Effect of Language Intervention on Mean Length of Utterance in Monolingual and Bilingual Children with Autism Spectrum Disorders in a Multi-Ethnic-Lingual Context

Sunitha Sendhilnathan, MASLP, M.A. (Psychology) & Shyamala K. Chengappa, Ph.D.

Abstract

The study investigated the effect of language intervention in English on twenty monolingual (only English) and twenty bilingual (English and anyone of the Mother Tongue Language) children with Autism Spectrum Disorders, aged between 4;0 and 6;11 years, in Singapore. Each participant received language intervention for six months. Mean Length of Utterance was computed at the baseline and after twenty-four weeks of language intervention. The results revealed statistically significant increase in the vocabulary growth in English in both the study groups, but no significance was indicated between the groups. The study indicated that bilingual exposure in children with Autism Spectrum Disorders does not have any negative impact in their language development.

Keywords: Monolingual, Bilingual, Mean Length of Utterance, Language Intervention

Introduction

Language is the main vehicle for communication and its development is a complex, dynamic process influenced by the child's age, language exposure, and social interaction (Fierro-Coba & Chan, 2001). It is all the more complex in children with developmental disorders, especially if they are exposed to more than one language. Many researches have emerged about children with a variety of language difficulties who are exposed to more than one language (Kohnert, Windsor & Ebert, 2008, Tomblin, Zhang, Buckwalter & O'Brien, 2003). There are various studies conducted in children with Autism Spectrum Disorders (ASD) and the effect of bilingual exposure in their vocabulary and language development (Hambly & Fombonne, 2012, Petersen, Marinova-Todd, & Mirenda, 2012, Ohashi, Mirenda, Todd, Hambly, Fombonne, Szatmari, Bryson, Roberts, Smith, Vaillancourt, Volden, Waddell, & Zwaigenbaum, 2012, Seung, Siddiqi, &. Elder in 2006.

Language Intervention in Children with Autism Spectrum Disorders

Thordardottir (2006) stated that, "the core features of ASD include impairments in social communication . . ." which further highlighted the importance that communication serves a large role in the outcome of someone's quality of life. Through communication we express our wants, desires and basic needs. Notredaeme & Hutzelmeyer, in 2010, (as cited in Taylor, F. 2012) found

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that, when studying individuals with pervasive developmental disorders, the most prominent concern of parents which causes them to seek professional assistance is communication impairments, followed by social interaction behaviors. Though there are several studies in this line, there's always a dilemma among parents of children with ASD, whether exposing their children to two languages, e.g. English in school and language intervention, Mother-tongue language in home, have any negative impact on the child's language development. Nevertheless, there have been limited studies investigating the effect of language intervention in bilingual and monolingual children with Autism Spectrum Disorders. Parents of children with language impairments sometimes wonder about the impact of second language on their child. As Lauren (2012) quoted that parents might have concerns like:

"My child has been exposed to two languages since birth. Will this make my child's language delay even worse?"

"Can I introduce a second language to my child? He already has a delay in his first language"

"Should I stop speaking my home language to my child?".

"If my child has a learning difficulty or language disorder, should we stop being bilingual so as not to confuse her?"

Language Development in Monolingual and Bilingual Children with Autism Spectrum Disorders

Hambly & Fombonne (2012) compared the social and language abilities of 75 young children with ASD who were categorized into three groups: monolingually exposed, bilingually exposed before 12 months of age, and bilingually exposed after 12 months of age. The abilities that were assessed across the three groups included social responsiveness, initiating of pointing, response to pointing, attention to voice, total conceptual vocabulary words in dominant and second languages, age of first words, and age of first phrases. The study showed that bilingually exposed children with ASD did not show additional delays in the above abilities compared to monolingually exposed subjects. They also did not find a significant difference in these skills between bilingual children who grew up in simultaneous versus sequential bilingual environments. Approximately 60% of the bilingually exposed children were observed to be acquiring vocabulary in two languages. The authors concluded that given these findings, caregivers should not be discouraged from continuing to speak to their children bilingually nor introducing a second language.

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Petersen, Marinova-Todd, & Mirenda (2012) compared the language abilities of 14 monolingual, English-speaking children with ASD with those of 14 age-matched bilingual English/Chinese-speaking children with ASD between the ages of 43 and 73 months. They compared the two groups' vocabulary skills and general language skills using bilingual versions of the Peabody Picture Vocabulary Test—III (PPVT–III), the MacArthur-Bates Communicative Development Inventories (CDI), and the Preschool Language Scale, Third Edition. They found that bilingual children had larger total production vocabularies and no significant differences in the size of their conceptual vocabulary or English vocabulary compared to the monolingual subjects. They also found the two groups to be equivalent in their overall language scores. They concluded that the findings suggested that children with ASD have the potential to be bilingual without experiencing disadvantages in their language development.

The findings of the studies above were consistent with the research done by Ohashi, Mirenda, Todd, Hambly, Fombonne, Szatmari, Bryson, Roberts, Smith, Vaillancourt, Volden, Waddell, & Zwaigenbaum (2012), which compared the communication abilities of a group of bilingually exposed young children with ASD (ages 24–52 months) with a group of monolingually exposed children with ASD who were matched by age and nonverbal IQ scores. The children were compared by the severity of their autism-related impairments in communication, the age of their first words, and the age of their first phrases, their receptive and expressive language scores, and their functional communication scores. The researchers found no statistically significant differences between the two groups of children on any of the measures used. However, these studies focused on comparing the skills between bilingual and monolingual children with ASD but did not study the effects after language intervention.

Seung, Siddiqi, &. Elder in 2006 conducted a longitudinal single-case study on a child who was initially diagnosed with language delay at age 3 and subsequently diagnosed with autism at age 3 years 6 months. This case study followed the child for 24 months and evaluated the efficacy of a unique Korean-English bilingual speech-language intervention. Speech-language intervention was provided twice weekly in his primary language, Korean, for the first 12 months by a Korean-English bilingual speech-language clinician. During the next 6 months, the intervention was gradually introduced in English; and by the final 6 months, the intervention was provided almost entirely in English. This study also incorporated information regarding parent interventions that was implemented by the parents at home. The child in this report made notable gains in expressive and receptive language development in both languages over the study period as well as decreases in aberrant behaviors. At the 24-month follow-up, he was able to respond to testing that was done completely in English. The results of this study support the practice of providing services in the primary language when English is not the language used at home to establish linguistic foundation of the primary language. Further, the study stated that as

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the child makes gains in the primary language, a gradual transition can be made to .intervention in English. The author concluded that the results of this study have important implications for future "research and clinical decision making" for assisting families of children from a variety of cultural and ethnic backgrounds.

Some investigators have raised questions about the prevalence of autism and differences in perception of autism and developmental disabilities by families in various ethnic groups (Dyches, Wilder, Sudweeks, Obiakor, & Algozzine, 2004). 'When children with autism from a bilingual family receive speech-language intervention, it also raises the issue of the language that should be used for the intervention; whether the intervention should be in English or in the primary language. Literature suggests an approach of "extending" language by allowing the child to use both primary language and English, rather than "limiting" intervention to only English (Guiterrez-Clellenm, 1999).

Jegatheesan in 2011, conducted a qualitative study among three Muslim families on raising a child with ASD in multi-lingual contexts and the challenges faced. The parents in the study have shared that each language used was critical as they served specific functional purposes. For instance, English was used for greater social participation and integration in the mainstream, Urdu language for communicating with the family members, and Arabic for religious readings and practices. The author reported that the three children in the study, at various levels of language skills, made notable improvements in language acquisition and communication skills.

Languages in Singapore

Such studies may form as supporting basis for speech and language therapists to recommend the parents of children with ASD that there's no evident detrimental effects in the language and vocabulary of children of ASD when exposed to more than one language, in a multi-ethnic, multi-lingual context, such as in Singapore. As a young and vibrant nation with a multicultural population, Singapore is home for close to 5.8 million people from four major ethnic groups-Chinese, Malays, Tamils and other minority groups such as Eurasians, Jews, Portuguese and more. The major languages spoken here are English, Mandarin, Malay, Tamil and various Chinese dialects, for example, Hokkien, Teochew, Cantonese, Hainanese.

Singapore has a policy of bilingualism, where students learn in English but are taught the language of their ethnicity, referred to as their "mother tongue". The mother tongue is seen as a way to preserve unique cultural values in the multicultural society, although their usage is decreasing in the home as English becomes more predominant. The majority of Singaporeans are bilingual in English and one of the other three official languages (Mandarin, Malay and Tamil).

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Need for the Current Study

In Singapore, among the many cases of developmental disorders seen, the rising number of reported autism cases is dramatic. Although there are no official reports on the prevalence rate of autism in Singapore, it was estimated in 2016, that one in 150 children in Singapore has autism, a higher rate that the World Health Organization's global figure of one in 160 children. These figures were revealed in the Singapore Government's third Enabling Masterplan that covered the five years till 2021 to create a more inclusive society for people with disabilities. A study conducted (Ho, 2007) by the Child Development Units of two main hospitals (National University Hospital and KK Women's and Children's Hospital) reported an increase in the number of case referrals for autism from 361 to 508 per year (about 30% of the referred caseload). Using the international prevalence rates of 60/10,000 to apply across cultures, it is estimated that there are probably 30,000 individuals with autism in Singapore's population of 5.8 million. With a school-age population of over half a million, it may be postulated that there are about 3,600 children under the age of nineteen diagnosed with autism.

Consequent to these huge numbers, there's a high demand for speech and language therapy services in the Early Intervention Programmes for Infants and Children (EIPIC). To meet this demand, Speech Language Therapists (SLTs) are being recruited from various ethno-cultural-lingual backgrounds, in a way restricting the therapy in English language only. As stated by Sendhilnathan and Chengappa (2019), in their review of language intervention for bilingual and monolingual children with ASD in a multilingual context, providing speech and language therapy in the child's mother tongue poses a challenge for the Speech Therapists. The local training program in speech therapy was started only in 2007 with an intake of twenty students for every two years. This intake has been increased to thirty students from 2015. Some of SLTs' traditional methods for bilingual children have incorporated strategies that are not maximally language-facilitating because they were designed from a monolingual mindset. It is not uncommon that parents seek clarification with the SLTs if they should use only one language and could it be their Mother Tongue Language (MTL) as the child is being cared by the grandparents, who is not proficient in English language. In such cases, it becomes arduous for the SLTs to suggest using the mother tongue as the child may be exposed to English at the EIPIC centres or preschool. It is an evident practice among SLTs in Singapore that most of the language intervention for children is provided in English language, while the children may be exposed to their mother tongue or other language at home. Parents are always anxious about exposing their children to two languages fearing that it might hinder their progress in vocabulary development. However, there's no evidence or research data conducted in Singapore population, showing the effects of monolingual versus bilingual language exposure in the vocabulary and language acquisition in children with ASD. This triggered the need for the current study whereby the clinicians could relate to the outcome of this study when advising parents on single or dual

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language exposure. The study aimed at finding the effect of language intervention provided in English language, on the vocabulary development in monolingual and bilingual children with ASD, by comparing their Mean Length of Utterances at base-line and after twenty-four weeks of language intervention.

Method

Participants

The present study included two groups of participants. Group I consisted of 20 participants who are bilingual (speaking English and MTL – Mandarin or Malay or Tamil) and group II had 20 children who are monolingual (speaking only English). All the participants had a formal diagnosis of Autism Spectrum Disorders. The participants were age-matched in both the groups. The participants were recruited from the EIPIC programme at Cerebral Palsy Alliance Singapore.

The study group I (Bilingual) had thirteen participants exposed to Chinese, five to Malay, and two to Tamil as their MTL and also used English at home and school. The study group II (Monolingual) had the following ethnicity - sixteen Chinese, two Malay and two Indian participants exposed to English language, 80% of the time at home and school. Both the study groups had more participants from Chinese ethnicity compared to Malay and Indians (Table 1). Similarly, there were more males compared to female participants.

Table 1 showing the demographic details of the participants in study groups I and II

	Study Group I – Bilingual	Study Group II - Monolingual
Age (in years & months		
4;0 - 4;11	4	4
5;0 – 5;11	7	7
6;0 – 6;11	9	9
Gender		
Males	16	13
Females	4	7

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Ethnicity		
Chinese	16	13
Malay	2	5
Indian	2	2

Selection of Participants

Participants were selected from the pre-readiness and readiness classes in the EIPIC programme as the children in these classes uses one to three word utterances for communication. Parents Information Sheet (PIS) about the research study and consent forms were given to those parents of children in the selected classes, who met the inclusion criteria. Children of those parents who consented for their child to participate in the study were recruited as participants. Media consent was also sought as the study included videotaping the therapy sessions used only for research purpose.

Determination of a participant's language status (functionally monolingual or bilingual) was established on the basis of two factors: (a) the participant's ability to maintain a conversation in a language or languages in relation to his/her immediate surroundings (producing spontaneous sentences as well as responding to the investigator) in the ambient language or languages) and (b) the reported percentage of language use by the parent in the following fashion: A participant was considered monolingual if she/he used English language more than 80% of the time (including school and home), and a participant was considered bilingual if MTL and English language were used at least 20% of the time (at school or in the participant's home). This information was extracted from the family report filled by the parents at the time of intake into the EIPIC programme.

Inclusion Criteria for participants in the Study group 1 are as follows:

(a) selected participants with a formal diagnosis of ASD, attending the EIPIC programme at CPAS
(b) chronological age between 48 and 72 months at the time of diagnosis
(c) hearing sensitivity within normal limits
(d) no comorbidity of intellectual disability
(e) participants using 1-3 words sentences for communication (Verbal ASD)
(f) bilingual (a participant was considered bilingual if MTL and English were used at least 20% of the time at school or in the child's home).

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Inclusion Criteria for participants in the Study group II are as follows:

All the above-mentioned inclusion criteria except that the study group II had Monolingual participants (a participant was considered monolingual if she/he used one language (English) more than 80% of the time (including school and home).

The participants in groups I & II underwent the psychological evaluation at one of the public hospitals or private centers in Singapore, to ascertain the Intelligence Quotient and confirm the diagnosis of ASD using the Autism Diagnostic Observation Schedule (ADOS). Similarly, the participants in both the groups I & II underwent the routine hearing screening at the Audiology department in any of the public hospital or private centres to rule out any hearing loss. All the necessary reports were extracted from the central folder for each participant at the Social Work Department at CPAS for the study purpose with parents' consent as per the Personal Data Protection Act (PDPA) policy. All the participants received speech and language therapy from the investigator, in English during the study period.

Exclusion Criteria for Participants in Both the Study Groups

Participants with (a) cerebral palsy or other neuromotor disorders that interfered with study assessments; (b) a known genetic or chromosomal abnormality; or (c) a vision or hearing or intellectual impairment were excluded from the study. To ensure independence of observations, only one participant per family was recruited for the study.

Study Design

The study employed the pre – post intervention design to investigate and compare the outcomes of language intervention provided in English in twenty participants (n=20) with ASD who were bilingual with that of equal number of participants (n=20) who were pre-dominantly monolingual. The data was collected at the baseline before the language intervention and twenty-four weeks after the language intervention.

Materials

The story sequence fairy tale book of Goldilocks and the three Bears, authored by Robert Southey and the folk tale The Three Little Pigs and the Big Bad Wolf (Aarne–Thompson classification system) were used for the picture description or story narration tasks, and for eliciting answers for the WH questions. These were carried out at the baseline and after twenty-four weeks of language intervention for data collection purpose. Along with these pictured books, miniatures or props depicting the characters such as Goldilocks, bear, pigs; objects like

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bed, bowl, etc were used to entice the participants and also for eliciting the targeted word/s and/or sentences.

Mean Length of Utterance

Verbal output in terms of vocabulary size and mean length of utterance were determined to study the outcome of language intervention in the bilingual and monolingual participants with ASD. Vocabulary size was assessed by measuring the Mean Length of Utterance (MLU) (Brown, 1973). Mean Length of Utterance (MLU) was taken as a tool to determine the average length of child's utterances in relation to morphemes rather than words. Mean Length of Utterance (or MLU) is a measure of linguistic productivity in children. It is traditionally calculated by collecting 50 - 100 <u>utterances</u> spoken by a child and dividing the number of <u>morphemes</u> by the number of utterances. A higher MLU is taken to indicate a higher level of language proficiency. A protocol crafted by Johnson (2005) was used to provide a principled basis for calculating the MLU (Appendix 1).

Procedure

Study Group I and II

A parent questionnaire in the parent's preferred language (English, Malay, Chinese or Tamil)) was presented to obtain information about the participants' background (e.g., proportion of use of each language in the household, family history of speech and language impairment), prior to the data collection process. This questionnaire is used routinely to collect the family details and demographics for all the enrolments.

Language Intervention

The participants, who had met the selection criteria were scheduled for speech and language intervention sessions with the investigator at the space designated for speech therapy in CPAS. Each participant was assessed by a team comprising of Allied Health Professionals (Occupational Therapists, Physiotherapists, Speech and Language Therapists) and interventionist, following which the team crafted the Individualized Educational Programme (IEP) goals at the beginning of the term. The goals in the IEP comprised the skills across the domains in Assessment Evaluation Programming System (AEPS) (Bricker, 2002a, 2002b, 2002c) tool used at CPAS for assessment of the child's level of functioning, periodically, across Fine Motor, Gross Motor, Adaptive, Cognitive, Social Communication, and Social skills. Out of the six domains in AEPS, the goals crafted under the cognitive, social-communication and social areas were focused due to the relevancy for the purpose of this study. The therapy was provided in English and the intervention activities were aligned with each participant's IEP goals, crafted by the team, so that the participant could learn or practice specific skills that were taught by the SLT in other relevant contexts. Each therapy session lasted for 45 minutes to one hour per week

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individually, with a three to five minutes warming-up activity. If a session is missed by the participant, a replacement session was scheduled during the same week. Overall, each participant has attended twenty-four sessions during the period of this study. The participants were also facilitated by the investigator during language lessons in the classroom once a month, for consistency and generalization of the goals across settings and activities.

The speech and language therapy sessions were typically child-focused, with the SLT creating learning opportunities for the child by getting the child to choose an activity as a warm-up (e.g. choosing crayons to colour a picture, using a marker pen to write or draw on the board, choosing pretend play items from the cabinet, etc.) before proceeding with the targeted activity planned for the study purpose. The SLT worked directly with the child using planned methods, strategies and approaches used to address areas of concern. Strategies from naturalistic approaches such as following the child's lead, including the child's interests, modeling, expansion of utterances, purposeful redirection, etc. were used to elicit the targeted language structures from the child. For example, modeling is having the SLT name or describe an object/picture/event shown to the child and then prompting the child to label or describe the object/picture/event.

Parents and / or Caregivers were encouraged to observe the SLT's sessions, so that the parents were able to witness the type of activities and strategies that could be carried out by them at home in a similar manner.. Individualized home-based programs were also devised for the family to work on targeted language skills between each therapy sessions to maintain the consistency and continuity of the activities and progress.

Videotaping of Sessions

Informed consent was sought from parents for videotaping the sessions in an angle that focused the participant and the investigator. Audio Recordings were done for participants' who did not have a video consent. Videotaping of the therapy sessions were done for analysis and evidence purposes. Each participant's speech and language output during pull-out sessions, on a picture description task in a story sequence e.g. Goldilocks and the three bears or The Three Little Pigs and the Big Bad Wolf, chosen by the participant were recorded. In addition, participant's responses to SLT's WH questions related to the story were also recorded at the baseline, and after 24 weeks of intervention. The videotaping was also done at the classroom to look at the language output and social pragmatic skills of the participant in a group setting, though these were not included for study purpose.

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All intelligible, spontaneous utterances from the participants were used to compute the mean length of utterance (MLU). Mean Length of Utterances were calculated as follows:

50-100 intelligible utterances were collected. The number of morphemes per utterance were counted and added, divided by the number of utterances. These were analyzed and interpreted accordingly during the analysis of the results. Speech samples were transcribed in specific protocols, based on recorded interaction situations between the investigator and the participant during the targeted language intervention session. Analysis considered the number of grammatical morphemes such as articles, nouns, and regular verbs, any pronouns, prepositions and conjunctions. The first five minutes recorded during the baseline and after twenty-four weeks of language intervention were considered as an adaptation period for the participant to the situation, and therefore were not considered in the analysis. Speech samples comprised the first 100 segments (utterances) produced by the participants.

Statistical Analysis

The obtained data was subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) version 20 to:

1. find out the effect of language intervention provided in English in monolingual and bilingual participants with ASD on the vocabulary development by comparing within the group differences at baseline, and after week 24 using Paired Sample t test.
2. determine if there's any variation in the vocabulary development between monolingual and bilingual children with ASD, following the language intervention using English as a medium, using Independent Sample t test.

Results

MLU in Bilingual Participants (Study Group I)

Paired Sample t test was used to find out the within group differences. The results in Table 2 indicates a significant difference in the mean scores of bilingual participants (study group I) between the pre (M=4.54; SD=0.77) and post (M=6.02; SD=0.41) language intervention. The results also revealed a highly significant value, $p<0.005$ within the group, ascertaining that all the participants presented with greater MLU scores after the language intervention. This also implied that language intervention played a huge role in the vocabulary development in children with bilingual ASD.

Table 2: Comparison of Mean, Standard Deviation and Significance value within bilingual participants (Study Group I) at the baseline and after 24 weeks of language intervention

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Bilinguals MLU Paired Samples Statistics							
	Mean	N	Std. Deviation	Std. Error Mean	df	t	p
Pair 1 Bpre	4.5450	20	0.77220	0.17267	19	-12.469	0.00**
Bpost24	6.0200	20	0.41371	0.09251			

** p<0.005

MLU in Monolingual Participants (Study Group II)

Table 3 shows the comparison of vocabulary growth in monolingual participants (study group II) with ASD before and twenty-four weeks after language intervention. As indicated, there was a significant increase in the MLU of the participants as noted from the mean scores at week 24 (M=5.25; SD=0.72) compared to the baseline scores (M=3.86; SD=0.46). This strongly suggests that regular language intervention contributes to the improvement of language and vocabulary development in children with ASD.

Table 3: Comparison of Mean, Standard Deviation and Significance value within monolingual participants (Study Group II) at the baseline and after 24 weeks of language intervention

Monolinguals MLU Paired Samples Statistics							
	Mean	N	Std. Deviation	Std. Error Mean	df	t	p
Pair 1 Mpre	3.8650	20	0.46823	0.10470	19	-12.805	0.00**
Mpost24	5.2550	20	0.72291	0.16165			

** p<0.005

MLU between the Monolingual and Bilingual Participants (study groups I and II)

An Independent Sample t Test was conducted to compare the MLU between Monolinguals and Bilinguals at the baseline and after 24 weeks of language intervention. The between-groups comparison revealed strong correlation between language intervention in English and the increase in MLU in English vocabulary in both the study groups at week 24 , t

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(38) = -4.107; p=0.000 compared to the baseline, t(38)= -3.367; p=0.002. However, there's no statistically significant value to show that Monolingual participants (study group II) had higher MLU compared to the bilingual participants (study group I). This indicates that exposing the children with ASD to more than one language does not hinder the vocabulary development. It is similar to those children with ASD who are exposed to one language.

Table 4 indicates the differences in the vocabulary development between the bilingual and monolingual groups of children with ASD, pre and post language intervention

Independent Samples Test		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
									Lower	Higher
MLUpre	Equal variances assumed	7.978	0.008	-3.367	38	0.002	-0.68000	0.20193	-1.08879	-.27121
	Equal variances not assumed			-3.367	31.308	0.002	-0.68000	0.20193	-1.09168	-.26832
MLUpost24	Equal variances assumed	12.598	0.001	-4.107	38	0.000	-0.76500	0.18625	-1.14204	-.38796
	Equal variances not assumed			-4.107	30.240	0.000	-0.76500	0.18625	-1.14524	-.38476

Discussion

The current study clearly indicated that language intervention and language exposure for participants with ASD, whether bilinguals or monolinguals, is essential for building vocabulary for communication and social interaction. Consistent exposure and periodical language intervention supported the development of MLU in both bilingual and monolingual participants considerably and these should be continued. The language intervention, when provided in a language different from MTL, does not lead to negative effect in the language acquisition in bilingual participants with ASD.

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This outcome is resonated in a single case study conducted by Seung, Siddiqi, and Elder (2006), on a Korean-English bilingual child with ASD. When assessed after twenty-four months of intervention in MTL initially for six months and English later, the child demonstrated that language skills could be developed in a bilingual child with ASD similar to monolingual counterpart.

The study group I and II had significant increase in their vocabulary at week 24 compared to the baseline. The possible reasons could be attributed to:

(i) language intervention that focused on building targeted vocabulary in the participants
(ii) the involvement of parents in providing learning and communication opportunities to the participants in their natural contexts, i.e. home
(iii) the interventionists embedding the vocabulary building strategies in the classroom contexts.

Essentially, the exposure to more than one language in bilingual participants in this study, viz. English for intervention and in the classroom, MTL in home played an immense role in the participants' overall vocabulary development. The investigator emphasized that language building strategies such as modelling, scaffolding, expansion of utterances, etc. during language intervention and in natural contexts displayed a positive outcome in the participants. For example, one of the participant was seen using the words exposed (hard and soft beds in the Goldilocks and Three Bears story) during the picture description task in his classroom in a similar context, hard scrub and soft cotton.

Gonzalez-Barrero & Nadig, in 2018, studied the impact of amount of language exposure on vocabulary and morphological skills in school-aged children with ASD who did not have intellectual disability. Forty-seven typically developing children and 30 children with ASD with varying exposure to French participated in the study. The findings of the study revealed that the current amount of language exposure was the strongest predictor of language skills in both groups of children. Further, the study indicated that many children with ASD are capable of acquiring two languages when provided with adequate language exposure.

The current study did not reflect significant variation in the vocabulary development between the Bilingual and Monolingual participants, before and after intervention, though the individual groups showed high variation in the MLU. This outcome resonates with the study conducted by Petersen, Marinova-Todd, & Mirenda in 2011. The vocabularies of English-Chinese bilingual children with ASD and monolingual children with ASD were compared. The

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authors concluded that bilingualism did not have a negative effect on the children's language development, as both groups had similar vocabulary scores.

Similarly, an intervention study was conducted by Summers et al in 2017 to find out the effects of a bilingual and monolingual treatment condition on the language skills of two bilingual children with ASD (ages 3 and 5) using an alternating treatment, single-subject design. The two treatment conditions, a monolingual English condition and a bilingual English/Spanish condition, were alternated across 14 treatment sessions. The outcome showed that both participants improved in each condition while the treatment conditions were highly effective for one participant and minimally effective for the other participant. Within each participant, effect sizes were similar across the two treatment conditions and there were differences in the maintenance patterns of the two participants. These results support the available evidence that bilingual treatments do not have negative effects on bilingual children with ASD.

Beauchamp and MacLeod (2017) reviewed researches on (a) bilingualism in neurotypical children and in children with development disabilities and language disorders, (b) the language development of bilingual children with ASD, and (c) the implications of recommending that these children be brought up as monolinguals when they live in bilingual contexts. The outcome of their review indicated that children with ASD can become bilingual, and bilingualism does not lead to further language delays. The review further implied that researches have shown detrimental effects for both the child and their family when children with ASD from bilingual contexts are raised as monolinguals. Hence, there are evidences that supports the recommendation that children with ASD from bilingual contexts be raised bilingually.

Conclusion

In a context like Singapore, the outcome of this study sends a positive message to the clinicians, parents, developmental pediatricians, teachers, and other professionals working in the service provision sector for children with ASD. The message is that there's no known negative effects in language development, when there are greater chances for the children with ASD getting exposed to more than one language. The medium of language intervention could be in English while the child is exposed to a different MTL at home. This also reduces the parental anxiety in ensuring that the child is exposed to only one language across the contexts viz, school and home. Exposing to a language other than MTL also increases the possibility of better social communication and integration into the society. Nevertheless, the decision-making of the language exposure must be made in discussion with the parents, showing relative evidences conducted in a similar group of population. The study is limited in having another group that received no language intervention for comparison, to understand its actual benefit, it may be against the best practices of a clinician. In conclusion, the clinicians should focus on language

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building strategies that are developmentally and functionally appropriate, for both bilingual and monolingual children with ASD for successful communication across pragmatic contexts.

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Appendix: 1

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Protocol for Calculating a Mean Length of Utterance [Source: Johnson (2005)]

How to count morphemes
Method:
1 Select 100 completely intelligible utterances (i.e. if even one word in an utterance is not understood, that utterance is excluded from the analysis. Words that are unintelligible are transcribed as x.)
2 Count the morphemes in each utterance according to the guidelines set out in the 'DO count' and 'DO NOT count' sections below.
3 Add the number of morphemes for all 100 utterances to give a total number of morphemes used.
4 Divide the total number of morphemes used obtained in step 3 above by 100 to get the mean length of utterance.
DO count:
1 The -s plural marker (e.g. *cat-s, dog-s*). Count it even when used on irregular plurals (e.g. *mouse-s*). [Exception: plurals never occurring in the singular (e.g. *pants, clothes*) count as just one morpheme.]
2 The -ed past tense marker (*walk-ed, play-ed*). The -ed morpheme is counted even when used improperly (*go-ed, drink-ed*).
3 The -ing present participle marker (e.g. *walk-ing, count-ing*).
4 The -s 3rd person regular tense marker (e.g. *he like-s sweets, Bob walk-s fast*). [Exception: *does* counts as one morpheme.]
5 Possessive -'s marker (e.g. *mummy's hat, boy's toy*).
6 Contractions (e.g. *she's, he'll, they're, what's, she'd, we've, can't, aren't* would all count as 2 morphemes each). [Exceptions: *let's, don't* and *won't* are assumed to be understood as single units, rather than as a contraction of two words, so are just counted as one morpheme.]
DO NOT count:
1 False starts, reformulations, or repetitions unless the repetition is for emphasis (e.g. "[then] then [he go] he went to the zoo" is counted as 6 morphemes; "No! No! No!" is counted as 3).
2 Compound words, reduplications, and proper names count as single words (e.g. *fireman, choo choo, Big Bird*).
3 Irregular past tense verbs and irregular plurals count as one morpheme (e.g. *took, went, mice, men*).
4 Diminutives (e.g. *doggie, horsie, dolly*) and catenatives (e.g. *gonna, wanna, hafta*) count as one morpheme.
5 Fillers (e.g. *um, well, oh, um hmm*).

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