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Effects of Augmentative and Alternative Device on Echolalia in Autism

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Dedication

I would like to dedicate this thesis paper to my number one support system, my family, for all the love, patience, and inspiration.

EFFECTS OF AN AUGMENTATIVE AND ALTERNATIVE DEVICE ON ECHOLALIA IN AUTISM

by

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Abstract

This study was a systematic replication of Mueller and Forbes (n.d.), which evaluated the effects of a high-tech and low-tech augmentative alternative communication (AAC) device on reducing echolalia in a verbal child with autism during conversational speech. The participant for this study was a verbal eleven-year male, who was diagnosed with autism prior to the study. A single subject alternating treatment research design was used to evaluate the effect of a high-tech speech generating AAC device (Proloquo2go) on echolalia. The participant was seen periodically twice a week for two months and periodically for one month. A functional analysis (Prizant & Rydell, 1984) was performed to determine the function of echolalia presented by the participant. The participant demonstrated the use of interactive and non-interactive delayed echolalia (Prizant & Rydell, 1984). Eleven conversational speech samples were obtained and recorded. Activities for elicitation of conversation between the researcher and participant included watching Pixar short films, playing board games, and reading books. The total number of utterances and the total number of echolalic utterances were counted to calculate the percentage of echolalic utterances (total number of echolalic utterances/ total number of utterances X 100) for each speech sample. The results support the use of a high-tech speech-generating device to reduce echolalic utterances.

Table of Contents

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List of Tables

List of Figures

Chapter 1: Introduction

Autism Spectrum Disorders (ASDs) are a rapidly growing epidemic in children and young adults. A recent government survey has estimated that 1 in every 50 school-aged children have been identified with having an ASD by parent report (Blumberg, et al. 2013). ASDs are a group of brain developmental disorders, which include Autism, Asperger's Syndrome, and Pervasive Developmental Disorder not otherwise specified (Mirenda & Iacono, 2009). ASDs may cause a wide range of impairments across different domains and range in severity. ASDs can affect social skills, communication, language, and behavior; which may be accompanied with restricted, repetitive, and stereotyped patterns in behaviors, interests, and activities. Researchers have extensively performed studies in attempts to determine the cause of ASDs. Neuroimaging studies have noted differences in mental processing in children with autism when compared to typically developing children (Gervais, et al. 2004). Other studies have suggested environmental and genetic factors to contribute to the cause of autism. Even though the cause of autism has not been identified it is a growing epidemic, which is characterized by impairments or delays in interrelated domains: social interactions, and communication and language (Eigsti, Marchena, Schuh, & Kelley, 2011).

1.1 Language and Autism

Language is a complex neurocognitive skill that is consistently affected in children with autism. Studies have shown the influence of neurological abnormalities from the hearing system to superior cortical processes in autism (Gervais, et al. 2004), which may be a contributor to the language difficulties in autism. By definition, children with autism will have difficulties in

language. According to Wilkinson (1998), language skills range from mutism and limited functional communication to relatively well-developed syntactic abilities and functional speech. Individuals may be proficient and functional in the use of language; however, they may manifest a deficit in pragmatics.

Pragmatics is referred to the use of language in the context of interaction. It involves the understanding of turn taking, topic maintenance, and relevance of contributions to a conversation along with non-linguistic behaviors, eye contact, body language, and facial expressions. Children with autism may contribute limited information to a conversation; however, it may be irrelevant and demonstrate the use of a phenomenon called echolalia.

1.2 Echolalia

Echolalia involves a repetition of utterances or phrases produced from another speaker or media, such as TV shows or cartoons (Tarplee & Barrow, 1999). There are two types of echolalia, immediate and delayed echolalia. Immediate echolalia involves repetitions that are produced either following immediately or at a brief time after the production of a model utterance. Delayed echolalia is producing an utterance previously heard. Researchers noted communicative intent in both immediate and delayed echolalia in children with autism.

Prizant & Rydell (1984) conducted a study analyzing the function of delayed echolalia in three individuals with autism. The researchers found that delayed echolalia may serve a variety of functions and may be produced interactively or noninteractively, with or without evidence of comprehension, and with varying degrees of relevance to the situational or linguistic context (Prizant & Rydell, 1984). The functions of delayed echolalia were separated into non-interactive and interactive delayed echolalia. Non-interactive delayed echolalia involves non-focused, situation association, rehearsal, and self-directive. Interactive delayed echolalia involves turn-

taking, verbal completion, label, providing information, calling, affirmation, requests, protest, and directive.

These findings are consistent with findings in analyzing the functions of immediate echolalia. Prizant & Duchan (1981) analyzed immediate echolalia in four individuals with autism. After performing a thorough analysis of verbal and nonverbal factors, they discovered immediate echolalia as having seven functional categories, non-focused, turn taking, declarative, rehearsal, self-regulatory, yes-answer, and request. It is beneficial to complete a functional analysis (Prizant & Duchan, 1981) in order to determine the communicative intent of echolalia.

Current research on echolalia and autism includes intervention studies aimed to reduce echolalia by behavioral modification. A procedure commonly seen in research is the cues-pause-point procedure (based on McMorrow & Foxx, 1986). Valentino et al. (2012) evaluated the use of cues-pause-point procedure to reduce echolalia to increase correct responding in a 3-year child with autism. The results demonstrated a reduction on echolalia and increased correct responses. Foxx et al. (2004) also evaluated the effects of cues-pause-point language on two children with autism during labeling. The results suggested this procedure can be effective in teaching children who use echolalia. Current research on echolalia intervention procedures has not evaluated the use of an augmentative alternative communication device to reduce echolalic utterances in children with autism.

1.3 Augmentative and Alternative Communication (AAC)

According to Beuklman and Mirenda (2005), 1.3% of all Americans have significant communication disabilities that limit or restrict their use of natural speech to meet daily communication needs. Individuals with significant difficulties can benefit from intervention implementing the use of an Augmentative Alternative Communication Device (AAC). AAC

includes all forms of communication (other than oral speech) that are used to express thoughts, needs, wants, and ideas (ASHA, 2012).

There are two types of AAC systems: unaided and aided communication devices. Aided communication incorporates devices that are external to the individuals who use them and involve the use of real objects or graphic symbols (Mirenda & Iacono, 2009). Unaided communication does not involve the use of external devices. An example of this is manual signing (Mirenda &Iacono, 2009). According to Mirenda & Iacono (2009), speech-generating devices provide auditory stimuli via speech output as an added component. Research has evaluated the use of AAC devices for children with autism who are nonverbal (Mirenda & Iacono, 2009). However, there is a lack of research in evaluating the use of an AAC in children with autism who are verbal and use echolalia.

1.4 AAC and Autism

Communication intervention approaches for autism are aimed to replace unconventional, repetitive, or problematic problems with functional communication. Interventions including an AAC device may be beneficial for individuals with autism who use echolalia, by assisting the transition from echolalia to generative language stages (Quill, 1995). A recent study by Mueller & Forbes (n.d.) evaluated the use of no-tech (picture communication board) and high-tech speech generating AAC device (AMDi TechTouch ®) in a nine-year-old male with autism who used immediate and delayed echolalia during two narrative samples. The results demonstrated the no-tech AAC was not helpful for the participant and fewer echolalic utterances were noted when using a high-tech speech generating AAC device. These findings should be interpreted with caution due to the short length of the narrative samples. However, these findings were supported by a theory, which states that the pressure to produce speech may be overwhelming

and the support of an AAC may facilitate speech by reducing pressure to communicate (Lloyd & Kangas, 1994).

AAC strategies may be used in combination with functional echolalia to develop more comprehensive total communication (Quill, 1995). The purpose of this study was to systematically replicate the study by Mueller and Forbes (n.d.) with a different participant diagnosed with "high functioning" autism. This study involved evaluating the effects of a high-tech speech generating AAC device on the occurrence of echolalic utterances in conversational speech. It is hypothesized that there will be a reduction in echolalic utterances when supported with the use of a high tech speech-generating device.

Chapter 2: Methods

2.1 Participant

The participant, L.G., is an eleven-year-old male, who was diagnosed by a neurologist with autism at 3 years of age. Prior to the study, L.G.'s parent completed a case history form and the results are as follows. After birth, L.G. failed his newborn hearing assessment and had continuous ear infections for a year. Pressure equalizer (PE) tubes were inserted three times for three months. All developing milestones were met, except his language and speech milestones, which were delayed. He started using single words at 5 years old, combining words at 6 years old, naming simple objects and engaging in conversation at 8 years old, and answering simple questions at 9 years old. He currently lives at home with his parents and older brother, where the primary language used is English. His mother and father are native Spanish speakers. However, L.G. does not speak Spanish.

Throughout the course of this study, he attended a local elementary school and received speech, occupational, and ABA therapy. His mother described L.G. as a social and competitive eleven-year old. As reported by his mother, he demonstrates the use of both immediate and delayed echolalia "talking in third person." The most common delayed echolalic utterances L.G. uses were utterances previously heard from media (movies and TV shows) and from his mother. The participant's mother addresses echolalic utterances by telling him "Tell me something else" or " I do not want to hear it anymore." He did not previously have exposure to any kind of AAC device.

After parent approval, L.G.'s speech re-evaluation results from the local speech/ABA therapy clinic L.G. attends were obtained. The Peabody Picture Vocabulary Test™ -4th Edition (PPVT™ -4) was administered to measure L.G.'s receptive vocabulary skills. L.G. received a

standard score of 56, which is 2.5 to 3.0 standard deviations below the mean. This score indicated his receptive vocabulary skills were below functional limits when compared to age–matched peers. The Clinical Evaluation of Language Fundamentals®- 4th Edition™ (CELF®-4) was administered to measure L.G.'s receptive and expressive language skills. His receptive language skills were measured by administering the concepts and following directions subtest. He received a scale score of 1, which was converted to a standard score of 55. This score is in the 0.1 percentile rank, which indicates a significant delayed performance when compared to age-matched peers. L.G. was observed during the assessment to use 3rd person pronouns (e.g. "he") to refer to himself. His expressive language skills were measured by administering the recalling sentences and formulating sentences subtests. For both subtests, L.G. received a standard score of 55, which is in the 0.1 percentile rank. This indicates a significant delay when compared to age-matched peers. It was noted during the recalling sentences subtest, L.G. primarily demonstrated omission and substitution errors. During the formulated sentences subtest, he formulated 4-7 word sentences with syntactic and semantic errors. L.G.'s mother completed the CELF®-4 pragmatic protocol to provide information on L.G.'s pragmatic development and social interaction skills. He received a raw score of 147, which when compared to age-matched peers he met the criterion score. However, there were noted concerns in emotional deregulation to humor, teasing, and failure.

Table 2.1 L.G.'s scores on assessments. SS: Standard score, RS: Raw score

Test	Score
PPVT-4	SS=56
CELF -4	
Concepts and following directions	SS= 55
Recalling Sentences	SS=55
Formulated Sentences	SS=55
Pragmatic Protocol	RS=147

A language sample was obtained to assess articulation skills. His intelligibility was noted as poor with an observed interdental lisp. He spontaneously formulated 5-7 word sentences consisting subject-verb-object/action. During conversation, L.G. completed approximately 3-4 turns. The re-evaluation results indicated he presented with a moderate receptive/expressive/pragmatic language delay secondary to autism and a mild articulation delay. L.G. demonstrated a progression from his previous evaluation in receptive and expressive language skills, articulation, and pragmatics. However, his speech-language skills continued to be below age-matched peers.

2.2 Experimental design

This study is a systematic replication of Mueller & Forbes's (n.d.) research study. A single subject alternating research design was used to evaluate the use of a high tech speech-generating AAC device on echolalia. There were two conditions. In the AAC condition, a conversational sample was obtained with the use of the AAC device. In the no-AAC condition, a conversational sample was obtained without the use of the AAC device. The conditions were counterbalanced each session to control for presentation effects.

2.3 Dependent measures

For this study, the dependent measure was the percentage of echolalic utterances from each conversational sample. The percentage of echolalic utterances was calculated by counting the total number of utterances and the total number of echolalic utterances (total number of echolalic utterances/ total number of utterances X 100). Initially, the percentage of echolalic utterances was calculated including transitional periods between activities. However, it was noted that the participant was not attending to the AAC device during these transitional periods.

Based on these observations, transitional periods were removed and the speech samples were analyzed to reflect L.G.'s echolalic utterances while attending to the AAC device.

A functional analysis was performed by the researcher to determine the function of the echolalia presented by L.G. based on the research study by Prizant and Rydell (1984). The participant demonstrated interactive and non-interactive delayed echolalia. The functions of delayed echolalia are shown in Table 2.1. Although an analysis of the type of echolalia was conducted, type was not included as a dependent measure.

Table 2.2 Functions of echolalia produced by participant.

Type of Echolalia	**Definition**
Turn-taking	An effort to participate in conversation
Providing information	Provide new information to listener
Calling	Serve as attention getting phrases
Protest	Desire to prohibit an activity

2.4 Procedures

This study took place at the participant's home. He was seen twice a week for two months, and then seen periodically for a month. The researcher visited L.G. at his home and sessions were held in his living room area sitting across a table from L.G. A video recorder was used to record every session. An I Pad with the Proloquo2go app was used during the activities in the AAC condition. The activities used were several Pixar short films (such as Knick knack, For the Birds, Mike's New Car, Mater & the Ghost Light), various games (such as Checkers, Memory, Tumble, and Jenga), and short children's books. The book activity was used only once, due to the loss of interest and unwillingness to participate.

AAC training was done in the first session only to ensure that L.G. could navigate through the AAC device. The AAC device was placed in front of him on the side where it was easily accessed for sessions that included the AAC. The vocabulary on the AAC device was assessed to ensure L.G. could receptively identify the item. This was done by asking "Show me____" for the basic vocabulary and "What do I say if____?" for phrases used for commenting.

Each session was conducted as follows. The researcher presented each activity. In the AAC condition, L.G. was given the short vocabulary assessment and then the activity began. In the no-AAC condition the activity began without any instruction. Reminders regarding the presence of the AAC device were given to L.G. intermittently throughout the activities. It was only necessary during book reading for the researcher to redirect L.G. back to the activity. During the remainder of the study L.G. was on task.

The short film and book were viewed before obtaining the conversational sample and the conversational sample was obtained while the researcher played the game with L.G. Before each therapy session, the researcher prepared four activities. Each set of activities included two similar activities. The two sets were completed in each session.

Table 2.3 Four activities during one session.

Set 1	**Set 2**
Activity with AAC	Activity with AAC
Activity without AAC	Activity without AAC

Table 2.4 Four activities during the following session.

Set 1	**Set 2**
Activity without AAC	Activity without AAC
Activity with AAC	Activity with AAC

The AAC device was programed to include vocabulary and phrases for one of the activities in each set. Pictures corresponding to the word or phrase were included with the icon. Examples of vocabulary and phrases included for the activities are listed below.

- Games:
    - Game pieces: “Blocks”, “checkers”, “marbles”
    - Phrases: “King me”, “I win!”, “You cheated”, “Your turn”
- Pixar short-films:
    - Characters from film: “Mater”, “Baby”, “Alien”
    - Items from film: “ball”, “car”, “coin”
    - Emotions of the characters: “scared”, “happy”, “sad”
    - Actions of the characters: “crying”, “playing”
    - Phrases: “Let’s watch it again”, “It was boring!”, “This was dumb”

2.5 Inter-rater reliability

Inter-rater reliability was established by using a Master’s of speech-language pathology graduate researcher as an outside judge. First, the outside judge and researcher reviewed the recorded videos of the therapy sessions and all disagreements on the transcriptions were agreed upon. Second, the outside judge was trained on the types of echolalia defined by Prizant and Rydell (1984). The transcriptions were reviewed and all echolalic utterances were analyzed independently by both the researcher and outside judge. All disagreements were resolved through discussion.

Chapter 3: Results

L.G. used a combination of verbal speech, gestures, and the use of the AAC device when it was available to engage in conversation with the researcher. As mentioned, above L.G demonstrated the use of delayed echolalia, which served several functions. His delayed echolalic utterances served as turn-taking, providing information, calling, and protesting. (Prizant & Rydell, 1984). During data collection, prosodic variations were noted during L.G.'s echolalic utterances, which is a noted characteristic of children with autism (Eigsti, Marchena, Schuh, & Kelley, 2011). The following is an example of echolalic utterances (bold font) produced by L.G.

C: Are you singing? What are you singing?
L.G.: **Go, go go! We have to get out of here!**
C: Get out where?
L.G.: The blocks. **Careful! Don't panic.**
C: We have to build them all the way up.
L.G.: **Don't panic, don't panic, don't panic!**

Overall, the results demonstrated a reduction of echolalia produced by L.G. in the AAC condition. Transitional periods between one activity and the next were initially included in the conversational sample. The results for percentage rates of echolalia including transitional periods are as follows and can be seen in Figure 1.

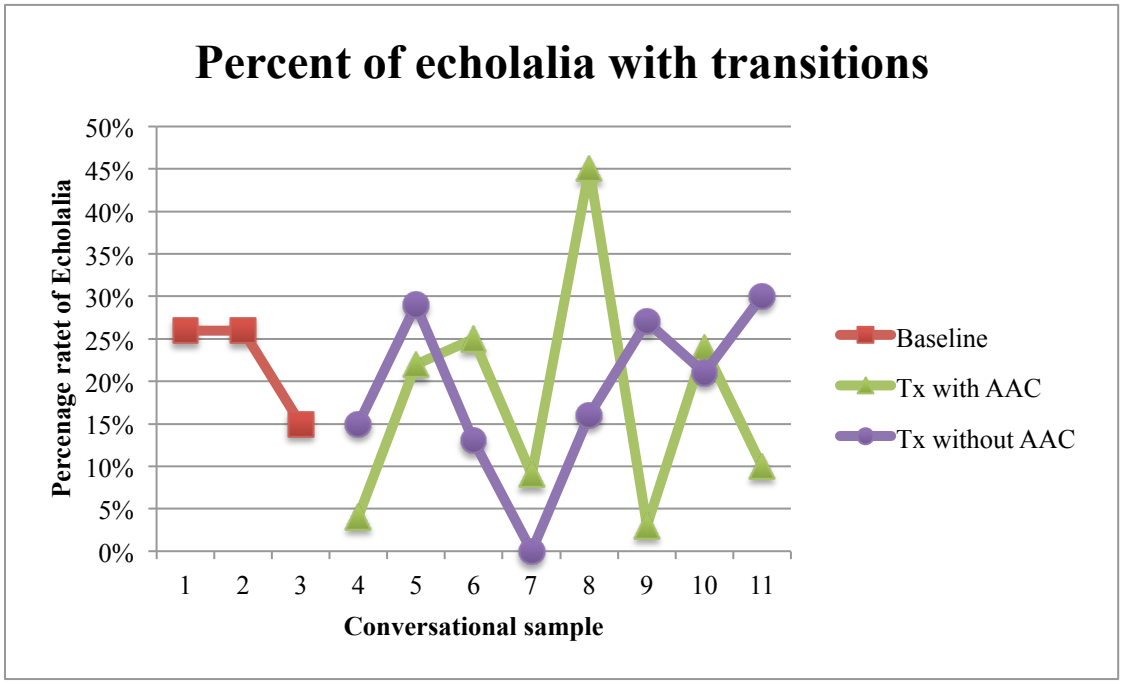

Figure 3.1 Percentage rate of echolalia with transitional periods.

During pre-evaluation, baseline data was collected and can be seen in conversational samples number 1,2, and 3. L.G. produced a total of 99 utterances with 26 echolalic utterances in sample 1, which was calculated to 26% while playing game. L.G. produced a total of 43 utterances with 11 echolalic utterances in sample 2, which was calculated to 26% while also playing a game. In sample 3 L.G. produced a total of 86 utterances with 13 echolalic utterances, which was calculated to 15% while viewing children's books.

For sample 4 two Pixar short films were used. In the no-AAC condition, L.G. produced a total of 33 utterances with 5 echolalic utterances, which was calculated to 15%. In the AAC condition, second short film, L.G. produced a total of 51 utterances with 2 echolalic utterances, which was calculated to 4%.

For sample 5 two games were used. In the AAC condition, L.G. produced a total of 67 utterances with 15 echolalic utterances, which was calculated to 22%. In the no AAC condition,

L.G. produced a total of 77 utterances with 22 echolalic utterances, which was calculated to 29%.

For sample 6 two games were used. In the AAC condition, L.G. produced a total of 68 utterances with 17 echolalic utterances, which was calculated to 25%. In the no AAC condition, L.G. produced a total of 76 utterances with 10 echolalic utterances, which was calculated to 13%.

For sample 7 two similar children's books were used. In the AAC condition, L.G. produced a total of 22 utterances with 2 echolalic utterances, which was calculated to 9%. In the no AAC condition, L.G. produced a total of 9 utterances with 0 echolalic utterances, which was calculated to 0%.

For sample 8 two games were used. In the AAC condition, L.G. produced a total of 62 utterances with 28 echolalic utterances, which was calculated to 45%. In the no AAC condition, L.G. produced a total of 43 utterances with 7 echolalic utterances, which was calculated to 16%.

For sample 9 two Pixar short films were used. In the AAC condition, L.G. produced a total of 29 utterances with 1 echolalic utterance, which was calculated to 3%. In the no AAC condition, L.G. produced a total of 26 utterances with 7 echolalic utterances, which was calculated to 27%.

For sample 10 two games were used. In the AAC condition, L.G. produced a total of 25 utterances with 6 echolalic utterances, which was calculated to 24%. In the no AAC condition, L.G. produced a total of 48 utterances with 10 echolalic utterances, which was calculated to 21%.

For sample 11 two Pixar short films were used. In the AAC condition, L.G. produced a total of 21 utterances with 2 echolalic utterances, which was calculated to 10%. In the no AAC

condition, L.G. produced a total of 10 utterances with 3 echolalic utterances, which was calculated to 30%.

It was observed by the researcher and outside judge that L.G. was not attending to the AAC device during transitional periods in game activities. Therefore, there was a noted higher percentage rates of echolalia in activities with the AAC when compared to activities without the AAC. In order to obtain a true measure of L.G.'s performance on echolalia transitional periods were removed from the transcriptions. The results for percentage rates without transitional periods are as follows in Figure 2.

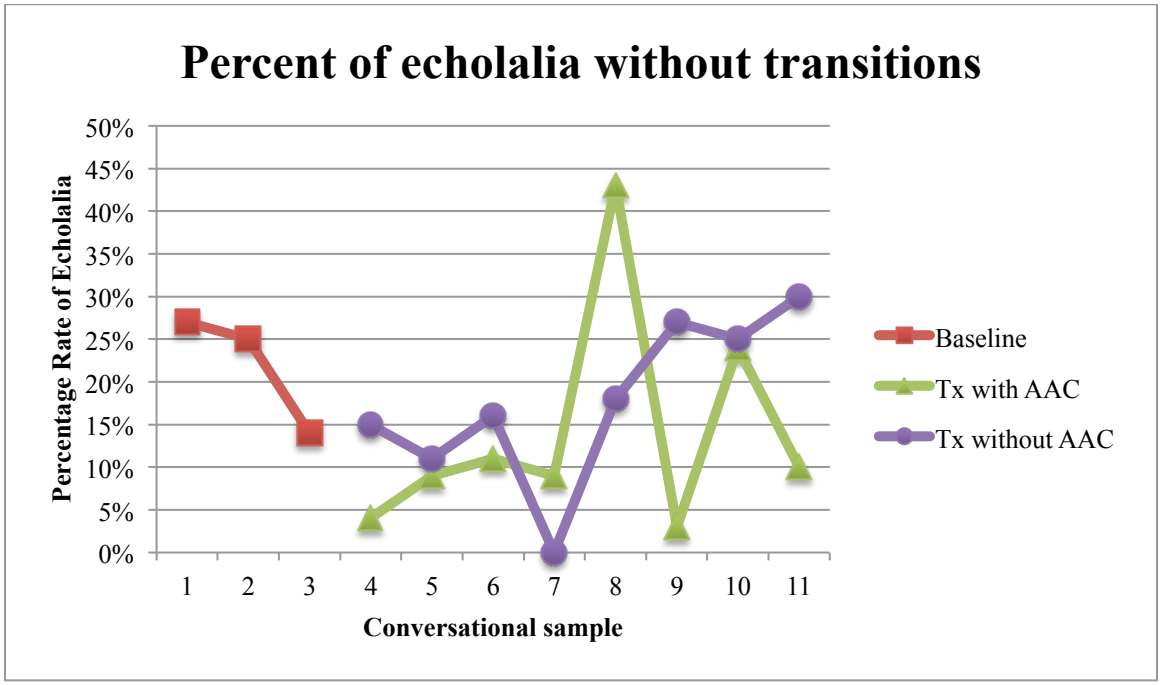

Figure 2 Percentage rate of echolalia without transitional periods.

When transitional periods were removed for sample 1, the percentage rate of echolalia increased from 26% to 27%. However, percentage rate of echolalia for samples 2 and 3 decreased. The percentage rate of echolalia for sample 2 decreased from 26% to 25% and the percentage rate for activity 3 decreased from 15% to 14%.

When transitional periods were removed from sample 5 (games) the percentage rates of echolalia decreased in both conditions. The percentage rate for the AAC condition decreased from 22% to 9%. The percentage rate for the no AAC condition decreased from 29% to 11%.

When transitional periods were removed from sample 6 (games) the percentage rate of echolalia for the AAC condition decreased. It decreased from 25% to 11%. However, the percentage rate for the no AAC condition increased from 13% to 16%.

When transitional periods were removed from sample 8 (games) the percentage rate of echolalia for the AAC condition decreased. It decreased from 45% to 43%. However, the percentage rate in the no AAC condition increased from 16% to 18%.

There were no transitional periods for sample 10 in the AAC condition. Therefore, the percentage of echolalia remained the same at 24%. But when transitional periods for sample 10 in the no AAC condition were removed the percentage rate increased from 21% to 25%.

In summary, during activities in the AAC condition was a noted decrease in echolalic utterances. The percentage of non-overlapping data (PND) (Scruggs, Mastropieri, & Casto, 1987) was applied to the data. The results are as follows: for samples including transitions, the PND for the no-AAC condition was calculated to 25% demonstrating ineffective treatment, while the PND for the AAC condition was calculated to 50% demonstrating minimally effective treatment. For samples without transitions, the PND for the no-AAC condition still demonstrated ineffective treatment with a PND of 25%, while the PND for the AAC condition increased to 75% demonstrating moderately effective treatment.

Chapter 4: Discussion

The purpose of this study was to determine whether echolalic utterances would be reduced in conversational speech, while using a high-tech speech-generating device. The results demonstrated that the support of Proloquo2go reduced echolalic utterances in conversational speech produced by L.G.

L.G.'s baseline performance demonstrates he used echolalic utterances an average of 33% of the time. When an AAC was implemented, there was a noted reduction of echolalic utterances. However, the results for sample 7 and sample 8 show contradictory evidence. The activity for 7 included reading books. The book activity in the AAC condition had a total of 22 utterances and 2 echolalic utterances and the book activity in the no-AAC condition had a total of 9 utterances with 0 echolalic utterances. The percentage rate for the book activity with the AAC was 9% and the percentage rate for the book without the AAC was lower 0%, suggesting that the AAC device did not aid to reduce echolalic utterances. However, there is a noted decrease in total number of verbalized utterances in both activities. This could be due to L.G.'s losing interest in the activity. It was observed during this activity, L.G. was distracted and had lost interest. He needed multiple redirections to remain on task. It was reported by his mother that L.G. does not like reading books at school and books are not used at home. After this, books were not used for activities.

The activity for sample 8 included games. The game that was played without the AAC was checkers and the game that was played with the AAC was Tumble. For the checkers game, L.G, produced a percentage rate of 19% of echolalic utterances and for Tumble, L.G. produced a percentage rate of 45% of echolalic utterances. This is also suggesting that the use of an AAC does not aid in reducing echolalic utterances and a noted increase in echolalic utterances was

noted. However, for the game Tumble in which marbles drop from a tower, L.G.'s behavior could be described as overstimulated or excited. When the marbles dropped he would increase prosody and volume by yelling. Therefore, it may be that his attention to the AAC device was minimal, despite multiple reminders. L.G. tends to produce more echolalia during periods of excitement.

These findings remain consistent with findings by Mueller & Forbes (n.d.) the use of a voice output communication aid may help reduce the number of echolalic utterances. The percentage of non-overlapping data (PND) (Scruggs, Mastropieri, & Casto, 1987) demonstrates ineffective treatment in the no-AAC condition for both, samples with transitional periods and samples without transitional periods. While the PND in the AAC condition for samples with transitional periods demonstrates minimally effective treatment and when transitional periods were removed the PND increased to moderately effective treatment, showing a significant difference between the no-AAC condition and the AAC condition.

The AAC device by L.G. was used for three reasons. It was observed that the AAC served as a communication device, language aid, and memory aid. There were instances where L.G. would use the AAC as a communication device where he would press down on the icon, which followed with voice output. Where other times, he would point at the icon without pressing down on it and verbalize an utterance using the word on the icon, demonstrating that the AAC served as memory or language aid. The researcher would respond to both communication from the AAC and L.G.'s verbal communication. The AAC device seemed to facilitate L.G.'s language skills. This could be explained by the theory mentioned above by Lloyd & Kangas. It could be that the AAC device is distracting L.G. from the pressures to communicate.

4.1 Limitations and future research

These findings should be interpreted with caution due to limitations. The limitations regarding single-subject research are the use of one of participant and lack of generalization to other individuals. Another limitation would be that L.G. was receiving indirect treatment on echolalia during speech therapy and during conversations with his mother. This may have an influence on the results. Echolalia was also not observed in other settings or with other speakers. Future research should include conducting additional analysis on the conversational samples that were obtained for this study. This would provide additional information on how the use of an AAC device is facilitating language skills. Future research should also include using more participants and comparing the AAC intervention to reduce echolalia with other interventions aimed to reduce echolalia. Due to data outliers, another interesting area of research should also include analyzing the use of an AAC device with over stimulating versus non-preferred activities. Since children with autism lay on a spectrum future research should also aim to analyze the use of an AAC with children who are considered to be low functioning and demonstrate the use of echolalia.

4.2 Clinical Implications

In conclusion, this study supplements the growing evidence of AAC device use in speech therapy and it opens up the door to a new area of research, AAC use in children who are verbal. Speech language pathologists typically use AAC devices with children who are nonverbal for alternate forms of communication. However, this study and the study by Mueller & Forbes (n.d.) provide evidence that AAC devices can also be beneficial for children who are verbal to augment the transition to generative language stages.

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Vita

On April 1,1989 Cynthia Valenzuela was born in El Paso, TX. She graduated from Burges High School in 2007 and attended El Paso Community College immediately after. She was then admitted into the University of Texas at El Paso and completed her undergraduate coursework for Speech Language Pathology. She was accepted into Speech Language Pathology Graduate School in 2011 when she began research in autism. Throughout her graduate school coursework, she conducted research with the guidance of Dr. Vanessa Mueller on Augmentative Alternative Communication and Autism. In November 2012, she attended and presented at the American Speech and Hearing Association National Convention on this research study in Atlanta, GA. Throughout her undergraduate and graduate coursework she worked as a behavioral interventionist with children with autism.

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