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Monolingual and Bilingual Intervention Outcomes in a Bilingual Child with Autism

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MONOLINGUAL AND BILINGUAL INTERVENTION OUTCOMES IN A BILINGUAL
CHILD WITH AUTISM

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By

Victoria Alexander

2015

Dedication

This thesis is dedicated to my beloved parents, Jorge and Patricia Alexander, and my dear husband, Mariano Valenzuela. Thank you for all of your support, patience, and love.

In memory of:

María Elena Corral & Javier Eduardo Corral

Esta tesis es dedicada a mis queridos padres, Jorge y Patricia Alexander, y a mi querido esposo, Mariano Valenzuela. Gracias por todo su apoyo, paciencia, y amor.

En memoria de:

María Elena Corral & Javier Eduardo Corral

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CHILD WITH AUTISM

By

VICTORIA ALEXANDER, B.S.

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Abstract

Background: When treating bilingual children with autism spectrum disorder (ASD), the language of intervention has been a controversial topic among professionals. Many professionals believe bilingualism will make it harder and more confusing to develop language skills (Yu, 2013). There is limited research on the treatment of bilingual children with ASD.

Purpose: To extend the limited research on the use of language of intervention in bilingual children with ASD. This study compared a monolingual English treatment and a bilingual English-Spanish treatment, to examine which one was more efficient.

Methods: A single-subject alternating treatment design with a baseline was used to compare the efficacy of two treatment conditions in increasing language skills in a bilingual child with ASD. The participant was a 5-year-old bilingual child with ASD. Treatment targeted increasing mean length of utterance (MLU) production and following two-step oral commands.

Results: The participant presented with increased performance in the two treatment conditions. For MLU, there was a slightly better performance in the monolingual English condition, however an increase was seen in the bilingual Spanish-English condition too. For following commands, the participant performed better in the bilingual condition initially, but at the end, both conditions showed improvement.

Conclusion: The results show that the child benefited from both treatment conditions. The study supports the practice of bilingual intervention and suggests that bilingual exposure does not affect language development.

Key words: Spanish-English bilingual, autism, children, language intervention, code-switch

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Chapter 1: Literature Review

1.1 Introduction

There are a growing number of bilingual immigrants in the United States and with that speech-language pathologists (SLPs) will be faced with evaluating and treating more children from culturally and linguistically diverse populations. According to the 2010 U.S. Census, 50.5 million people who reside in the United States are of Hispanic or Latino origin, making up 16.3% of the total population (Ennis, Rios-Vargas, & Albert, 2011). Due to the growing number of Hispanic individuals, SLPs can expect to have a large number of bilingual children on their caseloads. Within this population, there will be bilingual children with Autism Spectrum Disorder (ASD). According to the American Speech-Language Hearing Association ([ASHA], 2015), the U.S. Centers for Disease Control and Prevention found that the ASD prevalence in Hispanic children was 7.9 per 1,000. SLPs will face the dilemma of what language of intervention to use when assessing and treating bilingual children with ASD. The language of intervention to use has been a controversial topic for many professionals and for the families of bilingual children with language impairments. Many educational and health professionals, including SLPs, believe that bilingualism will make it harder and more confusing for children with ASD to develop their language skills (Yu, 2013). Some professionals believe that bilingual children with ASD will present with an additional delay in their language development due to the exposure to the second language and that these children should only be exposed to one language (Hambly & Fombonne, 2012).

Studies conducted to survey bilingual families with children with ASD found that parents were being advised to limit their children's language exposure to English only (Yu, 2013; Kay-Raining Bird, Lamond, & Holden, 2012). Most bilingual children receive therapy in the language

of the SLPs or the language of the school rather than in the native language of the child, although this practice is contrary to current research evidence (Hambly & Fombonne, 2012). In a survey study conducted to investigate bilingualism and ASD, bilingual parents of children with ASD reported that teaching their children two languages is important as to communicate with family members, schools, and neighbors (Kay-Raining Bird, Lamond, & Holden, 2012). Also, parents viewed bilingualism as a benefit to personal enrichment, travel opportunities, and job opportunities. In another study that surveyed the perceptions of Muslim families in regards to the language development of their children with ASD, multilingual commitment was believed to be necessary to acquire and expand the language development of their children (Jegatheesan, 2011). Even though many families value their native language, they are willing to sacrifice it and expose their children to only the second language, in order to help their children's language development (Yu, 2013).

There are problems involved in limiting the exposure of language to only English in bilingual children with ASD. Children with ASD have difficulty with social interactions and most of the time they tend to communicate with their family only. Limiting their exposure to English only may limit the natural interactions between the children and their families. According to Yu (2013), parents are more effective at communicating with their children when using their native language because many parents have a limited English proficiency. Using the native language is a more natural form of communication.

The ASHA Code of Ethics suggests that SLPs must show the highest levels of clinical competency (ASHA, 2010) when considering the client's and the family's cultural and linguistic preferences. According to the ASHA policy, SLPs should practice in a way that considers "the impact of culture and linguistic exposure/acquisition and uses the best available evidence for

practice to ensure optimal outcomes for persons with communication and/or swallowing disorders or differences” (American Speech-Language Hearing Association, 2007, p. 1). This policy suggests that SLPs must take into consideration the client’s and the family’s culture, values, and beliefs, along with the language preferences when assessing and treating individuals from a culturally and linguistically diverse population. Professionals must be aware of the features that influence the evaluation and the treatment process when dealing with bilingual children.

1.2 Bilingualism

When deciding what language of intervention to use when working with bilingual children with ASD, it is crucial to first understand the factors that affect bilingual language development. A child’s language development and acquisition reflects a combination of the input or exposure and the output or usage of language (Hammer, Komaroff, Rodriguez, Lopez, Scarpino, & Goldstein, 2012). The age of exposure, length and rate of exposure to the language, the educational settings, and the use of the language may affect a child’s language abilities. Bilinguals may learn the second language simultaneously or sequentially, depending on when the second language is presented. According to McLaughlin (1978) simultaneous bilingual acquisition is when children are exposed to the second language from birth and sequential bilingual acquisition is when children are exposed to the second language after the age of 3. A study that surveyed 191 Latino families to examine the aspects that affect bilingual children’s language abilities in their two languages found that children’s exposure to and usage of the two languages played a highly important role in their language development (Hammer et al., 2012). Results from this study suggest that children’s language use influenced their language abilities,

e.g. children who spoke more English had greater English vocabularies and children who spoke more Spanish had greater Spanish vocabularies.

There is evidence suggesting that, in bilinguals, two languages are represented in a single system by interacting in a dynamic way and being interconnected via lexical-level links and conceptual links (Gutierrez-Clellen, 1999). Bilingualism is considered a dynamic single system in which the first language (L1) and the second language (L2) are constantly interacting, rather than having two separate language systems for each (Goldstein, 2012). Lexical and conceptual links refer to the distribution of the total vocabulary and conceptual representation across the two languages (Goldstein, 2012). Many professionals believe that exposing children to two languages will require more effort to develop language skills and will limit the acquisition of the L2 (Yu, 2013; Gutierrez-Clellen, 1999). However, these professionals are not considering the dynamic interaction of the two languages and the sharing of common processes.

1.3 Bilingual Intervention In Bilingual Children With Language Impairment

There is limited research on the effects of language of intervention used in bilingual children with ASD and the impact of exposure to a second language. In studies of bilingual children with specific language impairment, no additional language delays were found when using a bilingual treatment approach (Perozzi, 1985; Perozzi & Sanchez, 1992; Thordardottir, Weismer, & Smith, 1997; Restrepo, Morgan, & Thompson, 2013). On the contrary, children were capable of acquiring both languages without hindering their overall language development. The studies demonstrated that the use of the L1 (home language) facilitated acquisition of the L2, and that using a bilingual intervention approach can be beneficial for the language development of children with language impairments.

In bilingual children, the development of the first language (L1) supports the development of the second language (L2). Previous research has shown that “children with language impairments can use skills developed in one language to facilitate the learning of skills in another language” (Yu, 2013, p. 12). Two studies demonstrated that the use of the L1 (home language) facilitated acquisition of the L2 (Perozzi, 1985; Perozzi & Sanchez, 1992). The studies measured the relationship between L1 (Spanish) and L2 (English) in facilitating learning of receptive vocabulary, including pronouns and prepositions. Both studies compared the effects of two language treatment conditions in children (ages 4 to 6) with language delays. Treatment in L1 followed by treatment in L2 facilitated acquisition of receptive vocabulary in L2 faster than when treatment was provided in L2 followed by treatment in L1 or when treatment was provided only in L2.

Bilingual intervention did not limit language acquisition when compared to a monolingual intervention (Thordardottir et al., 1997). In this single-subject alternating treatment design study, conducted with a bilingual child from Iceland with language impairment, two treatment conditions were compared. A monolingual English treatment condition was compared to a bilingual Icelandic-English treatment condition to measure the acquisition of school and home words learned in English. As a result, there was not a significant difference in the total number of words acquired between treatments; however, more home words were learned in the bilingual treatment than in the monolingual treatment.

Not only does a bilingual treatment approach not have negative effects on language skills, but also it produces greater gains in vocabulary. In a well-designed randomized control trial study by Restrepo et al. (2013), 202 preschool dual-language learners (DLLs) with language impairment were selected to participate in the study, along with a group of 54 typically

developing DLLs that did not receive intervention. DLLs with language impairment were either assigned to a Spanish-English vocabulary intervention, an English only vocabulary intervention, a bilingual mathematics intervention, or an English only mathematics intervention. After the intervention phase, acquisition of 45 treatment words in English and Spanish was measured. As a result, bilingual intervention facilitated Spanish vocabulary gains greater than in any other condition, and English vocabulary gains were comparable to those in the English only condition. These results suggest that in order to make gains in English vocabulary, it is not required to provide intervention in English only. However, providing intervention in English produced gains in English vocabulary only but had no effects on the Spanish vocabulary.

1.4 Bilingual Intervention In Bilingual Children With ASD

Research on language of intervention in bilingual children with ASD is limited. There is a lack of research to support the practice of limiting the language exposure to only one language in bilingual children with ASD. To our knowledge, there is no evidence that confirms that bilingual exposure will cause additional delays; to the contrary, previous research has demonstrated the opposite (Seung, Siddiqi, & Elder, 2006). A longitudinal case study, examined a bilingual, Korean-English boy diagnosed with ASD and language delays for a period of 24 months (Seung et al., 2006). Speech-language intervention was provided twice per week. During the first 12 months, the treatment was provided in the child's L1 (Korean). In the following 6 months, English was slowly presented into the treatment. During the last 6 months, the treatment was almost completely in English. As a result, the child's expressive and receptive language skills improved in both languages; as his native language vocabulary increased, his English vocabulary began to increase too. The study supported the practice of providing treatment in the native language first before conducting treatment in the second language.

In another study, a comparison of a Spanish (L1) treatment approach with an English (L2) treatment approach in a bilingual preschool child with ASD revealed that treatment in L1 yielded better results (Lang et al, 2011). The study measured the child's response to accuracy on identification of body parts and common objects by pointing, manding of specific objects, motor imitation, and challenging behavior. As a result, when the English treatment was compared to the Spanish treatment, the child performed better when treatment was delivered in the child's native language. The child showed higher correct responses and less challenging behaviors during the Spanish intervention than during the English intervention.

Other work has examined language outcomes of different types of bilingual children with ASD. Hambly and Fombonne (2012) found that bilingual children with ASD, exposed to two languages, did not experience additional delays in language development when compared to monolingual children with ASD. They compared social and language abilities of children with ASD from monolingual and bilingual environments in 45 bilingual children with ASD and 30 monolingual children with ASD (mean age of 56 months). The bilingual participants were assigned to two groups based on the language exposure: the simultaneous bilingual or sequential bilingual group. Twenty-four were simultaneous bilinguals (exposed to the second language before 12 months of age) and twenty-one were sequential bilinguals (exposed to the second language after 12 months of age). The study showed no significant differences in language abilities when comparing the simultaneous bilinguals to the sequential bilinguals. Also, no additional language delays were noted in bilingual children with ASD when compared to monolingual children with ASD.

1.5 Research Questions

The limited research on the use of language of intervention in bilingual children with ASD has led to the creation of this current study. The purpose of this study is to extend the limited research on the use of language for intervention in bilingual children with ASD. The research study compared the use of language of intervention, using monolingual English treatment and bilingual Spanish-English treatment, to examine which language condition was more efficient. It was predicted that the bilingual children with ASD would perform better in the bilingual treatment condition than in the monolingual treatment condition. The following questions were answered in the study:

1. Does a bilingual intervention produce greater gains in language performance in bilingual children with ASD than a monolingual intervention?
2. Does the language of intervention affect which language is used by bilingual children with ASD?
3. Do bilingual children with ASD code-switch more in a bilingual treatment condition than in a monolingual condition?

Chapter 2: Methods

2.1 Participants

2.1.1 Recruitment. Bilingual Spanish-English speaking children (female and male) with ASD were recruited from the community. During an Autism Awareness Family Picnic event, families of bilingual children with ASD were approached. Flyers were distributed with the purpose of the study and contact information. Participants had to meet the inclusionary criteria to participate in the study. Participants had to be bilingual in Spanish and English, diagnosed with ASD, and between the ages of three and seventeen. Exclusionary criteria were having a history of hearing problems, being nonverbal, having a significant articulation problem, and/or other neurological deficits. A total of two participants were recruited at this event. The parents of the participants were provided with information regarding the study and a meeting was scheduled to further explain the purpose of the study and to sign a written consent form.

2.1.2 Informed consent. An informational meeting was held with each participant's parents. During the meetings the parents were provided with a written consent form. Information was provided on the purpose of the study, the evaluation procedure, the treatment procedure, the risks, the benefits, and confidentiality. There were no risks associated with the study other than the risk of loss of confidentiality. There were no direct benefits for participating in the study other than the potential benefit from the language therapy. Both parents agreed to have their child participate in the study and signed the consent form.

2.1.3 Participant. The two participants recruited were bilingual Spanish-English speakers diagnosed with ASD. The first participant was a 3-year-old male. He was exposed to both English and Spanish at home, and only English at school. After signing the consent form, the parent did not respond to repeated phone calls or texts by the clinicians. The reason for

leaving the study was unknown but this child did not participate in the study after the parents signed the consent form.

The second participant was a 5-year-old female diagnosed with ASD at the age of 3 by a developmental pediatrician. The participant had received speech therapy in Early Childhood Intervention and was receiving speech therapy in school at the beginning of the study. She was exposed to both English and Spanish at home and school. This participant remained in the study until the end.

2.2 Study Design

A single-subject alternating treatment design with a baseline was implemented in this study. In such a design, two treatments are conducted in an alternating manner to compare the effects on a same behavior (Richards, Taylor, Ramasamy, & Richards, 1999). The treatments are alternated until an exit treatment criterion or a difference in performance between the two treatments is reached, indicating that one treatment is more effective over the other (Byiers, Reichle, & Symons, 2012). The exit treatment criterion for this study was set up to be at a discrepancy of 20% or more between the two treatment conditions across three consecutive sessions. To determine current functioning and potential targets for intervention, we first conducted an evaluation during the pre-intervention phase. The intervention study took place in the city of El Paso, Texas at the University of Texas at El Paso (UTEP), at the Speech, Hearing, and Language Clinic. The results of the evaluation and targeted goals are presented below followed by a description of the treatment.

2.3 Pre-Intervention Phase

2.3.1 Evaluation. Prior to intervention, the participant was evaluated in a quiet room at the UTEP Speech, Hearing, and Language Clinic by a graduate student clinician in the Speech-Language Pathology program, who was fluent in English and Spanish.

Case history. The participant's mother completed a case history questionnaire (Shipley & MacAfee, 2009), which was translated to Spanish by the graduate clinician as per the participant's mother request. The graduate clinician reviewed the case history questionnaire with the participant's mother during an interview in person. The participant's prenatal and birth history was unremarkable, without any complications. No delays were reported by the participant's mother in walking, running, and participating in activities that require small or large muscle coordination.

According to the participant's mother, her language development was normal. By 1-year, 3-months, she was combining two words, naming objects, and using simple questions, and then suddenly she stopped and regressed completely. The participant was a sequential bilingual Spanish-English speaker. Her first language was Spanish and she was first exposed to English at the age of 2. Her mother stated that she used both English and Spanish at home and school. At the time of the study, the participant communicated using 1-to-2 word phrases and gestures.

Language questionnaire. The participant's mother completed the *Bilingual English Spanish Assessment's* (BESA; Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2014) *Bilingual Input-Output Survey* (BIOS) and *Instrument to Assess Language Knowledge* (ITALK) to find out about the participant's language exposure and developmental history. The BIOS categorized the participant's language history exposure at home and at school in English, Spanish, or both, for each year of her life. For example, the mother was asked, "From 1 to 2

years old, did you and your family use Spanish, English, or both at home?” and “If your child attended school or daycare, were Spanish, English, or both used?”

The participant’s mother was also asked about the language input and output during a typical day during the week and the weekend on an hour-by-hour basis for the entire day that the child was awake. For example, the mother was asked, “From 9 to 10 am who does your child spend time with?” and “What language does he/she speak to your child in?” and “What language(s) does your child use?” Table 1 shows the percentages of English and Spanish, input and output in home and school. In both, home and school, the participant was exposed to more Spanish than English, and used more Spanish than English. At home, she spent time with her mother and sister. The participant’s mother had limited English proficiency and spoke to the participant in Spanish only. The participant’s sister spoke both Spanish and English. In school, both languages were used, however, Spanish was the main language used.

Table 1

Output-input percentages of use of language based on the BESA-BIOS

Language	Home		School	
	Input	Output	Input	Output
Spanish	62%	60%	62%	75%
English	38%	40%	38%	25%
Total	100%	100%	100%	100%

The ITALK calculates the child’s language use and proficiency in English and Spanish at home and school. It uses a scoring scale of 1 to 5, with 1 being the lowest score and 5 being the best score, across the following five domains: vocabulary proficiency, speech proficiency, sentence production proficiency, grammatical proficiency, and comprehension proficiency. Scores were assigned based on interviews conducted with the participant’s mother and teacher.

For example, to rate vocabulary proficiency, the mother and teacher were asked “How much English/Spanish vocabulary does the child use from the words she/he learns at home (e.g., food, clothing) or school (e.g. science terms)?” The ratings were the following: 1-few words; 2-limited range of words; 3-some words; 4-many words; 5-extensive vocabulary.

Table 2 shows the scores assigned to the participant for each of the five domains. School scores were provided by the participant’s teacher through a phone interview. Home scores were provided by the participant’s mother. The participant received scores lower than or equal to 3 in the areas of sentence production and grammatical proficiency in both, school and home; a score lower than 3 in vocabulary proficiency in school; and a score lower than 3 in speech proficiency in home. She received a high score in comprehension in both school and home. An average higher than or equal to 4.18 indicates no concerns. An average of less than 4.18 suggests conducting a speech-language assessment. The participant scored below a 4.18 in both languages for both home and school.

Table 2

Scores and averages from ITALK-School and ITALK-Home

Domains	School Scores		Home Scores	
	English	Spanish	English	Spanish
Vocabulary	1	2	3	5
Speech	5	5	2	3
Sentence production	1	1	2	2
Grammar	2	3	2	2
Comprehension	4	4	5	5
Average	2.6	3.0	2.8	3.4

Oral-facial examination and hearing screener. The clinician conducted a non-invasive oral-facial mechanism examination, which assessed the structure and function of the facial structure and oral cavity sections, such as the jaw, teeth, lips, tongue, pharynx, and palates for any irregularities. The participant was found to be within the normal limits for all the aspects of the oral-facial examination, indicating that she had adequate oral function to sustain speech production. The clinician conducted a bilateral pure-tone hearing screening to rule out any hearing problems. The hearing screening was conducted at 25 dB HL in the following frequencies: 500, 1000, 2000, and 4000 hertz tones in the right and left ear. The participant was instructed to raise her left or right hand when the pure tone air conduction was admitted to the corresponding ear. The hearing screening was attempted twice but the participant did not respond to any of the sound frequencies. It seemed the participant failed to respond to the sounds due to the participant's difficulty with following commands. The participant's mother did not express any concerns about the participant's hearing.

ASD ratings. A developmental pediatrician, independent to this study, had diagnosed the participant with ASD at the age of 3. The graduate student clinician completed the *Childhood Autism Rating Scale, 2nd edition, Standard Version* (CARS2-ST; Schopler, Van Bourgondien, Wellman, & Love, 2010) that was used to measure the severity of the symptoms of the ASD and the participant's functioning levels. The ratings were based on observations made by the graduate student clinician and on the information provided by the participant's mother in the Questionnaire for Parents or Caregivers (CARS2-QPC) during the interview. The graduate student clinician translated the questionnaire to Spanish for the participant's mother. The CARS2-QPC asks about the individual's behaviors in the following 7 areas: rating how the individual communicates, how he/she relates to others and shows emotions, how he/she moves

his/her body, how he/she reacts to new experiences and changes in routine, how he/she uses his/her senses (vision, hearing, touch, smell), and other behaviors (having unusual abilities or behaviors). For each behavior, a rating describing the behavior is given. The ratings are not a problem, mild-to-moderate problem, severe problem, not a problem now, and don't know.

The ratings and information provided in the CARS2-QPC were used to answer the CARS2-ST. The CARS2-ST consists of 15 category ratings. The category ratings were based on the following: relating to people, imitation, emotional response, body use, object use, adaptation to change, visual response, listening response, taste/smell/touch response and use, fear or nervousness, verbal communication, nonverbal communication, activity level, level and consistency of intellectual response, and general impressions. All of the ratings were added to obtain a total raw score and to indicate the severity group. The participant scored a total raw score of 31, which corresponds to a T-score of 40 and a percentile of 16 based on the age of the participant. A raw score of 30 to 36.5 is considered mild-to-moderate symptoms of ASD.

Language performance. The participant's receptive/expressive language skills were assessed using the *Preschool Language Scale – 5th edition, Spanish* (PLS-5, Spanish; Zimmerman, Steiner & Pond, 2012). The PLS-5 uses a dual language scoring system in which the items are administered in Spanish first and then the incorrect items are administered in English. It is composed of two subscales, the auditory comprehension and the expressive communication, which make up the total language score. Table 3 summarizes the results of the auditory comprehension and expressive communication assessments. The participant obtained a total language standard score of 59. A standard score in the range of 85 to 115 is considered average. This score placed her -2.73 standard deviations below the mean. This bilingual assessment demonstrated a significant impairment in receptive and expressive language across

her two languages. The participant presented with problems in the area of semantics, such as vocabulary, qualitative concepts, spatial concepts, quantitative concepts, and time/sequence concepts. She also presented with problems in the area of language structure, such as morphology and syntax. The participant showed good vocal development, use of gestures, and social communication.

Table 3

Results from the PLS-5, Spanish

Subscales	Raw Score	SS	SS CI (90%)	PR	PR for SS CI
Auditory Comprehension	41	62	59 to 71	1	1 to 3
Expressive Communication	33	61	58 to 73	1	1 to 4
Total Language Score	74	59	56 to 67	1	1 to 1

Note. SS = Standard Score; CI = Confidence Interval; PR = Percentile Rank. SSs are distributed with a mean of 100 and a standard deviation (SD) of 15. A score within 1SD below or above the mean (SS of 85 -115) is considered to be within the average. Any score below 1 SD (SS of 84 or less) is considered to be below the average.

Spontaneous conversational play language samples were collected in English and Spanish. The language samples were transcribed and analyzed using the *Systematic Analysis of Language Transcripts Software* (SALT; Miller, Andriacchi & Nockerts, 2011). During a 15-minute language sample in Spanish, the participant presented with a mean length of utterance (MLU) of 1.80. And in a 15-minute language sample in English, she presented with a MLU of 1.81.

2.3.2 Treatment plan. The following two target goals were selected by the clinician based on identified needs from the evaluation. Goal #1: The participant will follow two-step oral commands with a modal score of 5 or higher. The two-step oral commands consisted of two

individual commands linked by a basic conjunction, e.g. “*Grab the red block and put it under the table,*” or “*Close the door, then sit down.*”. This goal was measured using the multimodal scoring system on Table 4.

Table 4

Multimodal scoring system used during following two-step commands task

Multimodal Scoring System	
6	Correct without prompting
5	Correct with repetition of directions
4	Correct with imitation
3	Incomplete
2	Incorrect
1	No response

A score of 1 denoted no response, in which the participant would not respond to the clinician’s commands. A score of 2 denoted an incorrect response, in which the participant would perform both commands incorrectly. A score of 3 represented an incomplete response, in which the participant would follow only one step of the two-step command, or when the participant would perform an extra task in between the two correct commands. A score of 4 signified a correct response with imitation, in which the clinician would perform the task and elicited the participant to imitate the task. A score of 5 denoted a correct response given repetition of directions, in which the participant followed the two-step command correctly after being given the directions a second time. In the monolingual English condition, the commands were given and repeated in English if needed, while in the bilingual Spanish-English condition, the commands were first given in Spanish and repeated in English if needed. A score of 6

represented a correct response without prompting, in which the participant performed the task without any cues or repetition of directions from the clinician.

Goal #2: The participant will increase MLU to 3 or higher in spontaneous productions during conversational play using words or word approximations during a 5-minute language sample. MLU production was measured through the use of the *SALT Software* (Miller et al., 2011). Spoken productions were considered to be any spontaneous productions that the participant provided during conversational play activities in response to answering questions asked by the graduate clinician, asking questions to the clinician, commenting or requesting for items or actions.

2.3.3 Baseline. Baseline data was collected until a consistent performance over time was obtained. Based on the participant's performance on the evaluation process, baseline data was collected for MLU production during conversational play and for following two-step oral commands. Baseline for MLU in spontaneous production during conversational play was collected in Spanish and English for three sessions. During each session, three 5-minute segments for each condition were randomly selected, transcribed and analyzed using the *SALT Software* (Miller et al., 2011) to obtain the participant's MLU. During the baseline sessions, the participant was presented with various toys such as puzzles, play-doh, bowling pins, and Mr. Potato Head to elicit spontaneous productions during play conversation. Baseline data was also collected for the following two-step oral commands tasks in the participant's dominant language, Spanish, for two sessions.

2.4 Intervention Phase

A single-subject alternating treatment design with a baseline was implemented in this study to compare the effectiveness of the language of intervention conditions on increasing MLU

in spontaneous productions and on following two-step oral commands in a bilingual child with ASD. Intervention was provided twice per week for 7 weeks for a total of 14 sessions. During the 7-week intervention period, a total of two sessions were cancelled due to participant's and clinician's illness, giving treatment only once per week during those 2 weeks of the intervention phase. There was a make-up session at the end of the intervention phase, giving treatment three times per week during the last week. Treatment conditions were alternated within sessions. The order of the treatment conditions was predetermined in a random way through the use of an online randomizer, having no more than three consecutive sessions with the same order.

2.4.1 Session description. The treatment sessions were given in a quiet room with a two-way mirror at the university clinic. The clinician recorded the treatment sessions through the use of a video camera and a voice recorder. A graduate student clinician in the speech-language pathology graduate program at UTEP conducted the treatment sessions and an undergraduate student assisted the graduate clinician. Materials used during therapy included visual schedules of activities presented, picture books, and toys such as dress-up dolls, Mr. Potato Head, bubbles, puzzles, food items, and play-doh. The room had a wooden table, two plastic chairs, and a metal bookshelf.

Each treatment session was 60 minutes long and was divided into two 30-minutes blocks with a five-minute break in between the two treatment blocks. The schedule of the conditions was predetermined using an on-line randomizer in order to randomly alternate the treatment conditions within a session to eliminate order effect. One treatment condition was presented in one treatment block in a random order with the restriction of a maximum of three consecutive sessions with the same order of conditions. For example, the monolingual English treatment was given for 30 minutes, followed by the bilingual Spanish-English treatment, which was given for

another 30 minutes, and vice versa. Table 5 shows the order of treatment conditions for the counterbalanced alternative treatment phase. The monolingual English treatment condition, followed by the bilingual Spanish-English treatment condition was presented for a total of 6 sessions. The bilingual Spanish-English treatment condition, followed by the monolingual English treatment condition was presented for a total of 8 sessions.

Table 5

Order of alternating treatment conditions

Session	1	2	3	4	5	6	7	8	9	10	11	12	13	14
First Block	X_2	X_2	X_1	X_1	X_1	X_2	X_1	X_2	X_2	X_2	X_1	X_2	X_1	X_2
Second Block	X_1	X_1	X_2	X_2	X_2	X_1	X_2	X_1	X_1	X_1	X_2	X_1	X_2	X_1

Note. X_1 = monolingual English treatment, X_2 = bilingual Spanish-English treatment

The study was designed so that once a significant difference between the two alternating treatment conditions was observed, only the most successful treatment condition would be retained and continued. To reach this significant difference, treatment scores had to differ by 20% or more across three consecutive sessions. However, this criteria was not met during the study so the alternative treatment conditions continued throughout the 7 weeks of intervention, which will be further discussed in the results section.

During the monolingual English treatment condition, the clinician spoke English only regardless of the participant's use of language. During the bilingual Spanish-English treatment condition, the clinician spoke both, English and Spanish, and followed the participant's use of language. If during the structured play activities, the participant would not respond to comments or questions made by the clinician in one language, the clinician would make the same comment or question using the second language.

In each treatment block, the following two-step commands task was presented first, followed by the play-based conversational task. In between treatment blocks, the participant was taken out of the treatment room and was allowed to play for 5-minutes with a desired game or toy that was not used during the play-based conversational task, or was allowed to watch an online video, such as the Three Little Monkeys Jumping on the Bed, Itsy Bitsy Spider, and Frosty the Snowman.

2.4.2 Following commands. During the treatment phase, performance on the two-step oral commands was collected in the monolingual English condition and the bilingual Spanish-English condition. When treating the following two-step oral commands, the participant was presented with four blocks of different colors (red, blue, green, yellow) and a clear plastic bag for one treatment condition and with two plastic animals (a cow and a dog), a cup, a strawberry and a box for the other treatment condition. The materials used were alternated per week for each condition as to eliminate the possibility of the scores being affected by the materials used in the treatment condition rather than by the treatment. In the first six treatment sessions, the participant was presented with 5 trials on each treatment condition. As the participant's attention span increased, the number of trials was increased to 10 trials per treatment condition. The two-step oral commands used for treatment are presented in the Appendix. Treatment consisted of providing scaffolding strategies.

Reliability. An undergraduate student observed approximately 20% of the sessions (3 sessions) in a random order and independently scored the two-step oral commands tasks. Reliability was calculated by obtaining the total number of agreements between the clinicians, divided by the total number of agreements plus disagreements, and then multiplied by 100. The two-step oral commands inter-rater reliability was at 100% accuracy.

2.4.3 MLU production. During the structured play-based activities, the participant was presented one to two toys per treatment block to elicit spontaneous productions. No same toy was used for the two treatment conditions during the same week as to reduce the influence of one treatment condition on the other treatment condition. All treatment sessions consisted of language facilitation strategies and contextualized intervention that was centered on a main theme. The use of language expansion and language extension was implemented. For example, when the participant produced “doggy eat,” the clinician expanded the phrase by saying, “yes, the dog is eating” and extended the phrase by saying, “The dog is eating. It is hungry.” The clinician elicited the participant to elongate her speech productions by using modeling, repetition, and following the participant’s lead. The use of a visual schedule was implemented in all treatment sessions to address the participant’s behavior and attention to task, and to encourage participation in all activities presented. At the end of the session, the participant was provided with a sticker and a snack as a reward for participating in all the activities presented.

MLU production by treatment condition. During the structured play-based activities, 5-minute language samples from each of the two treatment conditions (monolingual English and bilingual Spanish-English) were collected, transcribed and analyzed using the *SALT Software* (Miller et al., 2011) to obtain the participant’s MLU. A total of two MLU productions by the participant were obtained; one for the monolingual English condition and another one for the bilingual Spanish-English condition, for each session. The transcriptions were separated by treatment condition, regardless of the language used by the participant.

MLU production by language. The transcriptions from the 5-minute language samples used to calculate MLU production by treatment condition were used to calculate MLU production by language. Each transcription, from every session, from both treatment conditions

was further analyzed by separating the language used (Spanish and English) by the participant. For example, in the monolingual English condition, the participant's utterances were separated into Spanish transcription and English transcription. Each language transcription was used to calculate the MLU production by language, leaving us with a Spanish MLU production and an English MLU production in the same monolingual English condition. The same was done for the bilingual Spanish-English condition for each treatment session. Utterances in which the participant code-switched were not included.

Reliability. An undergraduate student observed approximately 20% of the sessions (3 sessions) in a random order, and independently analyzed and transcribed the 5-minute language samples to obtain the MLU. The MLU transcription reliability was at 88% accuracy. Reliability was calculated by obtaining the total number of agreements between the clinicians, divided by the total number of agreements plus disagreements, and then multiplied by 100.

Coding. The 5-minute language samples from each intervention session that were randomly selected to score MLU production were also used to examine the participant's use of code switching. Code switching is when an individual alternates between languages in a single sentence or conversation. For our participant, we were looking at alternations or code switching between English and Spanish. We analyzed them using *SALT Software* (Miller et al., 2011) by adding codes to label each of the utterances in which the participant was code switching. A total of four different codes were used to identify the type of code switching. Table 6 shows the codes with descriptions and examples. The code [CW] was used when the participant code switched one or more words within a single utterance. The code [CU] was used when the participant code switched an entire utterance between utterances.

Table 6

Coding system used for transcription of language samples

Code	Description	Example
[CW]	Code-switching one or more words within an utterance	C Ahí a the store [CW].
[CU]	Code-switching an entire utterance, between utterances produced by the participant.	C Morado. E What are you going to make? C A purple [CU][E]. E Purple?
[E]	Elicited. Code switching due to the clinician's change of language. Based on the utterance used before.	C Finger (finger, finger). E Okay, ahora ya terminaste de pintar tu niño? C Sí mira [CU][E]. E ¿Cual otra mas vamos a pintar?
[S]	Spontaneous. Code switching between utterances or within utterances not based on the clinician's use of language.	C Yes two hand/s. E So say, he has two hands. C Quiero querer una [CU][S]

In addition to those two codes, [E] and [S] were also used to further describe the type of code switching. The code switching produced *within* [CW] or *between* [CU] utterances was either *elicited* [E] or *spontaneous* [S]. When the participant alternated between the two languages based on the language that was used by the clinician, we called it “elicited” and the code [E] was used. It was called “elicited” since the code switching occurred due to the participant following the clinician's code switch, not because it was intentionally elicited. When the participant alternated the two languages without being influenced by clinician's the use of language, we used the code [S]. After the transcriptions were coded, they were analyzed using rectangular files to compare the number of instances in which the participant code switched in each session and

the type of code switching. Once the rectangular files were obtained for the monolingual English treatment condition and for the bilingual Spanish-English condition, the standard deviations and the means were calculated.

Reliability. Coding reliability was obtained by having an undergraduate student randomly select and code approximately 20% of the sessions; a total of 3 sessions. The coding reliability for code switching in the transcriptions was at 100% accuracy. Reliability was calculated by obtaining the total number of agreements between the clinicians, divided by the total number of agreements plus disagreements, and then multiplied by 100.

2.5 Post-Intervention Phase

After the intervention sessions, a post intervention session was conducted. During this session, no treatment was provided due to maintenance purposes. Both treatment goals were probed to compare the scores obtained in the post intervention session to the scores obtained in the baseline sessions. The bilingual Spanish-English condition was presented first, followed by monolingual English condition. Data was collected for MLU production during conversational play and for following two-step oral commands.

Chapter 3: Results

The information gathered during the intervention and post-intervention phase provided us with the answers to our three research questions. Results were obtained by using visual inspection, obtaining effect size, and calculating means and standard deviations. The results will be presented in terms of answering the research questions.

3.1 Language Performance in the Treatment Conditions

To answer the first research question: Does bilingual intervention produce greater gains in language performance in bilingual children with ASD than monolingual intervention? The participant's performance on the two treatment goals was examined.

3.1.1 Following two-step commands. The first goal targeted receptive language skills. The goal was the following: The participant will follow two-step oral commands with a modal score of 5 or higher. Table 4 shows the multimodal scoring system used. The results of the comparison between the languages of intervention for the following two-step oral commands are displayed in Figure 1. Figure 1 shows the multimodal scores received by the participant during the following two-step commands tasks in the monolingual English and bilingual Spanish-English treatment conditions in two baseline sessions, fourteen intervention sessions for each treatment condition, and one post-treatment session.

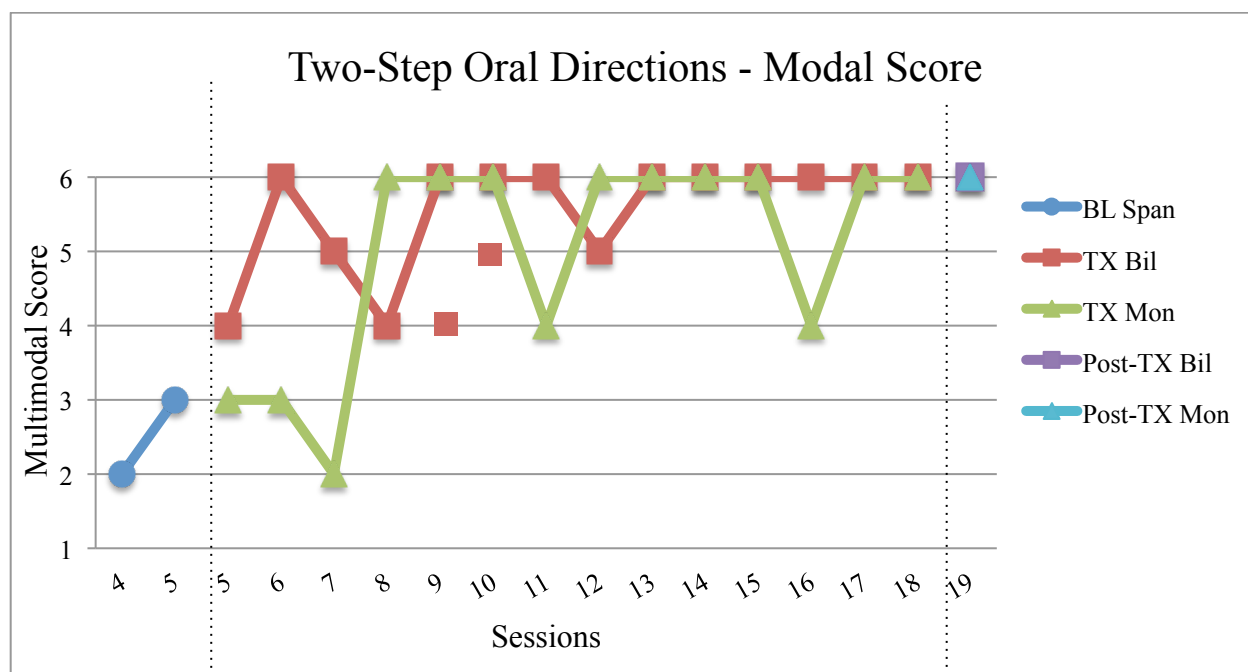


Figure 1. Responses to following two-step oral commands in baseline, treatment, and post-treatment sessions in both conditions. BL = baseline, TX = treatment, Span = Spanish, Bil = bilingual, and Mon = monolingual. Refer to table 3 for interpretation of the multidimensional scoring system.

Visual analysis was used to analyze the graphs with the data obtained from the participant's performance. The participant's performance in the baseline sessions was represented by an incorrect and incomplete response. In the treatment sessions, the participant's performance initially increased in the bilingual Spanish-English condition only; however, in the fourth treatment session, the participant's performance increased in the monolingual English condition too. In the first treatment sessions, the participant required demonstration of the two-step commands by the clinician in order to imitate. She also required repetition of directions by the clinician to perform the commands.

In two treatment sessions, during the bilingual Spanish-English condition, the participant showed bimodal scores, as illustrated on Figure 1 (treatment sessions 9 and 10). At the end of the treatment phase, in the last six sessions, the participant presented with a consistent modal score of 6, denoted by correct performance without prompting, in both conditions, except for one

session in the monolingual condition in which the participant presented with a modal score of 4. Even though at the beginning of the treatment phase the participant began to perform better in the bilingual Spanish-English condition, there was no clear difference between the two conditions at the end. At the end of the treatment phase, the participant received higher scores and a ceiling effect was reached. In the post-intervention session, the participant maintained a modal score of 6 for both treatment conditions.

The effect size of each treatment condition was obtained by calculating the percent non-overlapping data (PND). The PND was calculated by identifying the highest baseline point, counting the number of intervention data points that are higher than the highest baseline point, then dividing it by the total number of intervention data points, and multiplying it by 100. An effect size of 90% to 100% is considered to be highly effective, 70% to 89% moderately effective, 50% to 69% minimally effective, and less than 50% ineffective (Olive & Franco, 2008). The PND of the bilingual Spanish-English treatment condition was 100%, which was a highly effective treatment. The PND of the monolingual English treatment condition was 79%, which was a moderately effective treatment. The effect sizes calculated for the two treatment conditions show a significant effect on both treatment conditions; however, the bilingual condition had a higher effect than the monolingual condition.

3.1.2 Increasing mean length of utterance. The second goal targeted expressive language skills. The goal was the following: The participant will increase MLU to 3 or higher in spontaneous productions during conversational play using words or word approximations during a 5-minute language sample. Five-minute language samples from the participant's spontaneous productions during conversational play were randomly selected from each condition from every treatment session. Each language sample was transcribed and analyzed using *SALT Software*

(Miller et al., 2011) to calculate the MLU in words. Figure 2 shows the participant's MLU in words in the monolingual English condition and the bilingual Spanish-English condition in three baseline sessions, fourteen intervention sessions for each condition, and one post-treatment session.

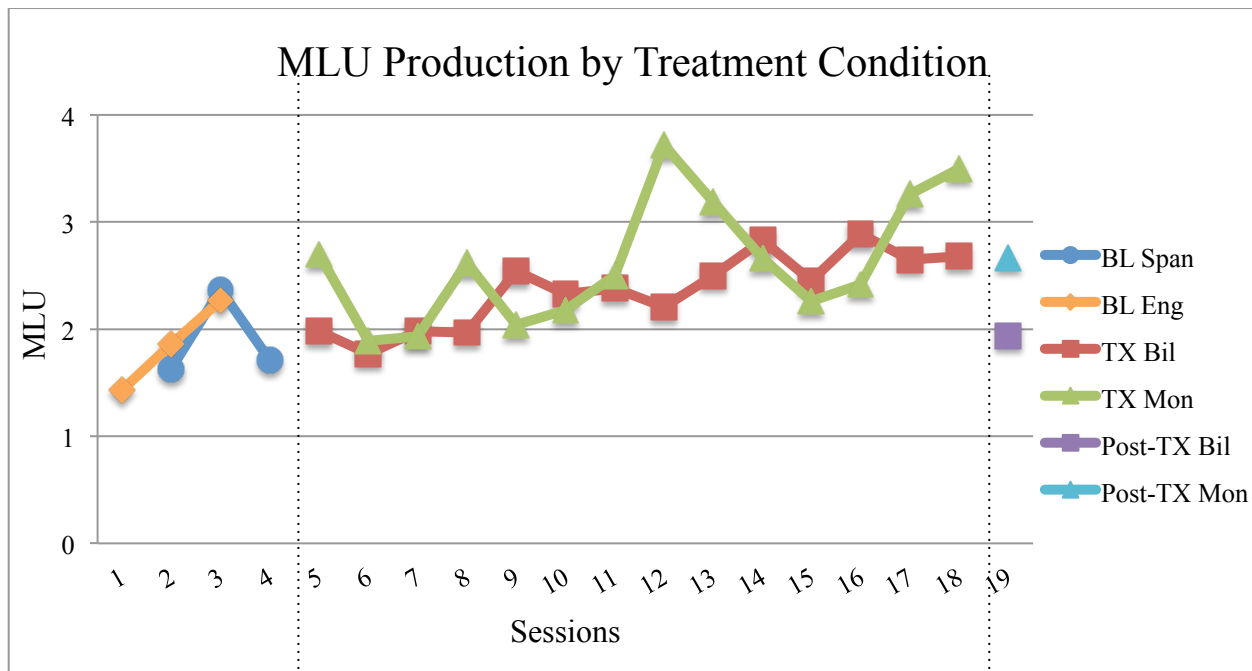


Figure 2. Spontaneous production of word utterances measured by mean length of utterance (MLU) in baseline, treatment, and post-treatment sessions. BL = baseline, TX = treatment, Span = Spanish, Eng = English, Bil = Bilingual, and Mon = monolingual.

Visual analysis was used to examine the graphs with the data obtained from the participant's performance. The participant's production of MLU in words in the baseline sessions were represented by a range of 1.43 to 2.27 in monolingual English and a range of 1.63 to 2.37 in bilingual Spanish-English. During the treatment phase, in the monolingual English condition, the lowest MLU production was represented by a 1.89 and the highest by a 3.72. There was an increasing but variable trend in the monolingual English condition. The lowest MLU in the bilingual Spanish-English condition was a 1.77 and the highest was a 2.89. Initially, there was no

immediate improvement observed in the bilingual condition; however, improvement was observed in the fifth treatment session, with an increasing but variable trend.

When comparing MLU production in both treatment conditions, there was a slight increase in both conditions; however, no clear difference in MLU in words between the two treatment conditions was observed. In the post-treatment session, the participant showed a decrease in MLU production in both treatment conditions. Even though the participant's performance decreased during the post-treatment phase, her performance in post-treatment monolingual English was still higher than the monolingual English during the baseline phase. The PND was calculated for both conditions to obtain the effect size of each treatment condition. The PND of the bilingual Spanish-English condition was 57%, and for the monolingual English treatment was 64%. The PND calculated shows a minimally effective treatment for both treatment conditions.

3.2 Participant's Use of Language

To answer the second research question: Does the language of intervention affect which language is used by bilingual children with ASD? The participant's use of language was examined by calculating the MLU productions in English and Spanish for each treatment condition, as illustrated in Figure 3. The participant's English MLU productions were calculated for the monolingual English treatment condition and for the bilingual Spanish-English treatment condition. The participant's Spanish MLU productions were calculated for the monolingual English treatment condition and for the bilingual Spanish-English treatment condition. In the monolingual English condition, the clinician spoke English only regardless of the language used by the participant. As seen in Figure 3, in the monolingual English treatment condition, the participant spoke English in every session and Spanish was used only once (session 14). In the

bilingual Spanish-English treatment condition, the participant used Spanish in every session and English in nine out of the fourteen sessions.

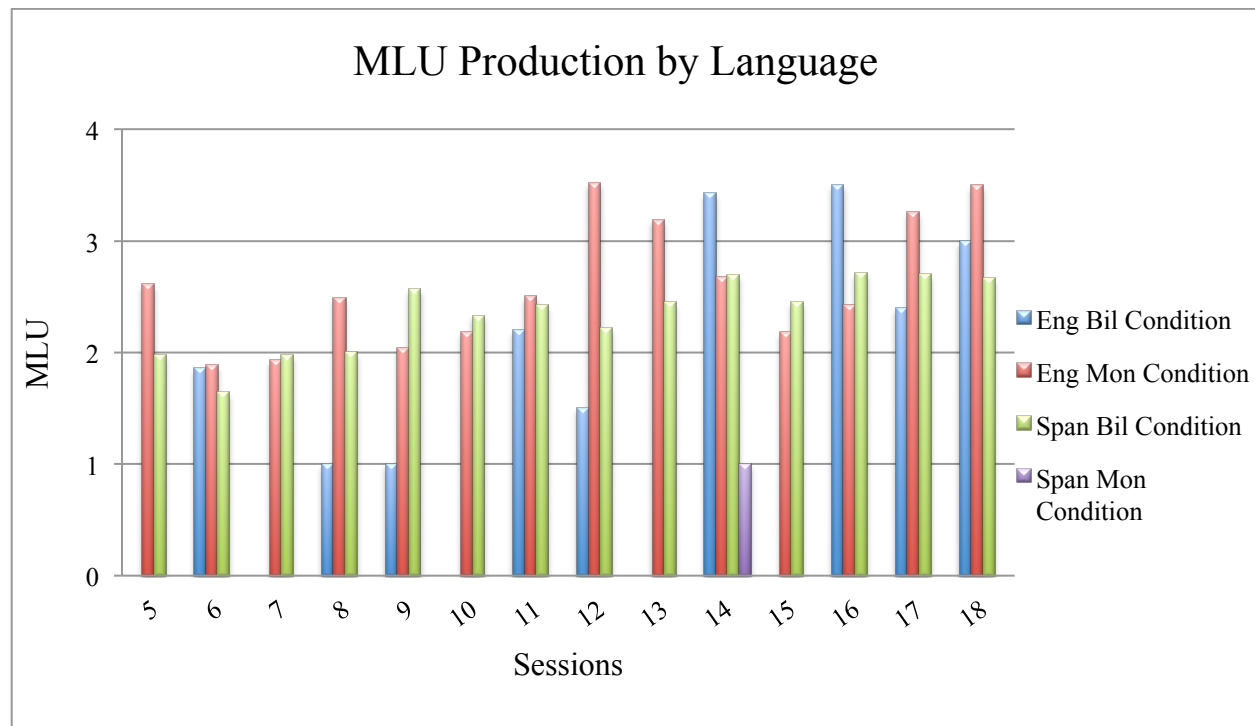


Figure 3. Production of mean length of utterance (MLU) in Spanish and English by treatment condition (monolingual English condition and bilingual Spanish-English condition). Eng = English, Span = Spanish, Bil = bilingual Spanish-English, and Mon = monolingual English.

3.3 Code-Switching

To answer the third research question: Do bilingual children with ASD code-switch more in a bilingual treatment condition than in a monolingual condition? The participant's coded transcriptions were analyzed using rectangular files. The standard deviations and the means were then calculated for each type of code. Refer to Table 6 for descriptions and examples of the coding system. Table 7 displays the results obtained for the standard deviations, means, and percentages of occurrence for all the code-switching codes for both treatment conditions.

On average the participant code switched between utterances 1.89 times per session in the bilingual condition and only 0.11 per session in the monolingual condition. There was no difference in code switching within utterances between the two treatment conditions. The

participant code switched within utterances an average of 0.61 times per session on the monolingual English condition and 0.50 times per session on the bilingual Spanish-English condition. The participant code switched more between utterances than within utterances. When looking at the code switching between utterances in the bilingual Spanish-English condition, 23% were spontaneous and 77% were elicited. In the monolingual English condition, 50% of the utterances were spontaneous and 50% were elicited.

Table 7

Code-switching means, standard deviations, and percentages

Treatment condition	[CW]	[CU]	%CUS	%CUE
Monolingual English				
Mean	0.61	0.11	0.50	0.50
SD	1.092	0.323	0.707	0.707
Bilingual Spanish-English				
Mean	0.50	1.89	0.23	0.77
SD	0.79	2.45	0.40	0.40

Note. SD = standard deviation, CW = code-switching within an utterance, CU = code-switching between utterances, S = spontaneous, and E = elicited.

Chapter 4: Discussion

In this study we used a single-subject alternating treatment design with a baseline to examine the effect of the use of language of intervention in bilingual children with ASD by comparing a monolingual English treatment to a bilingual English-Spanish treatment. The participant was a 5-year-old female diagnosed with ASD. The following questions were answered in the study: Does a bilingual intervention produce greater gains in language performance in bilingual children with ASD than monolingual intervention? What is the language used (Spanish or English) by the bilingual children with ASD, based on the language of intervention? Do bilingual children with ASD tend to code-switch more in a bilingual Spanish-English treatment condition than in a monolingual English treatment condition?

4.1 Benefits From Monolingual And Bilingual Conditions

The participant was exposed to two treatment conditions, monolingual English and bilingual Spanish-English, to target performance on following commands and MLU production. It was intended for the two treatment conditions to be randomly alternated until an exit treatment criterion of a difference of 20% or more was reached between the two conditions. Then, only the most successful treatment condition was going to be maintained. The exit treatment criterion was not met and therefore the two treatment conditions were used throughout the intervention phase.

Visual inspection and effect size were used to examine the results obtained from the participant's performance. The participant showed improvement in language performance during both treatment conditions with minimal variability. These findings suggest that the participant benefited from the bilingual treatment condition as well as from a monolingual one. There was no difference in performance between the monolingual and bilingual intervention. That is, the

participant was able to improve her performance in following commands and MLU production when using a bilingual and a monolingual treatment approach.

4.1.1 Following commands. Initially, the participant's performance increased in the bilingual Spanish-English condition only. By the fourth treatment session, the participant's performance increased in the monolingual English condition too. At the end of the treatment, there was no difference between the two treatment conditions. The results suggest that the participant similarly benefited from the treatment provided in the two conditions, the monolingual English condition and the bilingual Spanish-English condition. Not only did the participant benefit from both conditions but she also maintained performance. The post-intervention session demonstrated the efficacy of the therapy in both conditions to improve and maintain the participant's score in the following commands task.

Even though the participant benefited from conditions, the bilingual condition was more effective for following commands. When calculating for the PND, the monolingual condition was shown to be moderately effective and the bilingual condition was highly effective. This could be due to the faster improvement seen in the participant's performance during the bilingual condition. Initially the participant improved immediately in the bilingual condition only but with time, she improved in the monolingual condition too. These findings suggest that bilingual treatment condition produced a faster effect in the participant's performance.

4.1.2 MLU production. A slight increase but variable trend was observed in the monolingual and bilingual treatment conditions. Initially, improvement in the monolingual English condition only was observed. Improvement in the bilingual Spanish-English condition was not observed until the fifth treatment session. When comparing the participant's MLU production in both treatment conditions, more variability in performance was observed in the

monolingual English condition. The bilingual condition showed a more steady performance. The post-intervention session demonstrated that the MLU production rate was not maintained when treatment was not provided. Calculations from the PND showed both treatment conditions to be minimally effective. Even though the treatment effectiveness was minimally effective, just by comparing the participant's performance, the results revealed similar benefits from both conditions. These findings suggest that the participant benefited from the monolingual and bilingual conditions similarly. There was no difference in her performance between the two treatment conditions.

4.2 Language Use Based on the Communication Partner

The participant's use of language was examined by analyzing the production of MLU in Spanish and English separately. In the bilingual treatment condition, the participant used Spanish every time and English most of the time. English was used by the participant when the clinician was using it too. We found that the participant used Spanish only in one treatment session during the monolingual English treatment sessions, which was when the clinician was using English and no Spanish. These findings suggest that the participant used a particular language based on the language used by the communication partner, in this case, the clinician. The findings imply that the participant was following the appropriate conversational rules for the specific social context. Even though children with ASD have difficulty adjusting to social situations and have poor communication skills (Seung et al., 2006) the participant adjusted her language choices based on the clinician's use of language.

4.3 Code-Switching Based on Social Aspects

The results obtained from the transcriptions with the code-switching codes showed no difference in code switching one or more words within an utterance when comparing the two

treatment conditions. The participant presented with more code switching of an entire utterance between utterances in the bilingual condition than in the monolingual condition. Most of the code switching between utterances was based on the clinician's change of language used. The higher rate of this type of code switching indicates that the participant was following the clinician's lead. Similar results were obtained from examining the participant's use of language to answer the second research question. The code switching in the monolingual condition could suggest that the participant was using it as a strategy to fill in the gap of an unknown word.

4.4 Limitations

This study has limitations that should be addressed in future research. First, this study only addressed MLU production during conversational play and performance on following two-step oral commands. Further research should address other behaviors; not only communicational behaviors but also social behaviors that are typical of children with ASD, such as making eye contact and maintaining joint attention. Second, the amount of treatment sessions may not have been enough time to show a significant change in the participant's MLU production. It would have been interesting to look at the effect of each treatment condition on MLU production given more treatment time. Third, baseline did not show stable performance over time. Baseline on the two-step oral commands was collected only over two treatment sessions and showed an increasing trend. Baseline on the production of MLU was rising and not stable. Even though it is preferable to have a baseline, alternating treatment design studies do not require one (Richards et al., 1999). The purpose of an alternating treatment design is to compare the relative effects of the two treatments not the absolute effect of either one.

4.5 Clinical Implications

The study's findings suggest that providing a bilingual treatment does not have a negative effect on the language abilities in children with ASD; on the contrary, the study demonstrated that the bilingual child benefited from the bilingual treatment as well as from the monolingual treatment. This study supports the studies of Perozzi (1985), Perozzi & Sanchez (1992), Thordardottir et al. (1997), and Restrepo et al. (2013) that emphasize the practice of bilingual treatment in bilingual children with a language disorder, including children with ASD (Seung et al., 2006; Lang et al., 2011; Hambly & Fombonne, 2012). Eliminating a child's native language can cause further problems, as it reduces or eliminates communication with family members (Yu, 2013). On the other hand, eliminating the second language, English, may cause academic problems and create poor communication with the community; hence, the importance of supporting both languages in bilingual children with communication disorders such as bilingual children with ASD.

The results from the study suggest that the use of bilingual intervention did not negatively affect language abilities, as the participant benefited from the monolingual English condition as well as from the bilingual Spanish-English condition. This study supports the position that bilingual children with ASD can benefit from both monolingual and bilingual interventions; therefore a bilingual child can be exposed to both languages to facilitate development of L1 and L2. Using a bilingual approach to intervention will help conserve the child's home language and will prevent language loss. "The available literature suggests that intervention approaches may be most successful when they are designed to extend, rather than limit, the child's linguistic resources" (Gutierrez-Clellen, 1999).

Clinicians and parents of bilingual children with ASD make treatment language choices based on various reasons that have not been supported by evidence in the literature (Hambly & Fombonne, 2012; Kay-Raining Bird et al., 2012; Yu, 2013). Such choices have been influenced by the parents' language abilities, choices of special education, community value on the minority language, among many others, but clinicians should guide parents based on the research supporting the use of language. Based on the information from this study and the previous studies mentioned, parents of bilingual children with ASD should not be discouraged from exposing their children to a second language and maintaining their native language.

A bilingual child with ASD may similarly benefit from a monolingual treatment approach, as from a bilingual treatment approach. Professionals should consider using bilingual treatment approaches when working with bilingual children with ASD. It should be noted that this study is a single subject design study with only one participant. Replication of the current study is needed in order to generalize the results obtained to a larger population. This study was conducted in a border region city in which bilingualism is common. Studies conducted in other areas might find different studies based on the bilingual population from that area.

4.6 Future Directions

This is a first step study and future studies should focus on replication of this study. As mentioned previously, there is limited research on bilingual treatment in bilingual children with ASD. Replication is needed to confirm the results obtained in this study and to develop the limited research on bilingual children with ASD. Due to the heterogeneity of the population with ASD, it is important to use other participants with different levels of severity of ASD as this study was only based on one participant. Future studies should also compare the effects of the use of language in other behaviors. This study focused on communication behaviors only,

following two-step oral commands and MLU production. Future research should address other communication behaviors and social behaviors typical of children with ASD. Something else to consider in future research is the possibility of reaching a ceiling effect. In this current study, a ceiling effect was reached in the following two-step commands task. Future research should consider the ceiling effect and should increase the criteria or difficulty of the behavior targeted.

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Appendix

Two-Step Oral Commands

English	Spanish
<ol style="list-style-type: none"> 1. Touch your nose and say your name 2. Take the red block out of the bag and put it on top of the green block 3. Put the blue block in the bag and then give me two blocks 4. Put the red block in the bag and then touch your ear 5. Wave hello and point to the floor 6. Give me a high-five and then give me the blue block 7. Touch your nose and then touch your chair 8. Put all the blocks in the bag and then give me the bag 9. Put the blue block under the table and then touch the wall 10. Take the blue block out of the bag and put it on top of the red block 	<ol style="list-style-type: none"> 1. Toca tu nariz y di tu nombre 2. Saca el bloque rojo de la bolsa y ponlo arriba del bloque verde 3. Pon el bloque azul adentro de la bolsa y luego dame dos bloques 4. Pon el bloque rojo adentro de la bolsa y luego toca tu oreja 5. Saluda y apunta al piso 6. Chócala conmigo y luego dame el bloque azul 7. Toca tu nariz y luego toca tu silla 8. Pon todos los bloques adentro de la bolsa y luego dame la bolsa 9. Pon el bloque azul abajo de la mesa y luego toca la pared 10. Saca el bloque azul de la bolsa y ponlo arriba del bloque rojo
<ol style="list-style-type: none"> 1. Say your name and jump two times 2. Take the cow out of the box and put it under the table 3. Give water to the dog and food to the cow 4. Put the cow and the dog in the box and then give me the box 5. Put the cow under your seat and then touch the wall 6. Take the dog out of the box and give it food 7. Give water to the cow and then give me the cow 8. Put the dog in the box and then touch your eyes 9. Stand up and touch your nose 10. Touch your ear and smile 	<ol style="list-style-type: none"> 1. Di tu nombre y brinca dos veces 2. Saca la vaca de la caja y ponla abajo de la mesa 3. Dale agua al perro y comida a la vaca 4. Pon a la vaca y a el perro adentro de la caja y luego dame la caja 5. Pon la vaca abajo de tu silla y luego toca la pared 6. Saca el perro de la caja y dale comida 7. Dale agua a la vaca y luego dame la vaca 8. Pon el perro adentro de la caja y luego toca tus ojos 9. Ponte de pie y toca tu nariz 10. Toca tu oreja y sonríe

Curriculum Vita

Victoria Alexander was born in México in Ciudad Juárez, Chihuahua. She is the second daughter of Dr. Jorge Alexander and Patricia Alexander, and is married to Mariano Valenzuela. She received a bachelor's of science in psychology from The University of Texas at El Paso (UTEP) in 2007. While pursuing her bachelor's degree, she enrolled in the Bilingual Cognition Laboratory to assist Dr. Wendy S. Francis. She collaborated to the writing of the research paper, *Accommodating "backward" repetition priming effects in a transfer appropriate processing model*, in which the abstract was published on the *Abstracts of the Psychonomic Society*. In the fall of 2013, she entered UTEP to obtain her Masters of Science in Speech-Language Pathology, with a Bilingual Certification. She was awarded the Preparing Bilingually Certified Speech Language Pathologists' grant for the 2014-2015 school year. While pursuing her Master's degree, she became part of the Research in Bilingual Language Learning Laboratory under the supervision of Dr. Connie Summers. She participated in the 1st Annual Interdisciplinary Symposium: 21st Century Developments in Health Promoting Fields. Her research was presented at the 2014 UTEP Graduate Student Research Expo and at the Texas Speech Language Hearing Association 2015 Annual Convention. She served as a community service officer for the National Student Speech Language Hearing Association for two years, and is currently a social service officer.

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