AUGMENTATIVE AND ALTERNATIVE COMMUNICATION WITH AN ADOLESCENT COMMUNICATOR WITH SEVERE DEVELOPMENTAL DISABILITIES

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ABSTRACT

This case study focused on the effects of just-in-time programming on adolescent and school age individuals’ with severe developmental disabilities. Researchers collected data on the number of communicative turns taken, semantic concepts available, and engagement. Data was collected during 15 minute sessions for 11 weeks with both baseline and intervention sessions to conclude if just-in-time programming could increase the communicative turns taken by the individual during activities that were structured and motivating to the participant. This particular case study was part of a larger study following school-age and adolescent individuals with complex communication needs due to severe developmental disabilities.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF FIGURES</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>iv</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>v</td>
</tr>
<tr>
<td><strong>Chapter 1 Information</strong></td>
<td>1</td>
</tr>
<tr>
<td>Problem Statement</td>
<td>1</td>
</tr>
<tr>
<td>Overview of AAC</td>
<td>2</td>
</tr>
<tr>
<td>Types of AAC</td>
<td>3</td>
</tr>
<tr>
<td>Brief Overview of Visual Scene Displays</td>
<td>4</td>
</tr>
<tr>
<td>Just-In-Time Programming</td>
<td>5</td>
</tr>
<tr>
<td>AAC Issues for People with Developmental Disabilities</td>
<td>6</td>
</tr>
<tr>
<td>Research Question</td>
<td>6</td>
</tr>
<tr>
<td><strong>Chapter 2 Method</strong></td>
<td>7</td>
</tr>
<tr>
<td>Design</td>
<td>7</td>
</tr>
<tr>
<td>Participant</td>
<td>7</td>
</tr>
<tr>
<td>Materials</td>
<td>8</td>
</tr>
<tr>
<td>Procedure</td>
<td>9</td>
</tr>
<tr>
<td>Data Collection and Analysis</td>
<td>10</td>
</tr>
<tr>
<td>Reliability</td>
<td>10</td>
</tr>
<tr>
<td><strong>Chapter 3 Results</strong></td>
<td>11</td>
</tr>
<tr>
<td><strong>Chapter 4 Discussion</strong></td>
<td>13</td>
</tr>
<tr>
<td>Effects of Just-in-Time Programming</td>
<td>13</td>
</tr>
<tr>
<td>Clinical Implications</td>
<td>14</td>
</tr>
<tr>
<td>Limitations and Direction of Future Research</td>
<td>15</td>
</tr>
<tr>
<td>Conclusion</td>
<td>15</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>19</td>
</tr>
<tr>
<td>ACADEMIC VITA</td>
<td>21</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1 Emily Communicative Turns ................................................................. 11

Table 2 Number of Concepts ............................................................................ 12
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I would also like to thank Dr. Ingrid Blood for her continued support and motivation throughout my academic career. She has provided me with wonderful insight and inspiration.
Chapter 1 Information

Problem Statement

There has been little research done involving augmentative and alternative communication (AAC) for adolescents and school age individuals. As a result, the current technology available for adolescents with complex communication needs is not always age or developmentally appropriate. The technology available is time consuming to program, and therefore communication partners often do not add vocabulary frequently to the assistive devices. Also, the ability to add vocabulary during an interaction is not available on many of the current AAC systems available and therefore individuals who use AAC may have a difficult time communicating about a spontaneous event.

As children mature into adolescence, their interests and goals change and as a result their desire to communicate is altered. Understandably, an adolescent may no longer want to talk about playing on the playground, or playing house with friend like she did when she was a few years younger. As children age, their vocabulary increases. However, AAC for adolescents is not typically age appropriate and contains basic vocabulary. In addition, their expressive vocabulary may not being updated as quickly as their receptive vocabulary is expanding. Outdated vocabulary is one factor that may contribute to an individual experiencing social isolation and frustration because he/she cannot talk about the same current events that his/her peers are able to communicate about. Due to severe communication deficits, those with and severe disabilities often experience difficulty initiating interactions (Schepis & Reid 1995). According to Schepis and Reid one of the best forms of AAC is that with voice output. Individuals with voice output,
whether synthesized or digitized, can initiate communication interactions because they are more easily able to get the attention of the communication partner.

AAC is designed to improve the overall quality of life for individuals with complex communication impairments. By recognizing what works and what does not work within AAC systems researchers are able to design improved technology to help those with complex communication needs (CCN) better communicate.

**Overview of AAC**

AAC is all forms of communication except speech used to either supplement or replace speech output (ASHA). All individuals use AAC daily. AAC can take any form of gestures, facial expressions, symbols (e.g. emoji’s), writing, or pictures. Individuals with complex communicative needs typically benefit from some form of AAC.

Communication is essential, and can fulfill four main purposes: 1) communication of wants and needs, 2) information transfer, 3) social closeness, 4) social etiquette (Light, 1988). Communication of wants and needs messages are intended to have a communication partner complete an action requested by the AAC user. Information transfer results in sharing information between individuals. Social closeness is the category that is most often overlooked. However, social closeness is vital to an individual who uses AAC to establish, maintain, and create social connections with other people. Social etiquette is the simple niceties that occur within daily interaction. “Please and thank you” are examples of social etiquette routines. If an AAC user does not have the ability to communicate these messages, that individual does not conform to social conventions.
To give an individual with CNN access to an AAC device is not enough. It is essential that the individual using AAC develop communicative competence. According to Light (1989) communicative competence is “the quality or state of being functionally adequate in daily communication, or having sufficient knowledge in daily communication, or having sufficient knowledge, judgment, and skill to communicate” (p. 138). Communicative competence can be broken down into four areas, all of which must be mastered for an individual to successfully use an AAC device: 1) linguistic competence, 2) operational competence, 3) social competence, 4) strategic competence. Linguistic competence refers to the individual who uses AAC to master the linguistic code of their native language, as well as the linguistic code of their AAC device. Operational competence is the actual skills required to operate the AAC device, (e.g. hand motor movements, eye blinks, etc.). Social competence refers to the appropriate use of the AAC device in different contexts. Strategic competence consists of coping strategies that will allow the AAC user to bypass limitations due to their disability. Communicative competence is not an immediate achievement, it takes time and effort from the individual and the personal support team involved.

**Types of AAC**

There are three basic modes for communication: vocal mode, gestural mode, and graphic mode (Beukleman & Mirenda 2013). Vocal mode refers to the use of speech and vocalizations. Gestural mode refers to natural gestures, sign language, or finger spelling to produce and receive messages. Graphic mode is the use of two-three dimensional symbols to represent events or objects (e.g. texting, pictures). In AAC, communication devices can either be aided or unaided. Unaided communication devices do not require external objects, and uses the body to communicate. Unaided communication consists of the gestural and vocal mode. Aided communication requires an external object in addition to the use of the body. Examples include
writing on a whiteboard or using a tablet or electronic device. Aided communication consists of the graphic mode.

AAC devices can also be high-tech or low-tech. High tech devices have the ability to produce speech output, and allow for a large amount of vocabulary to be programmed onto the device. High tech devices can be dedicated, used solely for AAC purposes, or undedicated, used for purposes other than AAC (e.g. laptop) (Downey and Hurtig, 2003).

**Brief Overview of Visual Scene Displays**

Visual Scene displays (VSDs) are “representations of concepts are embedded in a full or integrated scene. This means that the entire image of the scene – whether a digital photograph, scanned image, or schematic line drawing – contains multiple concepts within it” (Wilkinson, Light & Drager, 2012, pg. 137). A VSD could be a photo of a child’s favorite book (see Appendix B) in which case the communication partner would take a photo of that children’s book, and create hotspots for each photo. Maybe the child would like to read along with the communication partner, and therefore the partner would create hotspots on the text with speech output reading the text. It is imperative to recognize however, that VSDs are not restricted to any one way of communicative intent, but rather that VSDs could be used to communicate multiple messages (Wilkinson, Light & Drager, 2012). An example of this would be that same picture of a child’s favorite book with a hotspot on the front cover with the speech output “I want to read a book”. There are many opportunities for different messages to be communicated in VSDs.

It is also important to consider what the VSD will include. A study conducted by Wilkinson & Light (2011) concluded that many VSDs omit human figures. However the study found that when college age individuals were presented with a VSD containing human figures,
the participants’ eye gaze were fixated on the human figures for longer and more rapidly than expected based on the size of the figure. This study in particular demonstrates that including human figures in a VSD may be a benefit to an individual.

**Just-In-Time Programming**

According to Beukleman and Mirenda (1998), the “ultimate goal of an AAC intervention is not to find a technological solution to communication problems but to enable individuals to efficiently and effectively engage in variety of interactions and participate in activities of their choice” (pg. 8).

When considering an AAC device that may be beneficial to an adolescent, it is important to consider his/her current level of communication. It is also important to take into consideration the individual’s social network and interests. If action is not taken to determine these two variables within an individual’s life, then the developed AAC system will not provide the individual with CCN much assistance in maintaining relationships, and engaging in activities.

“Just in time” (JIT) programming allows for on the fly programming of vocabulary by utilizing VSD. JIT programming gives the individual using AAC and communication partner the ability to add a VSD to the device on the spot and from there create hotspots to increase the vocabulary inventory of the AAC user. The ability to add vocabulary while communication interaction is still occurring gives the AAC user the ability to engage in conversation that is relevant to the user’s and communication partner’s surroundings and interests. This gives individuals the ability to have more natural communication, instead of pre-structured, planned interaction. JIT technology prevents the caregiver from forgetting to add vocabulary from a communication breakdown, because he/she is able to add that vocabulary on the spot. This also
allows the AAC user to access that same vocabulary when presented with a similar interaction in the future.

**AAC Issues for People with Developmental Disabilities**

The present investigation is a case study focused on a 14 year old adolescent female with a moderate intellectual disability. According to Beukleman and Mirenda (2005), people who have intellectual disabilities have only been seen as appropriate candidates for AAC intervention since the mid-1980s. Since then, people with intellectual disabilities have been increasingly provided with technology to assist them in communicating in multiple environments. Forty-three percent of moderate to profound intellectual disabilities are a result of chromosomal or a genetic disorder. Intellectual disabilities often co-occur with hearing, vision, motor, seizure, and communication disorders, as is the case with the 14 year old in this case-study. Worldwide, the prevalence of intellectual disabilities is between 1-3% (D. Beukleman & P. Mirenda, 2005, p. 240). “A demographic study conducted in the state of Washington indicated that people with intellectual disability comprise the largest percentage of the school-age population of individuals who are unable to speak” (D. Beukleman & P. Mirenda, 2005, p. 241).

**Research Question**

This study addressed the following questions: What is the impact of appropriately designed aided AAC intervention using Just in Time technology on the frequency of turns produced by an adolescent with severe developmental disabilities during shared context activities? And what is the impact of appropriately designed aided AAC intervention using Just in Time technology on the number of different concepts produced by an adolescent with severe developmental disabilities during shared context activities?
Chapter 2 Method

Design

A single case, case study (AB) was used for the evaluation method for this study. This type of study was appropriate for this research because it is very individualized in that it investigates unique persons in unique situations. The participant in this study had multiple disabilities. A Single case (AB) study focuses on the individual’s behaviors and interests, whereas a group study would require all the participants involved to be at a similar communicative skill with similar diagnoses and therefore would not have been suitable. A single case study also allows for a more thorough investigation and analysis of the communicative skills of the individual.

In this study, the independent variable was the intervention, including a tablet with JIT programing. There were a minimum of five baseline sessions prior to the independent variable being implemented in the sessions.

Participant

The participant in the single case study design was Emily (pseudonym used to protect participant confidentiality), a 14 year old girl in the 8th grade. Emily had multiple disabilities including: speech and language impairment, moderate intellectual disability, mild scoliosis, cleft palate, slight hyptonia, fetal alcohol syndrome, chromosomal amoralities, seizure disorder, septate hyman, recurrent ear infections, history of heart murmur, ADHD, and disruptive behavior disorder. Based upon observation from baseline sessions, Emily demonstrated functional hearing. Emily used five conventional signs and several other idiosyncratic signs and gestures. These signs were bye, eat, all done, tired, and silly. Emily also used a Super Talker Eight system
that gave her eight speech output choices to choose from. The Super Talker Eight is a fixed
display AAC system in which the items on the board are in a set location. Emily enjoyed music
and would initiate dancing with her communication partner when the communication partner
would play a song. She also used an idiosyncratic sign for dance, in which she would place her
hands on her hips to get her communication partners to join her in dancing.

**Materials**

The following materials were used during both the baseline and the intervention sessions:
music, leisure activities and books. During intervention, JIT technology was implemented which
allows for adolescents and their communication partners to create a VSD with communicative
hotspots. The JIT technology was presented on a Samsung Tablet 10.1. The tablet had dual
cameras, a 1.3 mega pixel front camera and 3.0 mega pixel rear camera. In order to create a
hotspot, the communicative partner must first take a picture to create a VSD. An example of this
would be to take a picture of an entire living room (See Appendix B for an example of a VSD).
The communicative partner would then draw hotspots within that living room using “on-the-fly”
technology (which allows the partner to create hotspots on the go whenever they so desire). The
hotspot was created by pressing the hot spot icon on the Default: Creating Pro page. The
communicative partner is then able to program voice output when these hotspots are activated by
touch. JIT technology also allows the user to customize their VSD using groups. When opening
the JIT Application under Creating Mode: the user saw a green camera icon, and a pink camera
icon. The green camera icon allowed the user to create groups. Once selecting the icon, the
camera icon is activated, and the user was able to take a picture. Once a picture is taken, that
picture would become the cover page for that group. The pink camera icon was to create pages
within already existing groups. The camera was activated once the pink icon was selected, and
the user could create as many pages within a group as they wished. This is useful for the user to help navigate their vocabulary with ease as well as organize some of their favorite activities (e.g. reading a book). Another feature of the JIT App can be accessed in Creating Pro. This feature allowed users to import pictures already on the Tablet’s gallery or from the internet.

Other equipment used in this study included a Mac desktop computer which was used to watch and code the baseline and intervention sessions. The Mac had a 2 x 2.4 GHz Quad-Core Intel Xeon Processor, and a 8 gigabyte 1066 MHz DDR3 EEC memory. The Mac also has a ATI Radeon HD 5770 1024 MB graphics card, and ran Mac OS X Lion 10.7.4 (11E53) software. An 8.9 MP Sony Handycam HDR-PJ260VE camera with 30 times optical zoom was used to video record the sessions with the participants.

Within both the baseline and the intervention sessions, magazines, classroom materials, books, and songs were used as activities to engage the participants in the study. Some of the books were customized for the participant, but the participant was familiar with the content beforehand.

Procedure

The participant completed five baseline sessions and five intervention sessions using the tablet with JIT programming. Sessions were scheduled once per week for 15 min. All activity items used during baseline and intervention sessions were held up in front of the participant so she was able to see them and were prompted to engage in activities with the communication partner. During an interaction, the researcher provided an opportunity for the participant and provided an expected delay. If the participant then responded to the opportunity by participating in the activity that was prompted, or by responding using the AAC device then the interaction
would continue. If not, the researcher would prompt the participant further by pointing to the AAC system in hopes to evoke a response from the participant. If the participant still did not respond after further prompting, the researcher would provide a model prompt by showing the participant what to do in order to take a turn in the activity (e.g. pressing yes/no on their AAC device for the participant).

**Data Collection and Analysis**

The sessions were videotaped using a Sony camera. These video recordings were transferred to the Mac desktop computer for further analysis. The 15 min baseline and intervention sessions were coded for analysis. Communicative turns were determined to be an intelligible symbolic expression that occurred in any mode.

Engagement was also coded as data for analysis. Engagement was defined as facial orientation towards the AAC device, the communication partner, or the activity that was presented. The data were coded every 10 sec during both baseline and intervention sessions. If engagement took place, the segment was coded with a + (plus) symbol. If engagement did not occur, the segment was coded with a – (minus) symbol. Facial orientation towards the AAC device was coded with the letter D. Facial orientation towards the communication partner (researcher) was coded with the letter P. Facial orientation towards the activity being presented was coded with the letter A.

**Reliability**

The reliability for this study was checked throughout the course of the study to ensure consistency and accurate representation of the data. Reliability was coded on 20% of the sessions and is still in the process of being calculated.
Chapter 3 Results

Figure 1 displays the number of communicative turns taking during the five baseline sessions followed by the five intervention sessions. During the baseline sessions, the participant was recorded as taking between 15-18 turns with each baseline session increasing in the number of turns taken. In the first intervention session her communicative turns increased to 32 turns. The following intervention sessions continued to show increase in the number of turns taken. The highest number of turns taken was in the 3rd intervention session with a total of 46 turns recorded.

Table 1 Emily Communicative Turns

Figure 2 displays the number of concepts available to the participant during each of the intervention sessions. The concepts available to the participant were equal to the number of hotspots available for selection during the intervention. Pages and hotspots that were changed or added using JIT programming were coded as concepts during intervention. By the end of
intervention, a total of 25 concepts were added to the participants AAC device with an average of 6 concepts added per intervention session.

*Table 2 Number of Concepts*
Chapter 4 Discussion

The current study focused on the number of communicative turns taken and concepts expressed by an adolescent communicator when intervention took place and JIT programing was implemented. The two major variables that were studied were communicative turns taken and the number of concepts available. In the section that follows, results of the study, clinical and educational implications, limitations, and future research directions will be discussed.

Effects of Just-in-Time Programming

The major result from this study indicated that the participant had a significant increase in the number of communicative turns taken and concepts available when intervention was provided as compared to baseline (See Figure 1 and Figure 2). Access to JIT software allowed the interventionist the ability to add vocabulary that was interesting and motivating to the participant. JIT programming also may have allowed the interventionist the ability to take advantage of events that may not have been anticipated before the interaction took place. When given appropriate intervention, an individual who otherwise had very little means of communication, could actively participate in communication and engage in activities. As reflected in the data, the participant had very few communicative turns during baseline, between 10-20 turns within a 15 min session. Once JIT programming was introduced, Emily increased her number of communicative turns from 10-18 to 32-46. This study demonstrates that even though someone is an adolescent communicator with CCN, intervention can provide individuals with the ability to communicate more effectively than before intervention.

JIT programming makes adding vocabulary easy by giving both the AAC user and the communication partner the ability to add conversation while an interaction is still taking place.
JIT programming has the ability to be customized, keep vocabulary relevant with the ease of on-the-fly communication, and the ability to keep the AAC device in front of the user rather than taking it out of view of the user to add more vocabulary. The ability to add vocabulary that is both interesting and motivating to the user will keep the user more engaged in daily conversation as well as activities that take place around that individual. Another advantage of JIT programming is the fact that it is a high-tech communication system. This is a benefit to both the AAC user and their communication partners because of the high vocabulary storage compared to that of a low-tech system. JIT programming also allows those with limited motor capability to access vocabulary with a touch of the screen. Because of the reasons stated previously JIT programming has the potential to make a tremendous impact on the lives of adolescent with complex communication needs.

**Clinical Implications**

The results of this study demonstrated a positive effect on the number of communicative turns and unique concepts expressed during communication. The data collected suggests that JIT programming may also be a benefit to other adolescent individuals with moderate intellectual disabilities. It is estimated that 1-3% of the world’s population is said to have an intellectual disability, and 92-100% of those individuals who have an intellectual disability would benefit from AAC (Beukleman & Mirenda, 2005, p. #240). Because of the prevalence of those individuals with intellectual disabilities, as well as co-occurring disabilities, clinicians and educators will likely work with individuals with this diagnosis at some point in their career. JIT programming may have the potential to benefit these individuals by giving them an ability to communicate in more natural environments and will ultimately give them a chance to succeed in
ways they otherwise may not have been able to. Just-in-Time programming could greatly benefit more individuals with a similar diagnosis to Emily.

**Limitations and Direction of Future Research**

This study showed positive effects of JIT programming for adolescents with CCN. However, there are still some limitations to this study. This study only focused on one participant, so it is impossible to say whether the benefits would generalize to a greater population. This study also does not take into account other age groups and other diagnoses. Also, because this is an AB study, with baseline and intervention sessions, there is no way to conclude whether the increase in performance was caused by a change in other factors such as: familiarity with the communication partner, familiarity with the JIT device, or familiarity with the task. Had this study involved more participants, it might have been possible to determine if the increase in communicative turns was due to the system itself or other factors involved.

Future research would be beneficial to determine if JIT programming would be effective with individuals with other diagnoses and age ranges. Future research should also investigate the effects of JIT programming longitudinally, since this case study lasted only 11 weeks and there was no maintenance phase, it is impossible to determine whether the increase of communicative turns continued after intervention concluded.

**Conclusion**

Adolescent with severe complex communication needs have the right to communicate. JIT programming may provide these individuals access to communication in every environment. On the fly technology ensures that communication breakdowns will be few and far between with the ability to add vocabulary while still in a communication interaction. By implementing JIT
programming it is possible to increase the number of communicative turns taken and the number of concepts expressed by the individual. The results of this study could have a significant impact on a larger demographic of people who otherwise would have no access to communication.
APPENDIX A

JIT Navigating Page

Navigating Mode
Appendix B

Example of a hotspot on a VSD
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    ▪ Witness interdisciplinary team approach through attending morning rounds, team conferences, and family conferences to coordinate patient care.
  o Fulton Elementary School June - November 2014
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- Observed therapy strategies to help remediate communication of children with speech disorders

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