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THE EFFECTS OF AN AIDED AUGEMENTATIVE AND ALTERNATIVE COMMUNICATION MODELING INTERVENTION ON PRODUCTION OF MULTI-SYMBOL MESSAGES BY A SCHOOL-AGED CHILD WITH AUTISM SPECTRUM DISORDER WHO USES AAC

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ABSTRACT

This study examined the effects of aided augmentative and alternative communication (AAC) modeling intervention on multi-symbol messages by a school-aged child with autism spectrum disorder (ASD) who uses AAC. A larger study was conducted including seven participants (six boys, one girl) between the ages of eight and twelve who had a diagnosis of ASD. The case study exclusively examined the girl, who was 12 years-old diagnosed with Mental Retardation, Pervasive Developmental Disorder-Not Otherwise Specified, and Spastic Diplegia Cerebral Palsy. The study consisted of four phases: baseline, intervention, generalization, and maintenance. During each of these phases storybooks were read and accompanied by a communication board on Proloquo2Go® on the Apple iPad®. During baseline, the researcher provided a verbal model of at least two symbols on the communication board and during the other phases provided an aided AAC model, which involved pairing natural speech with pointing out a corresponding symbol on an AAC device. The results suggest that aided AAC modeling intervention is an effective way to teach production of multi-symbol messages for school-aged children with ASD who use ACC. This conclusion suggests an expansion of the population in which aided AAC modeling is an effective intervention technique.

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Chapter 1

Introduction

According to the American Psychiatric Association (2000), Autism Spectrum Disorder (ASD) is characterized by impairments in three areas: social interaction, communication, and restricted and repetitive behavior patterns. However, because ASD is a spectrum of disorders, each person's symptoms manifest differently, with symptom involvement ranging from mild to severe. Social interaction impairments are manifested through nonverbal behaviors, such as lack of maintained eye contact, and failure to form developmentally appropriate relationships with peers (APA, 2000). Communication impairments affect both verbal and nonverbal communication, which also affect social interaction. Delays in or lack of development of spoken language, inability to maintain a conversation, and stereotyped and/or repetitive language are additional areas of potential deficit. Further, children with ASD exhibit behavior patterns that are restricted, repetitive, and stereotyped (APA, 2000). These behavior patterns can be seen through fixation on few areas of interest and strict adherence to set routines (APA, 2000).

Approximately 20-50% of all children with ASD require augmentative and alternative communication (AAC) to meet their daily communication needs (Lord, Risi, & Pickles, 2004; National Research Council, 2001). In 2013 Blumberg, Bramlett, Kogan, Schieve, Jones, and Lu reported concerning statistics about the prevalence of ASD, indicating that as of 2011-2012, 1 in every 50 children is diagnosed with ASD. According to this report, the prevalence of ASD in children ages 6-17 increased from 1.16% in 2007 to 2.00% in 2011-2012. This increase in prevalence affects more than just the parents and families of the children with ASD. Educators

and therapists, specifically speech-language pathologists, should also be aware of the changes in incidence estimates as there may be more children with ASD than ever before who will require therapeutic services.

There are many approaches available for intervening with children with ASD. One intervention approach considered effective with children with ASD is modeling (NRS, 2009). There are many reasons that have been proffered regarding why modeling appears to be such a powerful intervention strategy. Drager (2009) explains typically developing children receive constant input and models for how to use their form of communication; speech, therefore, it is logical that providing children using AAC devices with the same modeling and input using their expressive mode of communication may be facilitative of the language and communication development process. By modeling using an AAC device, the communication partner is both showing the child with ASD how to use the device for expressive communication as well as demonstrating that AAC is an accepted form of communication (Drager, 2009). Drager (2009) talks about several different modeling interventions that can be used with children with ASD. These include Aided Language Stimulation, Natural Aided Language Stimulation, Aided Language Modeling, and System for Augmenting Language. All of these interventions share two major similarities: the intervention takes place in a natural setting and the child with ASD is provided both verbal and visual input (Drager, 2009).

Aided Language Stimulation

According to Goossens' (1989), aided language stimulation involves the communication partner accompanying speech with visual stimulation through pointing to picture symbols that correspond to the speech. One of the unique things about aided language stimulation is that regardless of the device or selection technique the child is using, the communication partner always supplements speech with corresponding visual stimulation. Initially this technique was

used during routine activities and pretend play, but eventually emerged as beneficial for language development (Goossens', 1989).

Goossens' case study examined a 6 year, 3 month old girl with Cerebral Palsy who was functionally non-speaking (Goossens', 1989). The child was recently adopted from a Korean orphanage and had only resided in the United States for three months prior to the start of the study (Goossens', 1989).

Preliminary testing concluded eye-gaze was the best option for helping the child communicate using picture symbols. The purpose of the study was to investigate the use of aided language stimulation for helping the child acquire use of picture symbols for communication.

Results indicated the child achieved success with aided language stimulation at a rate that required her therapy track to be adjusted several times throughout the study (1989). Additionally, the child demonstrated initiation and interaction with picture symbols through use of the eye-gazing technique (Goossens', 1989). One of the biggest breakthroughs from this intervention was that the child frequently began to initiate speech through two- or three- word combinations (Goossens', 1989).

System for Augmented Language

Romski and Sevcik (1996) developed the System for Augmented Language (SAL), a five-component intervention approach designed to assist in language development for youth with moderate to severe mental retardation who used fewer than ten words functionally. The five components of SAL include: (a) giving the child access to an electronic speech-output communication device, (b) providing symbols displayed on the communication device with the corresponding English word above each symbol, (c) incorporating a natural environment that is manipulated to encourage communication exchange, (d) involving the child's communication partners in use of the communication device, and (e) providing constant feedback about progress between the child's communication partner and the researchers (Romski & Sevcik, 1996).

Feedback to the communication partners was provided using the Parent-Teacher Questionnaire, referred to as QUEST. The purpose of this tool was to gather information about how and when the system was being used (Romski & Sevcik, 1996). The researchers also provided the opportunity for face-to-face communication with the communication partners to respond to any questions or concerns.

The children in the study by Romski and Sevcik (1996) were 13 males between the ages of 6 years, 2 months and 20 years, 5 months diagnosed with moderate to severe mental retardation with few functional words. During this study, the participants were exposed to two types of symbols: referential and social-regulative (Romski & Sevcik, 1996). Referential symbols referred to concrete items, such as foods and objects. Social-regulative symbols referred to participant and communication partner-specific symbols. The System for Augmented Language was found to be an effective intervention for both comprehension and production of referential symbols; although, comprehension was consistently higher than production. These findings were maintained by the participants from Year 1 of the study to Year 2 (Romski & Sevcik, 1996). Results for social-regulative symbols were consistently lower than referential symbols. It is difficult to compare the two symbol categories, however, because social-regulative symbols were introduced much later in the study and information about pre-study comprehension of these types of symbols was more difficult to obtain (Romski & Sevcik, 1996).

Natural Aided Language Stimulation

Natural Aided Language Stimulation is an adapted form of Goossens' modeling intervention (Cafiero, 2001). This intervention technique combines the principles of Aided Language Stimulation with incidental teaching strategies in the natural environment. Cafiero (2001) evaluated the efficacy of Natural Aided Language Stimulation using case study research methodology with a 13-year-old male diagnosed with ASD. During intervention, the child's communication partner modeled symbol use on the child's AAC system by pointing to the

corresponding key on the activity-specific communication board while simultaneously speaking the message (Cafiero, 2001). Additionally, the communication partner would acknowledge each communication attempt made by the child by expanding, repeating, or shaping the communication on the communication board (Cafiero, 2001).

Results of the study indicated the child with ASD exhibited the ability to receptively process multiple symbols as well as use the communication board for expressive language without training. Further, use of Natural Aided Language Stimulation with the child resulted in positive behavior outcomes. Cafiero (2001) reported that prior to implementing Natural Aided Language Stimulation, the child demonstrated bolting, tantrums, and out-of-seat behaviors. From baseline throughout the duration of the intervention, the average occurrences of both bolting and tantrums decreased (Cafiero, 2001). The decrease in both of these behaviors is partially attributed to the visual and verbal components provided by Natural Aided Language Stimulation (Cafiero, 2001).

Aided Language Modeling

Drager, Postal, Carrolus, Castellano, Gagliano, and Glynn (2006) reflected on the commonalities of several modeling strategies, Aided Language Stimulation, System for Augmented Language, and Natural Aided Language, to create a novel modeling approach referred to as Aided Language Modeling (ALM). Three major components make up Aided Language Modeling: (a) using an index finger to point to the real-life item, (b) using the index finger to point to the symbol on the communication board that was just referred to in real-life, and (c) accompanying the prior two steps with vocalization labeling the item being referenced (Drager et al., 2006).

To determine the utility of ALM as an intervention approach with children with ASD, Drager and colleagues (2006) designed a study that investigated the extent to which Aided Language Modeling would increase the number of symbols two preschoolers with ASD could

identify. Additionally, the study explored the extent to which Aided Language Modeling would increase initiation of symbols during interactive play (Drager et al., 2006).

The participants included two preschoolers between the ages of three and five with ASD who used fewer than 30 functional words expressively (Drager et al., 2006). The Aided Language Modeling sessions took place at the day care centers of the participants and consisted of play activities determined to be highly motivating, e.g., dollhouse, cars, and playground (Drager et al., 2006). Accompanying each play activity was a variety of symbols representative of vocabulary of important parts of the play activity. For both symbol recognition and symbol production items were placed in front of the child, play was initiated, and the child was prompted (Drager et al., 2006). Upon meeting criterion for baseline, the child moved to intervention and upon completion of intervention to maintenance. Both preschoolers demonstrated increases and ability to maintain the increases in both symbol recognition and symbol production as a result of Aided Language Modeling (Drager et al., 2006).

Aided AAC Modeling

Binger and Light (2007) explored the effect of an aided AAC modeling intervention on the production of multi-symbol messages by preschoolers who used AAC. Aided AAC modeling is an intervention approach in which natural speech is paired with pointing out key graphic symbols on an AAC device (Binger & Light, 2007). The participants consisted of five children between the ages of three and five who had previous exposure to aided AAC, showed significant congenital speech impairment, and had a minimum of a 25 word expressive vocabulary (Binger & Light, 2007). Binger and Light (2007) reported that three of the children used voice output devices; the other two children used non-electronic communication boards. None of the participants were diagnosed with ASD.

Intervention consisted of seven imaginative play scenarios such as eating fast food, having a tea party, or playing with a farm, where each scenario had accompanying toys and a

communication board (Binger & Light, 2007). Three of the five children were seen at their schools and the remaining two children were seen at their homes.

Of the three children who used voice output devices, two of the children reached criterion, a minimum of 12 symbol combinations during three consecutive sessions, and were able to move to generalization sessions (Binger & Light, 2007). During generalization, both of these children not only reached criterion but exceeded criterion (Binger & Light, 2007). Both children maintained these levels of multi-symbol combinations throughout maintenance (Binger & Light, 2007). The child who did not initially reach criterion during intervention participated in two different modified modeling interventions. However, similar to the initial intervention, these alternatives proved unsuccessful. Because the child did not reach criterion in intervention, generalization and maintenance could not be administered (Binger & Light, 2007).

Both of the two children with low technology communication boards reached criterion during intervention and moved to generalization (Binger & Light, 2007). Binger and Light (2007) explained that during generalization, one of these children met criterion and the other child did not. The child who did not reach criterion in generalization entered a second generalization condition that included the researcher providing aided AAC models. With this extra support, the child was able to reach criterion levels of performance and progress to the maintenance stage of the intervention (Binger & Light, 2007). Both children showed variability in the maintenance phase but the overall trend of their data showed increases in multi-symbol combinations (Binger & Light, 2007).

The Current Project

There is evidence of the effectiveness of modeling interventions with children with ASD, and some evidence of effectiveness with young children with ASD who use AAC systems to communicate. There is still a need, however, to investigate the effects of a modeling intervention with school-age children with ASD who present severe communication difficulties.

For this reason, the current study explored the effectiveness of aided AAC modeling as a strategy for teaching school-age children with ASD who use AAC expressive communication through (a) increasing communication for the purpose of joint attention and (b) aiding the transition to multi-symbol combinations.

Chapter 2

Method

Participants

Participants for this study were recruited in one of two ways. School professionals in school districts in Central Pennsylvania were contacted to identify students meeting the inclusion criteria. In addition, personal acquaintances were contacted about possible connections to potential participants.

Through these recruitment efforts, informed consent to participate in the research project was obtained from the parents of seven children with Autism Spectrum Disorder (ASD). These included one female and six males. All participants were between the ages of 8 and 12 and had a diagnosis of ASD. All participants were candidates for augmentative and alternative communication, meaning their speech was insufficient to meet the demands of their daily communication. All children were also functioning in the "first word" phase of expressive language development (Tager-Flusberg, et al., 2009) at the start of the study. The children also had functional hearing and vision for the purpose of following along with a story with the researcher or a member of the research team.

Though seven participants were recruited for the larger study, for the purposes of this paper, data for only one participant, the female participant, will be presented and discussed. At the beginning of the study, Abby was a 9-year-old diagnosed with Mental Retardation, Pervasive Developmental Disorder-Not Otherwise Specified, and Spastic Diplegia Cerebral Palsy.

One year prior to the study, Abby began her current school placement at her local elementary school, where she is included in a general education setting with a sign language interpreter. Abby also attended speech therapy, occupational therapy, and physical therapy.

At the beginning of the study, Abby's communication consisted of unintelligible vocalizations, vocal approximations, American Sign Language, and gestures. Abby also used Proloquo2Go® on an Apple iPad® to communicate at school.

A language sample was collected as part of the series of assessments that were administered prior to the start of the intervention. Abby's language sample was collected in her home involved playing a modified version of Go Fish. Abby, her mother, her sister, and the researcher played the game. Throughout the language sample, Abby's mother provided a scaffolding support to get responses from Abby. Various forms of unaided communication were used throughout the language sample. Primarily, Abby used vocal approximations, for example, Abby's mother said, "Say you're" to which Abby responded, "You". Occasionally Abby would directly imitate what she was being prompted to say during this interaction. For example, Abby's mother said, "Do you have a whale Abby, yeah?" and Abby responded, "Yeah". Additionally, Abby utilized some basic signs from American Sign Language. Several times throughout the language sample, when asked if she had a certain card, Abby signed "No". Abby also utilized gesturing as a form of communication. When asked if she had a match, Abby would sometimes shake her head and then point to her card. According to parent report and researcher observation it was determined Abby's language sample was an accurate depiction of her communication abilities prior to initiating the study.

Abby appeared eager to read books with the researcher and appeared excited for the sessions, especially when she could read Disney Princess books. Abby was very pleasant throughout the sessions and rarely exhibited challenging or problematic behavior. Abby appeared to enjoy making jokes using the Apple iPad® while referencing the book being read.

Assessment Measures

Preliminary assessment measures were collected prior to beginning the study. These assessment measures included a combination of criterion-referenced and standardized tasks. The criterion-referenced assessment measures consisted of a Theory of Mind (Muris et al., 1999) task, an attention following task (McDuffie, Yoder, and Stone, 2005), and a motor imitation (Stone, Ousley, & Litteford, 1997) task. The standardized assessments that were administered included the Test of Auditory Comprehension of Language Third edition (TACL; Carrow-Woolfolk, 1999) and the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997). Additionally, the Communication and Symbolic Behavior Communication Scales Developmental Profile – Caregiver Questionnaire (CSBS DP; O'Neill, 2007) was filled out by Abby's mother. See Table 1 for Abby's results.

Table 1: Abby's Assessment Scores

Test Name	Type of Test	Abby's Scores
Theory of Mind (First Order)	Criterion-referenced	1/4 items correct
Motor Imitation	Criterion-referenced	12/12 items correct
Test of Auditory Comprehension of Language 3rd Edition	Standardized	Raw Score = 26 (Reached ceiling on item 36)
Peabody Picture Vocabulary Test	Standardized	Raw Score = 34 (Reached ceiling on item 49)

Setting

The setting for the intervention sessions was Abby's home. Typically, the sessions took place on a couch in the living room. Abby's mother and two siblings, along with various pets, were present for the sessions. Abby did not appear to be distracted in this environment despite inconsistencies in noise and activity levels.

Materials

There were three main materials used during the intervention sessions including: an Apple iPad®, the application, Proloquo2Go®, and storybooks. Two Apple iPads® were used

throughout the study and each contained the Proloquo2Go®application. Using the Proloquo2Go® application, communication boards for the various books were programmed. The book chosen by the child to read during the session determined which iPad® would be used. Vocabulary for the book-based communication boards was selected by members of the research team by reading each story and determining the words needed to converse about the story. The goal for this vocabulary selection task was to select words and concepts that would allow the children and researcher to communicate using a minimum of two two-symbol messages per double-page spread. Each communication board had an average of 25 symbols, which were color-coded by part of speech (i.e., action, object, or other). Adaptations to some of the communication boards were made as needed, such as when the vocabulary initially selected was insufficient for properly talking about the book.

Research Design

The research design for this study was a single subject multiple probe research design across three students with a simultaneous replication across four additional students. Baseline began for the first two participants concurrently, and once a stable baseline was established these participants moved to the intervention phase. While participants one and four started intervention, the other participants continued baseline. Once a treatment effect was noted for participants one and four, the next two participants with steady baselines from each group (two and five) began intervention. The same procedure was repeated for participants three and six and then finally seven. The dependent variables in this research study were the "frequency of related joint attention turns taken by the child with ASD during each 15-minute storybook reading interaction" and the "frequency of multi-symbol messages produced by the participants during each 15-minute storybook reading interaction". The independent variable was the aided AAC modeling intervention.

Procedure

Baseline

During baseline, Abby participated in a minimum of 15-minutes of storybook reading with the researcher. The books for these sessions were selected using information gathered from the participants' parents and teachers and from a preference assessment conducted with each participant at the beginning of the study. The researcher began each session by reviewing the available symbols on the communication board for the book on the Apple iPad®. The researcher accompanied the selection of each symbol with a verbal comment about how the symbol may be used in the story. As the book was read, the researcher would pause on each double-page spread to see if the participant made any attempts to communicate. If the child communicated, the researcher would recast or expand upon what the child communicated. If there was no attempt to communicate made by the child, the researcher would provide a verbal model that included at least two symbols on the communication board. The researcher provided a minimum of two verbal models per two-page spread during each baseline session. These models related to either the text or the illustrations on the page. After each model, the researcher would pause to give the participant a chance to communicate. Other than the initial review of the symbols, the researcher did not use the Apple iPad® during the baseline sessions. The Apple iPad® was easily accessible for the participant throughout the reading. A stable baseline was established when a pattern of data that showed no increasing trend was maintained across a minimum of three sessions.

Intervention

Similar to baseline, during the intervention sessions the child was allowed to choose the books that were read. Upon selection of a book, the researcher would read the story. Unlike baseline, the available vocabulary was not reviewed unless the book being read was new to the child. The clinician began to read the selected book and provided a minimum of two two-symbol aided AAC models on the Apple iPad® per two-page spread. In addition to the aided AAC

model, the researchers provided a grammatically complete verbal model of the intended message. Once again, the researcher would pause after finishing the text on each page to provide the participant with the opportunity to initiate communication. The researcher would also pause prior to modeling to allow the participant to initiate communication. Intervention sessions were completed once a treatment effect (highest baseline number of multi-symbol message +4) was observed across a minimum of three sessions.

Generalization

Generalization sessions had a similar procedure to intervention with the exception of the books that were read. To ensure the participants were generalizing the use of multi-symbolic messages across more than just the books that were read during intervention, books that had never previously been read in an intervention session were read during generalization sessions. A minimum of two generalization sessions were completed.

Maintenance

The maintenance phase of the study was the exact same as the intervention phase. Each participant was allowed to pick the books that were read. Two maintenance sessions were completed: one session at 16 days post-generalization and the second 29 days post-generalization.

Data Coding

Although all data collection videos were coded in entirety, for consistency across the sessions a 15-minute segment from each video was used for the purpose of reporting data. Turns were coded as Intentional Related Symbolic turns (RS), Intentional Unrelated Symbolic turns (US), Intentional Related Gestural turns (RG), Intentional Unrelated Gestural turns (UG), Perseverative Symbolic turns (PT), and Exploratory Symbolic turns (ET). Social referencing was not required in order for a turn to be considered an intentional. Refer to Table 2 for detailed descriptions about each of the types of turns.

Table 2: Data Collection Type of Turn Definitions

Type of Turn	Definition	Modality	Example
Intentional Related Symbolic turn (RS)	Symbolic turn taken by the child that was directly relevant to the model provided by the researcher, the context of the story, or the page being read	Speech, American Sign Language, Apple iPad®, PECS, other forms of ACC or signed language system	Reading about Ariel and Abby uses the Apple iPad® to say, "Ariel."
Intentional Unrelated Symbolic turn (US)	Symbolic turn taken by the child that was related to the storybook reading context	Speech, American Sign Language, Apple iPad®, PECS, other forms of ACC or signed language system	Reading about Ariel and Abby uses American Sign Language to request a glass of water.
Intentional Related Gesture turn (RG)	Gestural turn taken by the child that was directly relevant to the model by the researcher, the context of the story, or the page being read	Distal or proximal finger point	Reading about Ariel and Abby uses her right pointer finger to point to a picture of Prince Eric on the page.
Intentional Unrelated Gesture turn (UG)	Gestural turn taken by the child that was not related to the storybook reading context	Distal or proximal finger point	Reading about Ariel and Abby uses her right pointer finger to point to the sandwich on the table.
Perseverative Symbolic turn (PT)	Child expresses same message (via any symbolic mode) multiple times within one two-second time period	Speech, American Sign Language, Apple iPad®, PECS, other forms of ACC or signed language system	Reading about Ariel and Abby presses "Flounder" four times in a row with less than a two second time period between each selection.
Exploratory Symbolic turn (ET)	Child changes pages or navigates to other applications on the iPad®, the child navigates away from book currently being read; child expresses multiple different messages (via any symbolic mode) within one two-second time period	Speech, American Sign Language, Apple iPad®, PECS, other forms of ACC or signed language system	Reading about Ariel and Abby navigates away from the story board to the Apple iPad® home page.

Reliability

In order to achieve reliability with coding, 20 percent of the total data for each participant was coded and compared between two research team members. Random segments from data collection videos from all parts of the study, baseline, intervention, generalization, and maintenance, were selected and coded. To determine point-by-point reliability, the two members of the research team compared every code they recorded. If any discrepancies were found, the team members would discuss and review the video where the discrepancy occurred. Reliability for Abby's data collection of RS turns was calculated as 93%. This number was determined by counting the agreements and dividing the number by the agreements plus the disagreements and multiplying the result by 100.

Chapter 3

Results

Two-Symbol Related Symbolic Turns

The overall trend across the study was an increase in the production of two-symbol related turns (See Figure 1). During baseline sessions, Abby averaged 0 two-symbol related turns, ranging from 0 to 0. Abby increased her use of two-symbol related turns during the invention stage of the study, taking an average of 5 turns (range: 1 – 10). Generalization sessions showed similar increase as seen in the intervention stages. Abby averaged 8.3 (range: 7 – 10) two-symbol related turns during the generalization sessions. Abby's averaged 10 two-symbol related turns during the two maintenance sessions (range: 9-11).

Three-Symbol Symbolic Related Turns

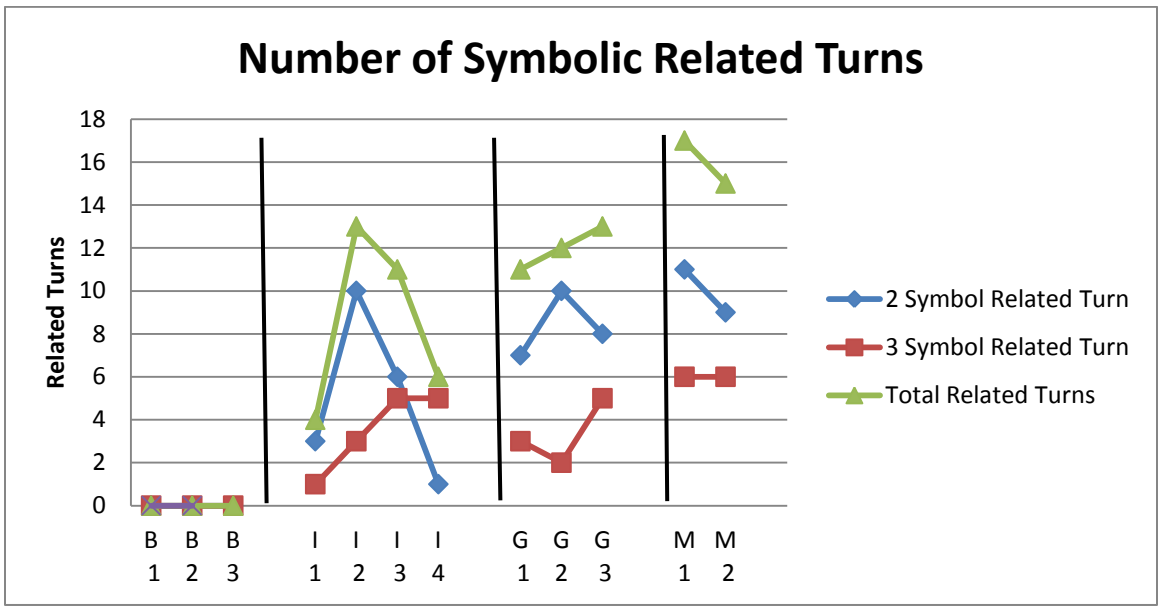
It was not until intervention that Abby started using three-symbol related turns (See Figure 1). During the baseline sessions, Abby did not take any three-symbol related turns. Abby showed an increase in three-symbol related turns during her four sessions of intervention. Abby averaged 3.5 three-symbol related turns through intervention with a range of 1 to 5. Abby's use of three-symbol related turns during generalization averaged 3.3 per session (range: 2-5). Maintenance showed a similar pattern of overall increase as intervention and generalization. Over two maintenance sessions, Abby averaged 6 three-symbol related turns, with a range of 6 to 6 three-symbol related turns per session.

Total Related Symbolic Turns

Abby took no multi-symbol related turns throughout baseline. During intervention, Abby's total number of multi-symbol related symbolic turns increased averaging 8.5 with a range

of 4 to 13. Abby's total number of multi-symbol related symbolic turns continued to increase during generalization. Abby averaged 12 related turns (range: 11-13) during generalization. Continuing to follow the trend of increasing related turns, Abby took an average of 16 multi-symbol related turns during maintenance (range: 15-17). Throughout baseline, Abby demonstrated no use of multi-symbol related symbolic turns but was taking single-symbol related symbolic turns.

Figure 1: Symbolic Related Turns Taken Throughout the Study



Chapter 4

Discussion

Aided AAC modeling proved an effective intervention approach for Abby, a school-age girl with ASD who used AAC for communication. Results indicated Abby was successful in learning to produce multi-symbol messages during a book reading context and that she was able to maintain these gains multi-symbol production over time.

Performance on Two-Symbol Related Turns

Abby showed an overall increase of two-symbol related turns throughout the study. Despite taking no two-symbol related turns during baseline, Abby averaged 5 two-symbol related turns in intervention. During generalization, Abby's average two-symbol related turns increased to 10 per session. This overall increase was maintained during maintenance, where Abby once again averaged 10 two-symbol related turns per session. The results indicate Abby learned and maintained the acquired skill. This overall rising trend supported that aided AAC modeling intervention was successful in teaching Abby to produce multi-symbol combinations.

Performance on Three-Symbol Related Turns

Similarly to Abby's performance on two-symbol related turns, Abby showed an overall increase of three-symbol related turns throughout the study. Abby increased her average use of three-symbol related turns from 0 in baseline to 3.5 in intervention. Abby showed a slight decrease in average three-symbol related turns from 3.5 turns in intervention to 3.3 turns in generalization. Although seemingly insignificant, this decrease could have resulted from engaging in novel story-book reading, which may have been less motivating. During maintenance, Abby averaged 6 three-symbol related turns per session, which indicated that the

skill had been maintained. These results show that aided AAC modeling intervention was effective in teaching combinations that involve more than one or two symbols. This could also lead to hopes of even further development of symbol combinations that may develop into full sentences.

Performance on Total Related Turns

Not only did Abby's performance on multi-symbol related turns throughout the study confirm the findings of Binger and Light (2007) that aided AAC modeling was successful in increasing multi-symbol combination of preschool children with complex communication needs, but Abby's performance also expanded that population to a school-age child with ASD. Abby's production of related multi-symbol combinations increased from an average of 0 in baseline to an average of 8.5 in intervention. During generalization, Abby averaged 12 related multi-symbol combinations, showing a continued increase. This increase continued to be seen in maintenance, where Abby averaged 16 related multi-symbol turns. Aided AAC modeling helped Abby expand her use of multi-symbol combinations, allowing her to communication in more detail about the book that was being read.

Clinical Implications

The results of this study supported use of aided AAC modeling with school-age children who have ASD and require AAC for communication. Although aided AAC modeling was only used during a story-reading activity, it may also be effective in other activities. Utilizing several modes of communication through a combination of speech, symbols with the word written above, pointing to the page and symbols, and speech output from the AAC device resulted in a positive outcome for producing multi-symbol combinations for the function of joint attention. This multi-modal approach was important for the input the child was receiving, as well as the output the child produced, which is in line was previous research (Goossens', 1989; Romski & Sevcik, 1996; Cafiero, 2001; Drager et al., 2006; Binger & Light, 2007).

Drager et al. (2006) reported, for some children motivation of the activity, in this case, the book being read, may prove critical for the success of the intervention. Abby's motivation throughout the study held true to these findings. Although Abby would read any book that was presented to her, she was more motivated and engaged when reading preferred books, such as Disney Princess books. Motivation is something to be aware of when providing therapy to children with similar profiles to Abby.

Current Study Limitations

Although the results from this case study appear promising for the future of aided AAC modeling for school-age children with ASD, there are some limitations that must be considered. First, the results represent a single case study. Although the results showed positive effects with this child with ASD, these results only represent one child. Other factors may have played a role in this child's success that if not present in other cases may not yield the same results.

Another limitation to the study was the book-reading activity. Although this activity created obvious opportunities for communication from the child, the study did not examine if the child was able to generalize multi-symbol production during other activities, such as play, or going to the grocery store with the parents. Even though the book reading activity took place in the child's house, considered a natural setting, book reading may not be a natural activity that occurs in the child's home.

An additional limitation is that a single researcher acted as the communication partner throughout the entire study. Generalization to other communication partners may be restricted because of the use of one communication partner who is not typically in the child's natural environment.

Further limitations include maintenance sessions were only conducted up to 29 days post-generalization. This does not provide enough elapsed time to determine if multi-symbol

production is truly maintained. Additionally, throughout intervention and maintenance, the child was allowed to reread preferred books. Although this assisted with motivation, this increased the possibility that the child started to learn or memorize the book, which would result in altered data.

Future Research

Because of some of the limitations above, it would be beneficial to conduct further research investigating the use of aided AAC modeling as a source of teaching multi-symbol combinations to children with ASD who use AAC. This research should increase the sample size of the population being served to insure the success reported from this study was not by chance and expand upon the activities in which aided AAC modeling is used as intervention. By limiting the intervention activity to a book-reading activity, it does not prove that the child has generalized the skill to more than just that activity. Participating in other natural daily routines such as dinner or bedtime with various communication partners while using the device may give a better understanding of how well the child has learned the skill.

Data was collected two times over maintenance and only up to 29 days post-generalization. Further research over a more extended period of time would be beneficial to assure that the skill has been maintained. Additionally, reading novel storybooks, rather than rereading certain books may or may not provide more accurate data. Although it would eliminate the concern of the child memorizing the book, it may prove less motivating for the child.

Conclusion

Aided AAC modeling proved to be a successful intervention for teaching a school-age child with ASD who uses AAC to produce symbol combinations during a story-book reading activity. Not only did aided AAC modeling facilitate the child's ability to produce multi-symbol combinations, but it also resulted in an overall increase of related symbolic turns. The child also showed maintenance of the acquired skills 16 days post-generalization and 29 days post-generalization.

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Education

Bachelor of Science in Communication Sciences and Disorders With Highest Distinction, May 2013

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Schreyer Honors College

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Honors and Awards

- Communication Sciences and Disorders Student Marshal
- Alumni Recognition for Student Excellence Award
- The Evan Pugh Scholar Award (Junior and Senior)
- President Sparks Award
- President's Freshman Award
- Dean's List All Semesters
- Alpha Lambda Delta (Freshmen Honor Society)
- Omicron Delta Kappa
- AMCC Academic All-Conference Team

Association Memberships/Activities

- Penn State Dance MaraTHON Axis Family Relations Chair
    - Danced in THON 2013
- NSSLHA (National Student Speech Language Hearing Association)
- Sign Language Organization
- NCAA Women's Soccer (Penn State Altoona)
- Global Brigades
- Intramural Soccer, Softball, Volleyball
- Centre Soccer Association – Youth Soccer Coach

Professional Experience

- Penn State Communication Sciences and Disorders Department
    - Research Assistant
        - Language and Literacy Research Initiative
        - Hintz Modeling Project
- Teacher's Assistant CSD218 – American Sign Language I
- Speaking from the Heart, Inc. – Secretarial Work
- Penn State Human Development and Family Studies Department
    - Research Assistant
- Lionville Youth Association (LYA) Sports Camps – Director and Counselor
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Research Interests

I am interested in several topics in the field of communication sciences and disorders including, young children with Autism, people who are nonverbal and traumatic brain injuries. Although each of these topics is very different from one another, I hope to have the opportunity to work with all three populations in the future.