). These professionals assert that using or exposing a child with autism to more than one language will confuse them with no evidence to support this claim (Kremer-Sadlik, 2005; Yu, 2013; Yu, 2016).

Some professionals also tell parents that children with autism will take twice the time to learn two languages compared to learning one (Yu, 2013). They instruct the family to select one language to use when addressing the child with autism, preferably English, since it is the language used at school and it is most widely accepted by society (Yu, 2013; Yu, 2016). Since health professionals are providing these recommendations, parents reported believing it was the best way to help their child. This type of advice has reportedly motivated parents to begin speaking to their child only in English (Kremer-Sadlik, 2005; Yu, 2013; Yu, 2016).

Yu (2016) provided insight about how application of this advice affects families at home. Yu observed a Chinese American family that felt forced to discontinue speaking to their child with autism in their home language of Chinese. The mother reported being told repeatedly by the Speech-Language Pathologist (SLP) at her child’s school that speaking two languages was

negatively affecting the child's progress in therapy. The mother mentioned feeling fearful that services would be discontinued if the demand of speaking only English to the child was not accepted and followed through. She described this change as "an accommodation to the professionals" (Yu, 2016, p. 429), not as an accommodation to her child. When such demands involving their child go against their own beliefs and values, parents are placed in a difficult position.

Yu (2016) tracked the family's implementation of speaking only English to the child with autism. Most of the time English was used when directly addressing the child; however, the child was still exposed to Chinese. Family members would speak Chinese to each other when the child was present and even with matters directly concerning the child. Moreover, although most of the family's speech in English consisted of semantically correct English words, other areas of language had traces of Chinese. Since the family was not fluent in English, their use of syntax, phonology, morphology, and pragmatics incorporated their native language. The family's word order, pronunciation, tenses, figures of speech, and intonation were characteristic of their native language. Yu argued that even if a family agrees to the demands of speaking to their child in English only, they may not have the ability to follow through adequately. The idea of speaking only one language in a bilingual home may in fact be untenable.

In another study conducted by Yu (2013), parents confessed feeling uncomfortable switching the language they used with their children to English only. They reported that the change of language felt unnatural and, even though they considered themselves proficient English speakers in professional settings, they did not feel confident using English to socialize and to efficiently express their ideas and emotions. Parents whose primary language was not English had trouble transitioning to this condition, especially when speaking English with those individuals

that they were used to conversing with in their native language. Parents felt so uncomfortable with these demands that they did not follow through with instructions to only speak to their child in English (Yu, 2016).

Besides being unnatural, the language model being provided by parents may be poor (Yu, 2013; Yu, 2016). Parents should avoid using a second language if they are not proficient in that language because it will expose the child to a poor-quality language model (Jacobson & Cairns, 2008; Toppelberg, Snow, & Tager-Flusberg, 1999). This can further complicate the child's acquisition of that language. If parents use a language they are not proficient in with the child, the child will not only receive an incorrect language model, but they will also be deprived of the rich language model that could have been provided in the parent's dominant language (Kremer-Sadlik, 2005; Yu, 2013).

Several other negative effects include emotional distance, social isolation, and culture rejection. Speaking a language other than the parent's dominant language may cause strained emotional relationships to develop with their child (Kremer-Sadlik, 2005). This comes as a result of the parent and child not communicating as effectively as they would in their dominant language (Kremer-Sadlik, 2005). Additionally, if the rest of the family primarily speaks a language different from that of the child with autism, the child will not be able to participate in any conversations taking place in that language (Kremer-Sadlik, 2005). They will not only miss out on the content of the conversation, but also on the social skills model and the opportunity to practice socializing (Kremer-Sadlik, 2005; Yu, 2013).

Kremer-Sadlik (2005) provided an example of a Chinese child with autism who only spoke English while his parent's first language was Mandarin. The parents spoke English when conversing with the child since it was the only language he spoke; however, they engaged in side

conversations with other members of the family in Mandarin. In that type of situation, children miss an opportunity to practice social skills and could also miss out on an opportunity to learn about their culture (Kremer-Sadlik, 2005; Yu, 2013). The child from Kremer-Sadlik's (2005) study said he did not identify with being Chinese, which may have been because he did not understand the language used to experience the culture. This situation could cause a lack of cultural identity even when the rest of the family is fully immersed in the culture (Kremer-Sadlik, 2005; Yu, 2013).

**Language of intervention.** Treatment studies specific to the topic of language of intervention in bilingual children with autism are currently not prevalent in the literature. A treatment study was conducted by Seung, Siddiqi, and Elder (2006) with a three-year old Korean boy with autism. With the availability of a clinician qualified to conduct intervention in both Korean and English, the child was provided with bilingual intervention. Initially, he only received intervention in Korean, his primary language, while attending a preschool where English was the language used. The participant's English developed along with his Korean during the Korean only intervention. Then, the treatment began to slowly incorporate more English. The study lasted a total of 24 months and the child reportedly demonstrated gains in verbal ability in both languages and social interaction. Aside from effects in the child's language, parents' stress level reportedly decreased through the course of the study.

**Bilingual advantages.** Diaz (1985) and Yu (2013) commented that bilingualism was actually associated with cognitive advantages. Hambly and Fombonne's study (2012) used the Interpersonal subsection of Vineland Adaptive Behavior Rating Scales – II to quantify the participants' social skills and personal relationships. This investigation concluded that simultaneous bilingual children with autism had better interpersonal skills than monolingual children with autism. However, sequential bilinguals received the lowest scores of the three

groups. Another study by Valicenti-McDermott, et. al. (2013) reported that bilingual children with autism were more likely to vocalize and use gestures compared to their monolingual counterparts. They stated that learning more than one language improved cognitive abilities.

### **Purpose of Study**

In the current study, language outcomes of a bilingual child with autism in two different treatment conditions, a monolingual English and a bilingual English/Spanish condition, were examined. A rapid alternating treatments design with three baseline sessions and a final maintenance phase was conducted to answer the following question: Does bilingual English/Spanish intervention yield greater language performance than monolingual English intervention for a bilingual child with autism?

## Methods

### Recruitment of Participant

The participant was recruited from a community mentoring program for parents of children with autism in the El Paso, Texas area. A brief informational session about the study was presented to the parents during one of their scheduled meetings. Flyers in both English and Spanish were handed to parents and contact information (name of parent, telephone number, and age of child) was collected from two people who were interested in having their children participate in the study. One of the parents expressed that their child's schedule would be difficult to work with for the current study. Therefore, the other parent on the sign-up sheet was contacted by phone to schedule a meeting at the Speech, Language, and Hearing Clinic at the University of Texas at El Paso.

**Informed consent.** During the first meeting, the mother of the child was informed about the study's purpose, procedures, confidentiality, and potential risks and benefits. The mother was asked if she preferred that the information be explained in English or in Spanish and she requested that the discussion be held in Spanish. Communication continued to be conducted in Spanish through the end of the study after this request. After reviewing the study's details and implications, the mother confirmed her child's participation in the study and signed the written consent form. A copy of the consent form was provided to the parent for personal records.

**Participant.** The participant was a 3 year, 8-months-old English/Spanish bilingual male diagnosed with ASD and attention deficit/hyperactivity disorder (ADHD). His mother reported that his primary language of communication was Spanish, but the head start program he attended used both English and Spanish.

## **Assessment**

An initial evaluation was conducted at the Speech, Language, and Hearing Clinic at the University of Texas at El Paso during the first meeting. A case history was obtained by interviewing the participant's mother. The mother reported complications during childbirth; the epidural was injected wrong twice before correct placement. However, no other complications during pregnancy or birth were reported. She stated that her son reached his developmental milestones, such as sitting, crawling, and walking, at appropriate ages.

His language skills were also reported to be typical in early development. He was using single words at 1 year. After turning one, mother reported that he went through a "silent period". At 2-years-old he began to combine two words and was able to name simple objects shortly after. At age three, he was diagnosed with autism and ADHD by a developmental pediatrician. The participant was enrolled in a head start program at the start of the study and mother reported that he was scheduled for an Admission, Review, and Dismissal (ARD) meeting to determine eligibility for services. After the study began, the participant began receiving speech services at school and Applied Behavior Analysis (ABA) therapy outside of school.

**Hearing screening.** The participant's hearing was then screened using sound field testing at 20 dB for the frequencies of 1000Hz, 2000Hz, and 4000Hz with visual reinforcement audiometry. The client passed the hearing screening in all frequencies.

**Oral mechanism examination.** An examination of oral-facial structures was then performed and revealed facial, mandibular, and labial areas to be unremarkable. Evaluation of the tongue revealed a short lingual frenulum with limited range of motion. The tongue's structure and strength was within normal limits. Evaluation of the posterior pharyngeal wall, hard, and soft

palate were determined to be typical. There were no deficits in structure, strength, or range of motion of facial structures observed.

**Speech evaluation.** The participant was observed using non-standardized assessment throughout the evaluations. According to these observations along with parent report, it was determined that there were no voice, fluency, or visual acuity issues. Articulation and phonology were not formally assessed due to the nature of the study; however, non-standardized assessment was used to evaluate the participant's articulation and phonology. During the language assessment, as well as during conversations, use of phonological processes was observed. Some of the processes observed included weak syllable deletion, gliding, assimilation, and stopping.

**Behavioral evaluation.** The *Childhood Autism Rating Scale - Second Edition* (CARS-2; Schopler, Van Bourgondien, Wellman, & Love, 2010) was used to describe the participant's symptoms and severity of autism. The CARS-2 High Functioning Version (CARS2-HF) was chosen based on the participant's age and individual profile. The CARS2-HF was completed by a graduate student clinician along with input from the participant's mother. The CARS2-HF is a 15-item questionnaire where each item is rated on a 4-point scale. The areas covered by this questionnaire were relating to people; social-emotional understanding; emotional expression and regulation of emotions; body use; object use in play; adaptation to change/restricted interests; visual response; listening response; taste, smell, and touch response and use; fear or anxiety; verbal communication; nonverbal communication; thinking/cognitive integration skills; level and consistency of intellectual response; and general impressions. Based on the areas covered by this questionnaire, the client's verbal communication was most affected. Mother reported that he failed to engage and reciprocate during conversations with other people and frequently used made up words and repetitive phrases. Mother also reported that the participant demonstrated some

difficulty understanding, expressing, and regulating emotions as well as difficulty relating to people. The participant received a total score of 31.5, which indicated mild to moderate symptoms of autism as shown in Table 1.

An Occupational Therapist (OT) from the University of Texas at El Paso was invited to an assessment session to observe the participant's behavior. The OT determined that the participant appeared "disorganized" throughout the session, likely due to seeking sensory input. The OT recommended providing vestibular and proprioceptive input before each session to better organize the participant. She also recommended providing sensory input throughout the session as necessary to maintain an organized state. These strategies were implemented into treatment and continued to be used throughout the study.

**Language evaluation.** To evaluate the participant's language, the *Preschool Language Scales - Fifth Edition Spanish* (PLS-5 Spanish; Zimmerman, Steiner, & Pond, 2011) was administered. The PLS-5 is a comprehensive language assessment that provides information about the examinee's developmental language abilities. The Expressive Communication portion was attempted first; however, difficulty engaging the participant caused clinicians to discontinue administration of this portion and begin administration of the Auditory Comprehension portion. The Auditory Comprehension section was administered across several sessions. The clinician administered items until the participant no longer engaged in the tasks and then continued administration in the next session. As summarized in Table 1, the participant's standard score for Auditory Comprehension was 96, placing him in the 39<sup>th</sup> percentile. With 90% confidence, his standard score interval was 89 to 104 and his percentile rank interval values were 23 to 61. These scores placed the participant within 1 standard deviation below the mean, indicating that his auditory comprehension was within typical range.

Table 1

*Diagnostic results*

Assessment	Results
PLS-5 Spanish: Auditory Comprehension	Standard Score: 96 Percentile Rank: 39
CARS	Symptoms of ASD: Mild to Moderate

Language samples were collected in both English and Spanish to further evaluate the participant’s language abilities. The *Systematic Analysis of Language Transcripts Software* (SALT; Miller & Iglesias, 2012) protocol for a conversational play sample was followed. The samples were then transcribed, however, the transcriptions were not compared to the database as a result of the participant’s autism diagnosis. Analysis of the transcripts revealed the client’s expressive communication skills to be poor. He had difficulty communicating specific information and resorted to use of general terms such as “a ver” and “este”. He repeated these terms one after the other whenever the clinicians did not understand what he was attempting to communicate. The transcripts revealed that the client could name several objects using one-word labels and was able to expand on these one-word labels by imitating the clinicians.

**Assessment conclusions.** After careful evaluation of the formal and informal assessments administered to the participant, increasing types of spontaneous requests was established as a goal for treatment. The participant’s requests prior to the start of the study consisted of reaching for objects and using “a ver” repeatedly for a variety of different requests. Therefore, the goal established for the treatment plan was increasing types of verb + object combinations in requests during spontaneous speech in a 5-minute sample. Sessions took place at the Speech, Language,

and Hearing Clinic at the University of Texas at El Paso two times a week for an hour each during the treatment phase and thirty minutes during the continuation of treatment phase. Sessions were conducted by fully bilingual graduate student clinicians from the Speech-Language Pathology program at the university with the assistance of undergraduate students in the program.

## **Procedures**

**Treatment design.** The design of the study was a single-subject rapid alternating treatment design with baseline (Hegde, 2003). There were three phases in this design: baseline, treatment, and continuation of treatment. The assessment phase previously described was used to determine the goals for treatment. Once this was completed, a baseline was established for control and to use as a reference for calculating treatment effects. As soon as the participant achieved a steady baseline, the treatment phase began. Following the alternating treatment design, the treatments would continue until one of the treatments was at least 20% more effective than the other across 4 consecutive sessions. Treatment would then continue in the more effective condition only. A final maintenance phase was added to probe for generalization of treatment outcomes after scaffolding provided during treatment was removed.

**Baseline.** Baseline of the participant's requests was obtained during the three sessions following the assessment. These data points were obtained by eliciting a 5-minute conversation play sample in each language condition, English and Spanish/English. After the language samples were obtained, they were transcribed, and requests were tracked using a code system developed by the graduate student clinician and summarized using the Utterance Code Summary from *SALT Software* (Miller & Iglesias, 2012). A steady baseline was achieved after collection of three baseline data points, therefore, the treatment phase began in the fourth session.

**Treatment.** The treatment phase consisted of alternating treatment conditions within each session. The conditions being alternated were a monolingual English only intervention phase and a bilingual English/Spanish intervention phase as shown in Table 2. The order of language conditions for each session was determined using an online randomizer; both treatments were used during each session, half of the session was conducted only in English and the other half of the session was conducted in both English and Spanish.

Table 2

*Alternating Patterns of Treatment*

Session	Treatment														Maintenance	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	1	2
First half	B	B	M	B	M	M	B	M	B	B	M	M	B	M	M	B
Second half	M	M	B	M	B	B	M	B	M	M	B	B	M	B	B	M

*Note.* M = Monolingual English condition; B = Bilingual English/Spanish condition.

During treatment, data was collected in the same manner as baseline. The difference between baseline and treatment was that during the treatment phase participant received treatment in the form of modeling, phonemic cues, and positive verbal feedback during both language conditions. The clinician incorporated modeling during structured play and conversation by making requests depending on the activity to demonstrate appropriate requests. Phonemic cues were also used during the sessions to encourage application of requests modeled by the clinician. For example, if the participant reached for a desired ball, the clinician would cue him with “Gi-” and ideally the participant would say “Give me ball”. Positive verbal feedback was used to encourage the participant to use different requests when speaking. If the participant spontaneously

requested an object or responded correctly to a phonemic cue, the clinician would reinforce the request by saying “Good asking” or “Good job”.

**Scoring.** All sessions were video recorded; the videos were used to score the participant’s requests after the session had concluded. Each utterance that included a request was counted and both *types of requests* and *total number of requests* were calculated as follows. *Types of requests* were operationally defined to be unique verb + object combinations used to request actions, objects, or attention. Different verb + object combinations were counted as different *types of requests*. Conceptual scoring was used, therefore, requests in English, Spanish, or a combination were accepted and counted in both conditions as shown in Table 3. If two different verb + object combinations were the same in meaning across languages (i.e. give me ball and dame ball) they were counted as two different *types of requests*.

If the participant made a request with the same verb + object combination in the same language within a 10 second time frame, the first request was counted as one spontaneous request, while the subsequent requests within 10 seconds were counted as repetitions. *Total number of requests* in spontaneous speech were counted during the same 5-minute conversation sample. *Total number of requests* were allowed to be the same verb + object combination; however, the same criteria for the 10 second time frame was applied to ensure a spontaneous request versus a repetition. Repetitions of clinician were not counted as requests.

Table 3

*Scoring Convention Examples*

Types of Requests	Example	Description
1	<i>Give me ball</i> <i>Give me ball please</i>	Same verb + object combination Same language

1	<i>Give me ball</i> <i>Give the ball to me</i>	Same verb + object combination Same language
2	<i>Give me ball</i> <i>Roll the ball</i>	Different verb + object combination Same language
2	<i>Give me ball</i> <i>Dame pelota</i>	Same verb + object combination Different language
2	<i>Give me ball</i> <i>Dame ball</i>	Same verb + object combination Different language
2	<i>Give me ball</i> <i>Dame martillo</i>	Different verb + object combination Different language

**Continuation of treatment.** The rapid alternating treatments design involves alternating treatment conditions until one of the conditions is considered to be more effective. Once a condition was determined to yield greater effects than the other, treatment would be continued in the more successful condition for the remaining sessions. The criteria for continuation of treatment was for a condition to yield at least 20% more *types of requests* compared to the other treatment condition across four consecutive sessions. The criteria for continuation of treatment was not met during this study; therefore, treatment conditions continued to be alternated through the completion of the study.

**Maintenance.** Although the alternating treatment design does not require follow up of outcomes after conclusion of treatment, a final maintenance phase was added to the design to determine whether the participant generalized gains made in treatment. Two sessions were conducted following the treatment phase in which feedback was removed. Language conditions were alternated within sessions; half of the session was in the monolingual condition and the other half in the bilingual language condition as shown in Table 2. The order in which these were presented was determined in the same manner as the treatment phase, by using an online

randomizer. During these sessions, the participant was not provided with modeling, cues, or verbal praise.

### **Reliability**

Reliability was established through inter-rater reliability. Two bilingual graduate students at the University of Texas at El Paso scored randomly selected recordings of each condition for 3 sessions of the study comprising 15% of the total sessions. The percentage of inter-rater agreement was 90% and ranged from 89% to 96%. This percentage was obtained by dividing the number of agreements by the number of agreements and disagreements and multiplied by 100. This percentage was high and indicates reliability of scoring request types during the study.

## Results

Overall, the participant demonstrated gains in both the monolingual and bilingual treatment condition. Figure 1 demonstrates the client's performance in the monolingual condition (blue markers) and during the bilingual condition (red markers). The markers in Figure 1a represent the different *types of requests* made and the markers in Figure 1b represent the *total number of requests* made during the 5-minute sample in each condition.

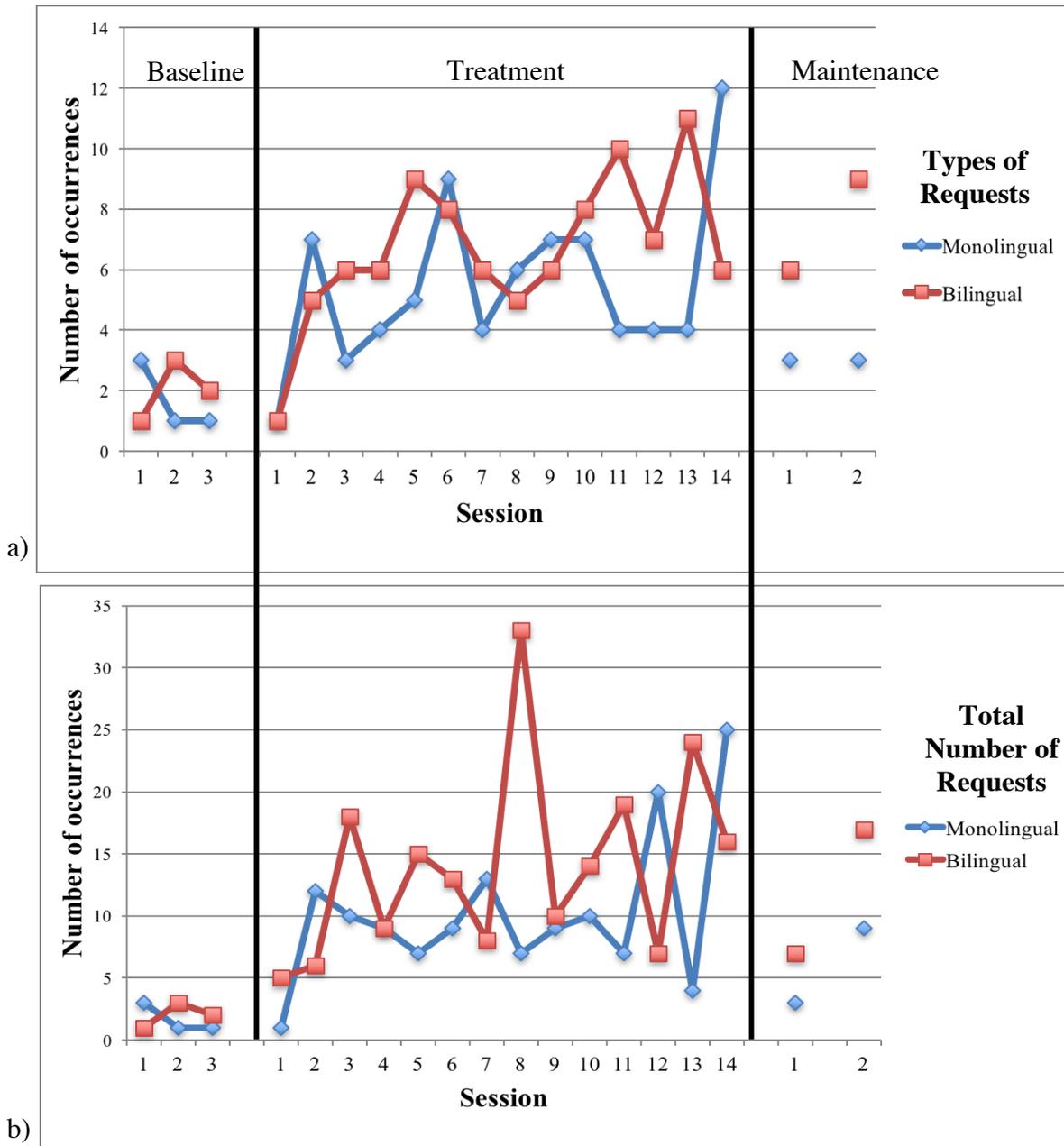
### Baseline Phase

Following assessment, baseline points were collected across three sessions. As demonstrated in Figure 1, the participant made 3 *types of requests* and 3 *total number of requests* during the first baseline session in the monolingual condition. During the second and third session, the participant made 1 type and 1 total request in the monolingual condition. For the bilingual condition, the participant made 1 request during the first session, 3 *types of requests* and 3 *total number of requests* during the second session, and 2 *types of requests* and 2 *total number of requests* during the third session. Performance across these sessions was determined to be stable, therefore, treatment began on the following session.

### Treatment Phase

**Types of requests.** The participant's daily performance was monitored for continuation of treatment criteria. The criteria for continuation of treatment was at least 20% more *types of requests* in one condition compared to the other treatment condition across four consecutive sessions. During this study, the participant performed more than 20% better in the bilingual condition than the monolingual condition across three consecutive sessions in treatment sessions 3, 4, and 5. However, the participant had more request types in the monolingual condition during the 6th treatment session. In treatment sessions 6, 7, 8, 9, and 10 the participant performed similarly in

both conditions, alternating more request types between conditions. Again, during treatment sessions 11, 12, and 13, the participant made more than 20% more *types of requests* during the bilingual condition. However, during the fourteenth treatment session he made more *types of requests* during the monolingual condition; therefore, neither condition was determined to be more effective.



*Figure 1. (a) Participant's number of types of requests and (b) total number of requests made during 5-minute conversational speech samples elicited through play situation in each treatment condition.*

**Total number of requests.** Figure 1b demonstrates the participant's *total number of requests* made during the same conversation sample used to determine the *types of requests*. *Total number of requests* ranged from 1 to 25 requests after the treatment for *types of requests* began. The variety in number of *total number of requests* indicates that control was lost. As a result, improvements in *types of requests* cannot be directly attributed to the treatment. The improvement in *types of requests* could have been affected by maturation, the client becoming accustomed to the clinician, or multiple treatment interference as the participant was receiving services outside of the study.

### **Maintenance Phase**

Once the treatment phase was completed, two maintenance sessions were conducted to determine maintenance of treatment outcomes. The sessions took place within one week following the end of treatment. During these sessions, no feedback was provided. The first maintenance probe demonstrates higher performance in the bilingual condition compared to the monolingual condition. He made 6 different *types of requests* in the bilingual condition, compared to 3 *types of requests* in the monolingual condition. However, the participant had low request types in both conditions. This may have been as a result of the participant being unwilling to participate throughout the session and only requesting to be left alone; therefore, a second maintenance session was performed. During the second maintenance session, the participant once again performed better in the bilingual condition than in the monolingual condition. He made 9 different

*types of requests* in the bilingual condition, compared to 3 *types of requests* in the monolingual condition.

**Effect Size**

Effect size was calculated using Scruggs and Casto’s (1987) definition of Percentage of Non-Overlapping Data (PND). The PND was calculated by counting the number of treatment sessions in which the participant performed better than the highest baseline point. This number was then divided by the total number of treatment sessions and multiplied by 100 as shown below. The number of treatment sessions greater than the highest baseline points is represented by “x” and the total number of treatment sessions is represented by “y”.

$$PND = \frac{x}{y} (100)$$

According to interpretation norms for PND, 70-90% is considered moderately effective and 90% or higher was considered highly effective.

In this study, the highest baseline point was 3. There were 12 sessions during the monolingual condition and 13 sessions during the bilingual condition where the participant made more than 3 *types of requests* out of the 14 treatment sessions conducted. The PND for the monolingual condition for request types was 85.7% (12/14) and the PND for request types during the bilingual condition was 92.9% (13/14) as shown in Table 4.

Table 4

*Percentage of Non-Overlapping Data*

Condition	<i>Types of Requests</i>		<i>Total Number of requests</i>	
	PND	Effectiveness	PND	Effectiveness
Monolingual	85.7%	moderately effective	92.9%	highly effective

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Bilingual	92.9%	highly effective	100%	highly effective
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Therefore, the PND of 85.7% effect size for *types of requests* in the monolingual condition is considered moderately effective. Treatment for *types of requests* in the bilingual condition, a PND of 92.9% was considered highly effective. PND for *total number of requests* was calculated using the same formula. Effect size for both the monolingual condition and the bilingual condition were 92.9% and 100% respectively. The PND for *total number of requests* indicates that treatment was highly effective.

## Discussion

The purpose of this study was to determine whether a monolingual English treatment condition or a bilingual English/Spanish treatment condition would yield greater language outcomes in a bilingual child with autism. The goal for treatment was to increase the participant's *types of requests* in spontaneous speech. A single subject rapid alternating treatments design was used to expose the participant to two language conditions in order to compare treatment gains in each condition.

Results of this study demonstrated that incorporating a second language during intervention did not negatively affect the participant's performance. These findings are consistent with studies by Hambly and Fombonne (2012), Ohashi, et al. (2012), Petersen, et al. (2015), and Valicenti-McDermott, et al. (2013). In fact, language outcomes in both the monolingual and bilingual conditions improved. Treatment gains made by the participant in the monolingual condition were considered to be moderately effective, in contrast, treatment gains in the bilingual condition were considered to be highly effective. Therefore, not only did exposing a bilingual child with autism to more than one language not cause negative effects, the participant was able to achieve higher treatment gains when exposed to both languages.

Maintenance probes revealed that the participant generalized treatment outcomes better in the bilingual condition. This demonstrated that when feedback was removed, he was able to maintain treatment outcomes better in the bilingual condition than in the monolingual condition. The participant's performance may have been better in the bilingual condition because he was exposed to both languages at home and in school. Therefore, the exposure to both languages was the language condition that more closely resembled the environment that the participant encountered on a day to day basis.

In addition, excluding the home language may have deprived the child of some gains achieved during the study in the bilingual condition. Diaz (1985) and Yu (2013) argued that exposing children to a bilingual environment was associated with cognitive advantages. Considering outcomes were more effective and maintained better in the bilingual condition, exclusion of the home language may have deprived the participant of additional gains made in the bilingual condition. During the bilingual condition, the participant had resources available to him in both languages. If a child's home language was taken away completely, it may cause them to miss out on using cognitive resources that could have been available to them in that language (Diaz, 1985; Hambly & Fombonne, 2012; Ohashi, et al., 2012; Petersen, et al., 2015; Valicenti-McDermott, et al., 2013; Yu, 2013).

Interdisciplinary collaboration was imperative in this study. The participant was very active in the beginning of the study and had difficulty engaging in the activities presented by the clinician as a result. The OT's recommendations for providing the participant with vestibular and proprioceptive input when he became "disorganized" was essential for achievement of increasing types of requests. This strategy addressed a behavior that otherwise may have hindered the participant to achieve maximum gains.

### **Limitations of Study**

A limitation of this study may be a part of the design itself. Alternating conditions of treatment may cause treatment diffusion, where one of the treatment conditions affects the outcome of the other treatment condition. Randomization of administration of treatment conditions was implemented to control for this factor. Although treatment conditions were alternated during each session, the bilingual English/Spanish outcomes could be carrying over to the monolingual

English conditions. In addition, requests in either language were accepted in the monolingual English condition, which further allows the possibility of treatment diffusion.

Requests made in Spanish or containing a mixture of Spanish and English were counted as acceptable in the monolingual condition. This scoring system may affect results as the clinician was providing positive feedback for use of the home language during the “English only” condition. The type of elicitation used in intervention could also be considered a limitation. Language samples were obtained only from conversational and play situations. More structured methods could be used to measure treatment goals and score outcomes.

### **Clinical Implications**

Aside from the limitations of this study, the effect size of 92.9% in the bilingual condition and 85.7% in the monolingual condition supported the idea that bilingualism does not negatively affect language skills. In fact, greater effect sizes were achieved in treatment and maintained better in the bilingual condition. Clinicians and health professionals could implement this study while practicing in the field. They could become informed about language function not being hindered by exposure to both languages at home and during treatment. This in turn would improve the quality of life of many families from culturally and linguistically diverse backgrounds who are struggling to provide an English only environment for their child with autism. Families that are not proficient in English could speak to their child in their native language and, as a result, may be able to develop better relationships with their children. It would also allow the child to be included in social situations where a high quality language model may be provided. The child may also be more likely to participate in cultural events where the native language is used and be in touch with their cultural origin.

## **Future Research**

Future research should focus on contributing to this area. In order for the results of this study to be considered valid, replication across subjects, examiners, and settings should be established in order to achieve generalization across the areas mentioned. Future studies should also consider adding a long-term maintenance phase to determine whether the outcomes of these treatment conditions in participants uphold across time. Further improvements can be made by the use of a design that has more control over treatment diffusion.

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## Vita

Amelie Muzza is a Laredo, Texas native who spent part of her childhood living in Nuevo Laredo, Tamaulipas, Mexico. She received all her elementary and high school education in the United States. Amelie attended Texas A&M University and graduated with a B.A. in Spanish in May 2014. She then completed the Post-Baccalaureate Leveling Program for Speech-Language Pathology at Our Lady of the Lake University in May 2015. Amelie enrolled in the University of Texas at El Paso (UTEP) in the fall of 2015 to begin the Master's of Science in Speech Language Pathology program and was awarded the Preparing Bilingually Certified Speech-Language Pathologists Grant (PBC SLPs Grant) for the duration of the program.

While attending UTEP, Amelie joined Dr. Connie Summers' Research in Bilingual Language Learning (ReBLL) Lab. She presented her research at the ARMADILLO Southwest Cognition Conference's Poster Session in September 2016. She then presented at the 2016 Graduate Research Expo and was awarded first place in the poster category.

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