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Pragmatic Organization Dynamic Display (PODD) and Enhancement of Communication on Individuals with Autism

Karen Feathers

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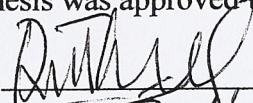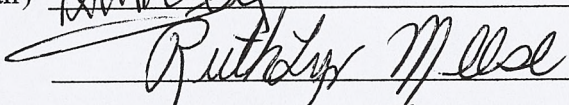
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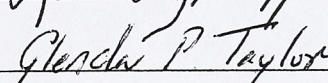
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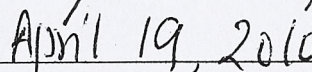
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Abstract

The purpose of this research was to investigate the communication patterns of a ten-year-old boy with autism within his natural environment and to implement a new communication system called Pragmatic Organization Dynamic Display (PODD) to increase the efficacy of his communication. PODD is a new version of a picture communication system developed by Gayle Porter from Melbourne, Australia, intended to increase semantic and syntactic communication components. The first of three settings in this single-subject multiple baseline across settings design was the subject's morning job at school delivering mail and taking tea orders. The second setting was the cafeteria for morning snack with a peer and adults from his self-contained classroom. The third setting was his home environment at the end of his school day where he interacted with family members and clinicians working in the home. The researcher collected data on expressive language utterances counting the frequency of types of communication (vocalizations, gestures, signing) and levels of prompting (spontaneous, responses, cued speech). The data were analyzed by counting the frequency of expressive utterances of communication preferences in each of the three settings while adding PODD with communication partners as the intervention in each setting. The results showed across multiple settings an increase in frequency of occurrences of types of communication and levels of prompting.

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Pragmatic Organization Dynamic Display (PODD) and Enhancement of Communication on Individuals with Autism

A child with autism spectrum disorders (ASD) presents an array of puzzles in the process of accessing his or her inner self. The real challenge is both understanding the child's thoughts, feelings, desires, and needs and finding ways to enable the child to get outside of an isolated world to one of self-expression within a comfort zone of his or her natural environment. In our society, we are only beginning to understand how much children with ASD know and have learned in life and are puzzled by how to unlock the door of communication for them to be able to live productively in our society.

Many avenues exist today to assist children with ASD in developing their abilities to communicate more effectively, cope with their surroundings, and live independent lives. Romski and Sevcik (2005) advocated for introducing another mode of expression through augmentative communication and assistive technology techniques before the child reaches total frustration and communication failure due to lack of speech development. Many options need to be explored that range from low-tech communication boards with picture vocabulary to high-tech computerized dynamic displays, and the selection process is most important in discovering the most efficient way to address each child's unique communication needs (Cumley, Maro, & Stanek, 2009).

Definition of Autism Spectrum Disorders (ASD)

According to Wing and Gould (1979) children with Autism Spectrum Disorders (ASD) have difficulties in development of core areas of communication, socialization, and activities/interests as a triad of deficits. According to the Diagnostic and Statistical

Manual of Mental Disorders-Fourth Edition-Text Revision (APA, 2000) guidelines, ASD

falls under an umbrella of five specific spectrum disorders classified as Pervasive

Developmental Disorder (PDD). Hollander et al.(1998) and Lord, Cook, Leventhal, and

Amaral (2000), established that characteristics vary greatly in areas of functioning,

learning, skills, behaviors, and interests within the spectrum and may change as children

grow (as cited in Myles & Simpson, 2008).

Characteristics of Children with Autism Spectrum Disorders (ASD)

Communication can be greatly affected in children with ASD. Some children

have no verbal language or severe developmental language delays. Some have an interest

in using augmentative communication or signs and gestures. Others communicate by

leading caregivers to their wants and needs. Bryson (1996) conveyed that one-third of

persons with ASD never develop verbal language. Some children with ASD develop

immediate echolalia and mimic what they hear as soon as they receive a message. Others

have delayed echolalia and repeat messages heard previously and stored in memory.

Pronoun reversals, such and *you* and *I*, are common due to repetition of stored messages

or their difficulties with deictic words. Individuals with ASD who do use spoken

language may have difficulties with pragmatics and interactive conversations. Due to

very literal interpretations of words, individuals with ASD may misread conversation

intent and social cues. They may interpret figurative language literally and lack ability to

participate in creative and imaginative play. Individuals with ASD may also have

difficulty interpreting nonverbal behaviors meant to communicate messages in social

gestures. They may not make eye contact and maintain eye gaze while attending to

events or objects around them (Alaimo & Heflin, 2007).

Socialization is impaired in individuals with ASD along with deficits in functional language. From infancy, children with ASD avoid eye contact, do not react to social stimuli, and show preferences for objects over people. They do not respond as readily to human voices and do not smile and vocalize like other small children during the first few years of life. Sustaining eye gaze is another predictor as well as responding to their own name being called. Following eye gaze also predicts the delay of language development. Small children with ASD lack social referencing and do not point at objects to indicate interests. They do not engage others in conversation; yet, when they do converse, the topics center on their personal interests and knowledge rather than reciprocal sharing (Myles & Simpson, 2008).

Individuals with ASD have very narrow interests and preferences that are often different from age-appropriate peers. Many children perseverate on parts of objects and repeat activities using objects. Some children take toys apart and put them back together again. Others focus on statistics of a topic without indicating a real interest in the topic itself, such as a sport. Many prefer to focus on objects centering on activities or procedures rather than the socialization created by the activity and the reciprocal interactions with people. Stereotypical behaviors exist that are not age or developmentally appropriate. Activities may be structured around the same rituals using objects related to the activities that may last for extended periods of time. These perseverations restrict their ability to generalize to new situations in their environment and may be accompanied by self-stimulatory behaviors and involve repetitive gross and fine motor patterns such as hand flapping, rocking back and forth, facial grimaces, and head weaving. Interruptions to their ritualistic behaviors and activities may cause

irritability or tantrums. Between ages two and five, these behaviors become more and more noticeable and are thought to help the child cope with the surrounding environment. Such behaviors may often serve the purpose of seeking sensory input or filtering out extra sensory information (Alaimo & Heflin, 2007).

Autism Spectrum Disorders (Pervasive Developmental Disorders) (PDD)

The ASD umbrella consists of five types of pervasive developmental disorders: autistic disorder, Asperger's disorder, Rett's disorder, childhood disintegrative disorder, and PDD-NOS. All share some common characteristics; yet, each individual is unique and manifests different characteristics.

Children with autism are identified before the age of three with deficits in communication, socialization, and interests. As stated previously, a third of children with autism do not develop verbal language. Only about a fourth of children with autism are identified on intelligence scores to have average to above average intelligence and are considered to have high-functioning autism. Many children with autism have intelligence scores in the intellectual disability range. Some have seizure disorders and abnormal brain electrical discharges (Alaimo & Heflin, 2007). Males are more often identified with autism than females with a ratio of 3:1 to 5:1 (Lord & Schopler, 1987; Ritvo & Freeman, 1978). Research suggests that there are variants in how the systems of the male brain operate (Baron-Cohen, 2003a, 2003b; Baron-Cohen & Hammer, 1997; Knickmeyer, Baron-Cohen, Raggatt, & Taylor, 2005; Kunzig, 2004). Much research has been done on the brain differences in individuals with autism spectrum disorders. Differences have been studied in the areas of brain function, neurotransmitters, cell growth, brain size and structure, and brain regions (Myles & Simpson, 2008).

Children with Asperger's syndrome develop language normally and usually selectively talk about their own areas of interests rather than interacting reciprocally with others. They do not interpret body language and other nonverbal communication with others that provide cues for interpretation of receptive communication of others. Using extensive vocabulary and imparting knowledge of narrow interests for lengthy periods of time characterize the child with Aspergers without a sense or concern for maintaining the attention of the listener. Understanding figurative language and understanding humor are often challenging. Individuals with Aspergers do not read social cues and have weak pragmatic skills. They do not filter their own thoughts and speak honestly when most might not share everything that comes to mind. Children with Aspergers benefit from behavior interventions to give strategies for managing anger and agitation over changes in the environment that they cannot control (Attwood, Hinton, & Sofronoff, 2007). They adhere to strict schedules and follow rules rigidly. Delays do not include cognitive delays or underdeveloped self-help skills, but some have fine motor difficulties and can be clumsy (Alaimo & Heflin, 2007). Use of social stories, comic strips conversations, giving opportunities to interact with others, and teaching theory of mind skills improves social skills with peers (Attwood, 2000).

Rett's disorder is characterized by a single gene defect and has similar characteristics of children with autism. A sudden loss of normally-acquired language and motor skills is noted in girls between the ages of 6 to 18 months. Intellectual disability is common with Rett's disorder. Head growth lessens between 5 and 48 months, and hand skills decrease between 5 and 30 months. Females with Rett's disorder lose hand control

as the hands become drawn inward toward the body and present constant wringing

motions, and mobility is greatly affected creating the need for dependency on others.

Childhood Disintegrative Disorder (CDD) is a disorder characterized with deficits

in communication, socialization, and interests and activities that follows a two-year

period of normal development but must be diagnosed by the age of 10. After the age of

two, the child loses control of acquired skills in the area of self-help skills, social

interaction, language skills, motor skills, and adaptive behavior. Communication is the

major deficit in the triad of characteristics of ASD with CDD (Alaimo & Heflin, 2007).

Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) is

characterized as presenting some of the deficits in communication, socialization, and

interests and activities as in the ASD triad but not meeting all criteria. Some

characteristics are usually mildly present in all but pervasive in at least one area (Myles

& Simpson, 2008).

Deficits with Communication

Communication is the major area of deficit creating cause for concern and focus

in implementing treatment and making accommodations for children with ASD.

According to Stuart (2002) many students with autism have dyspraxia and do not have

the motor planning skills needed to form meaningful expression due to an inability to

program the position of the musculature (Dell, Newton, & Petroff, 2008).

Communication affects other major deficit areas of socialization and the ability to

participate with others in interests and activities. Therefore, finding the right mode of

communication to augment and assist children with ASD scaffolds the entrance to their

world and, in turn, links their world to the society around them.

The use of augmentative and alternative communication (AAC) is a way of thinking in the process of communication in general socialization and interaction with others, in the exchange of information with others, and in making requests of others. This can be in modes such as pointing, gestures, writing, and speech. AAC is used in the absence of expressive communication such as verbal speech and can be in the forms of sign language or alphabet or picture symbols. Children who have trouble with verbal communication can use voice output communication aids (VOCAs). These technical AAC systems can utilize what they can do and scaffold into a more effective communication tool to help them develop independence and have more control over their decision-making processes. With AAC, children can interact more effectively with others, and become more productive and integral members of society (Green, Massie, Neill, O'Dorman, Page, Post, Randle, Turner, & Young, 2003).

Use of AAC to Reduce Negative Behaviors in Children with Autism

Children with autism often exhibit negative behaviors such as self-abusive behaviors, biting, screaming, hitting, and tantrums. These behaviors can be the result of frustration when a child has the desire to communicate and does not have the ability of self-expression (Carr et al., 1994; Durand, 1993). These characteristics cause great trauma for the child and family and can often limit participation in daily community life for the child and family members. Depression, anxiety, and family conflict are more prevalent in families with children with ASD. School participation in general education settings is frequently not possible due to safety issues and the disruption to the learning environment created by the tantrum for both the child with autism and other students in the classroom.

Koegel, Koegel, and Dunlap (1996) indicated that providing an avenue for communication as a proactive way to reduce tantrum behaviors has become a growing focus of educational programs for children with autism. Functional communication with aided AAC, when used effectively, can reduce the onset of these negative behaviors. Since dyspraxia is a characteristic of many children with autism, use of an intervention such as Picture Communication System (PCS) and Pragmatic Organization Dynamic Display can relieve the stress related to inability to access language needed to voice and work through distress (Cafiero & Porter, 2009). In 1995, Califero conducted a study of four families of children with autism using the PCS system as a second language in the natural environment. All four of the families expressed a reduction in distress of their children and overall stress in the family, and three families noticed increased communication interactions. Use of AAC is becoming best practice for schools in formulating specialized programs for children with autism and is showing great improvement in these children's ability to cope with their school, home, and community environments.

Supporting Legislation and Definition for AAC

The Technology-Related Assistance Act for Individuals with Disabilities provided individual states with funding to develop a plan for providing people with disabilities assistive technology devices and services. This was known as the Tech Act of 1988. Later, the Americans with Disabilities Act (ADA) of 1990 mandated reasonable accommodations on the job sites, giving the responsibility to provide these accommodations to employers. The Individuals with Disabilities Education Act (IDEA) of 1997 issued the mandate to consider assistive technology for any student with a

disability when planning for the program of education in an individual educational plan

(IEP). Assistive technology device is defined as "any item, piece of equipment or

product system, whether acquired commercially off the shelf, modified or customized,

that is used to increase, maintain, or improve the functional capabilities of children with

disabilities" (IDEA 2004). Assistive technology service is defined as "any service that

directly assists a child with a disability in the selection, acquisition, or use of an assistive

technology device" (IDEA 2004).

This includes the training of the child and those intending to use the device with the child

for the purpose of succeeding in school. Augmentative communication augments or

enlarges the natural mode of communication to the maximum degree possible using

supports and scaffolds and often uses assistive technology devices and services as the

avenue to maximize communication abilities. The objective is not to replace speech, but

rather to take away the pressure of speech being the only way to communicate and

produce language. Children continue to develop speech to the best of their capability

even in the presence of augmenting communication and even with the use of assistive

technology (Burkhart, 1993).

Access Methods for Assistive Technology Devices

        Determining an access method means deciding how the child will indicate choices

for messages he/she wants to send listeners or communication partners. Direct selection

gives the child the most independent means of access by touching or pointing directly to

the message symbol or eye pointing through use of an eye-gaze board or "e-tran", where

the communication partner interprets the preferred message from the other side of a

selection frame. Many AAC devices are activated by depressing a key or touch pad

surface. Others involve only physical contact with the need for pressure and can be set at different thresholds to assist the child in activation. Assisted direct selection is where the child uses a pointer, which can be a finger or other body part, joystick, headstick, or light pointer to make the direct selection.

Visual scanning for electronic communication aids can be used where the child moves a cursor electronically and makes a selection using a switch. Listener assisted scanning is where a communication partner reads choices to the child, and the child indicates a desired choice. Scanning patterns may be different for children depending on their motor capabilities. Three major types of scanning techniques used to secure selection of communication messages are circular, linear, and group-item scanning. Scanning time and speed need to be tailored to the child's visual, physical, and cognitive needs and abilities and may be controlled directly, automatically or continuously, or in step patterns.

If the child has speech patterns, a voice activation system using speech recognition may be used. Strategies for using access methods include timed activation which can be set at different intervals to give wait time to the child. The child may only need release activation to make contact with desired choices or may need filtered activation if he/she cannot find the exact location of the message choice but can secure the general area of the selection. Speech can be synthesized from stored digital data in a variety of ways. Text-to-speech can be produced by feeding the information from text into the AAC device, converting the codes to memory and generating digital phonetic speech, and then transferring the speech to verbal speech with proper inflections and intonations. Digitized speech can be recorded, stored, and fed back to the child when

appropriate responses are desired. Combinations of text-to-speech and digitized speech are also used in AAC devices using keyboards that transfer messages to spoken words. Feedback is important to secure a response to the selection as a message received to the sender and can also provide information about the message during the selection process to assist the child in moving forward to complete the process.

Electronic communication aids use auditory scanning where vocal messages and choices can be activated by switches. Children with both motor and visual deficits benefit from these assisted scanning access methods. Tactile displays may include textures, shapes, raised dots for Braille, and partial or real objects and is determined by the motor, visual, and cognitive abilities of the child (Beukelman & Mirenda, 2008).

Communication Partner-Assisted Access Method

Communication Partners are often essential to the successful implementation of an aided communication system, which means the training of all selected partners in the school, home, and community needs to take place in a thorough, consistent, and systematic way. Skills that are important for partners to learn are the selection and knowledge of the vocabulary used in the system and its placement on the system. They need to know how to program and use the system and how to access and utilize a prompt hierarchy. They must also learn strategies as facilitators to know rates for pausing, how to expand conversations while in progress, and how to model the communication process for the child (Cumley, Maro, & Stanek, 2009).

Kent-Walsh and McNaughton (2005) have suggested an eight step procedure for training communication partners in methods of aided communication that begins with assessing the partners' natural preferences for communication in typical environmental

settings after partners agree to the training program. Trainers will then explain the

importance of systematic implementation with the child using the AAC to the partner

assistant and explain the strategy using a step-by-step procedure and how to easily

remember it. During the third step, the trainer models the step-by-step process for the

partner with verbal explanations for each step. The partner then practices the steps with

the trainer while naming and describing each step.

The communication partner continues the practice session with controlled

implementation of the strategy and procedures with an AAC user under the direction of

the trainer. Feed back is provided during the practice session.   Partners continue

implementation of the strategy with the child using the AAC device in several situations

within the child's typical daily settings under the direction of the trainer. The trainer

continues to provide feedback but fades prompting.

The final phase of the training of communication partners involves documenting

the progress of the partner in implementation strategies and asks for feedback from the

child using the AAC device or the caregiver. The trainer also helps the communication

partner devise a plan for continuing to generalize the strategy into new situations and

environments. The communication partner will then continue practice and

implementation of the strategy into multiple settings as a plan for the long-term

intervention. As the AAC user and communication partners plan to transition into new

settings, they will encounter unfamiliar partners who can be initiated into the strategy

with minimal explanation and prompting provided in the AAC device for the specific

purpose of explaining that the child uses a communication device and is attempting to

communicate a message.

Models of Intervention

Outcome goals for using AAC need to be set for the purpose of enhancing the child's ability to send a message and to ensure it is received by another person within the child's natural environment. A developmental model is one consideration, meaning to pair the expectations of normally-developing children with the normal progression of skill development with the progression of skill sets suggested for children with communication deficits using ACC intervention for attainment (Green, Massie, Neill, O'Dorman, Page, Post, Randle, Turner, & Young, 2003). Like normally-developing children experimenting with language, this intervention would involve experimentation, turn-taking, and enjoying language exploration, and building naturally on successful messages received in a reciprocal manner.

The second language approach for new systems is another intervention model where a child is experiencing success in one form of communication but is also experiencing deficits in some settings and with unfamiliar listeners. Creating more systematic and gradual introduction to the new form of communication can prove to be a more effective orientation as opposed to total immersion. Creation of a multi-modal language environment where the ACC method is practiced on simpler levels working to more complex as mastery is attained is more successful, especially with complex dynamic displays or other high tech communication devices.

Romski and Sevcik (1996) created a system for augmenting language called SAL as an effective augmentation of communication using a partner to model the usage and augmentation of the language device. This aided language stimulation, augmented input, or augmentative communication input system encourages language partners to use the

ACC device as a part of their own communication with the child to model its use and

implement it into natural interactions with the child.

Light and Binger (1989) developed a building communicative competence model

of intervention which goes beyond language skills to include four competency levels.

Operational competence is the child's ability to operate the device, which often needs to

be fine-tuned for each individual child. Social competence gauges the child's ability to

obey social rules and understand the hidden curriculum of reciprocal sharing in social

situations like turn-taking in asking and answering questions with a communication

partner. Linguistic competence measures the child's ability to use grammar and

vocabulary efficiently and would also provide indicators of how the ACC device would

need to be customized to offer a wider range of choices with core curriculum areas to

allow for greater sentence structure and communication of broader ideas. Partners would

need to be able to communicate experiences, thoughts, and feelings using the selected

ACC communication device. Strategic competence allows the child to learn and plan a

strategy for communication involving increasing the rate and speed of the message

delivery, being able to present relevant information as the conversation unfolds, and

preventing mistakes in communication when messages are received incorrectly and need

repair.

The routines and choice making intervention model allows the child to establish

familiar routines that have high frequency of occurrence within a structured environment

that builds on predictability (Green, et al., 2003) The child can develop more control with

his/her life when more choices are offered around when and how normal activities are

accomplished as well as with what materials and with whom they are done. Transitions

can be anticipated, introduced to the child, and cued appropriately and in a timely manner, which is essential for children with autism. Behaviors can be more easily managed with this predictability when rewards and consequences are known within the parameters of the environment.

Message Selection and Display Sets

Considerations for message selection vary according to gender, age, cultural backgrounds, and cognitive abilities, and should be reflective of the child's needs, interests, and preferences. Updating message systems is an ongoing process as the child grows and changes in ability and needs. Core vocabulary involves words that most children use everyday and in multiple settings to allow for flexibility. Coverage vocabulary refers to the vocabulary that is needed for the individual child's basic needs. Fringe vocabulary consists of words that are used in one setting that are vital to that setting and incorporate the child's special interests and activities. Marvin (1994) suggests that children who develop speech typically use core vocabulary in normal communication, and adults supplement with fringe vocabulary. Messages will vary according to the situation and need and must be motivating and relevant to the user in the form of letters, words, phrases, and sentences. Some messages indicate a message has been misread and function as communication facilitators, such as "you've misunderstood" or "I don't understand" (Johnson, 1995). These messages help generate self advocacy for the child and help the child redirect the message independently.

Display sets are typically fixed, dynamic, and hybrid. Fixed or static displays have the symbols and items or objects in a fixed location on the ACC device and are used mostly in low-tech communication boards and speech-generating devices (SGDs). The

child's visual, motor, tactile, and cognitive needs dictate the number of items the child

uses on the display and can spread onto multiple displays to accommodate changes in

topics and categories used by the child. Dynamic displays are higher tech and are usually

computer screens with visual symbols created electronically by program and works by

activating the category or topic to reveal needed details for discussion. Hybrid displays

involve a combination of fixed and dynamic features where a child may have iconic

codes for vocabulary that are activated by a light sensor when the child makes a selection.

Visual scene displays (VSD) are pictures, photographs, or environmental samplings that

are used to place the object or vocabulary in a real-life context for the child. Real people,

places, activities, and actions are presented in the pictures and are widely used in AAC

devices (Beukelman & Mirenda, 2008).

Special consideration must be given to the physical characteristics of the display

sets in order to individualize the intervention for the child according to the language,

sensory, motor, and cognitive abilities of the child (Bukelman & Mirenda, 2008). The

number of items on the display is determined by the number of communication messages

needed by the child. The size of individual items on the display, the spacing and

arrangement of items, and the size of the overall display are determined by the motor

access tool or system used by the child and the visual capabilities and how many

messages the child can access effectively. With auditory displays, the child's memory

and organizational capabilities to store messages become important factors.   Orientation

of the display involves where the display is situated in relation to the floor and the

position of the child and is dependent upon the child's motor control, range of vision,

posture, and positioning in relation to the AAC device.

Low-Tech to High-Tech Dynamic Displays

Low-tech devices are inexpensive, simple displays that can be made with everyday items found in most department stores. These have few movable parts and use no electronic devices. Items can be ordered easily from catalogs or remade with adaptations and creative modifications. Examples of low-tech items can be highlighters, pencil grips, color-coded numbers and folders, keyboard labels, selecting and pointing devices, moisture guards on keyboards, and keyguards. These may use larger letters, key word labels, use of high-contrast colors, disposable items, picture displays, or adaptive components to assist with mobility in order to access needed educational items (Dell, Newton, & Petroff, 2008).

High-tech options involve electronic systems and computer technologies, have more complex operations, and are much more expensive. They offer more flexible outcomes for the user and increase task production. Computers can be equipped with software for writing, reading, and gathering information from the Internet. They can be programmed with voice output systems and can link to other electronics in the environment, allowing for greater independence for the user. Depending on motor dexterity and control of the user, they can be equipped with mouse alternatives such as trackballs, joysticks, touch screens, head pointing systems, and eye-gaze systems. Keyboards can be customized to meet the unique needs of the child (Dell, Newton, & Petroff, 2008).

Video taping can be an effective, high-tech AT form when learning expressive vocabulary skills and social interaction skills (Comer, Swenson, Weingarten, & Wirkus, 2009). Video modeling and video self-modeling are effective AT techniques for

teaching functional skills, appropriate behaviors, and social-communication skills to kids with autism (Akullian & Bellini, 2007). Children with autism can benefit from high and low-tech AT devices. AAC strategies help build language and interactive and comprehensive text with caregivers, family members, teachers, and peers as well as enhance language used in writing (Beukelman & Mirenda, 2008).

Barriers to AAC as a Successful Communication Tool

Binger and Kent-Walsh (2009) reported the key to success of AAC usage as a communication tool is based on external and internal factors in the child's environment. Internal factors relate to the child's characteristics, abilities, and disability and the careful selection of the right AAC device that will maximize the communication potential of the child. Without the AAC device, the child may not be communicating at all or may be communicating infrequently with others. He or she may be only using a few words or gestures to indicate wants and needs without the motivation to produce or initiate anything further. External factors are the factors that affect the communication partners and immediate environment or availability of the equipment needed, the opportunities provided to communicate using the AAC device, and the curricula provided to train the child using the AAC device with the familiar and unfamiliar communication partners. The complex schedules of related services, though necessary and important, can interrupt the flow of natural communication and can inhibit opportunities to work with the child with the AAC device in the classroom with other students and general education teachers where more possible communication partners could be utilized in a generalized setting.

The attitudes, belief systems, and experience of the professionals and the family members working with the AAC user affect the success of its implementation and

maintenance. These individuals may feel an AAC device should be used in the event all

other modes of communication fail (Romski & Sevcik, 2005). Others may believe it

should only be introduced early in life in order to be successful (McSheehan,

Sonnenmeier, & Turner, 2006). If these beliefs exist within the individuals working with

the AAC user, their commitment to the structure and process of implementation may be

compromised. Teachers who have homogeneous classrooms and who typically do not

diversify for varied learners may struggle with how to work with a child using an AAC

device who may require more modifications and accommodations than the other students

in the classroom in order to function and be productive.   Teachers are also bound to

mandated curricular standards and pacing guides and may understand what is needed for

the child using the AAC communication tool with their range of needs and abilities but

may be more focused on teaching to the norm.

Communication partners may tend to monopolize the majority of the

conversation, asking yes-no questions and speaking for the child instead of allowing the

child to respond, or may become sidetracked with the AAC device itself instead of

focusing on the child (Blackstone, 1999; Houghton, Bronicki, & Guess, 1987; Kent-

Walsh & McNaughton, 2005; Light et al., 1985; Sigafoos, 1999). The job of the

communicator is one of facilitation with the hope the child will begin to initiate

independently after effective modeling and training.

Pragmatic Organization Dynamic Display (PODD)

Pragmatic Organization Dynamic Display (PODD) is a low-tech dynamic AAC

device developed by Gayle Porter from Melbourne, Australia. It presents a systematic

approach to vocabulary that can build upon patterns of understanding with placement of

symbols in routine order for easy retrieval as an organization of partner-assisted

communication. Partners ask ordered questions prompting subjects to turn pages to find

routine/color-coded pages with page numbers on tabs to find pictured vocabulary in

categories bound together in a binder. Aided language stimulation techniques are

modeled for subjects by partners to enable communication interactions within the child's

natural daily environment (PODD Communication Books, 2008). PODD supports

Burkhart and Porter's belief that a systematic approach to learning vocabulary that builds

on patterns is effective because it follows the patterns of the brain to build understanding

and utilize working memory and allow availability of symbols and develop automaticity

of usage of vocabulary through learning a routine and systematic retrieval method (2006).

PODD organizes vocabulary according to conversational discourse and function

of communication. Schematic, topic, anecdotal, and taxonomic organizations are all

usable. Aided language techniques are used through communication books. Page sets

follow development of child and foster use of aided language stimulation. Routine

placement of pages provide for automaticity and initiation. Participants use the "go to"

and operational command symbols to directly access the page tabs required for desired

communication topics. Light (1989) and Light (2003) factor the range of communication

demands that can be met through PODD.   In addition, environmental supports add

intrinsic and extrinsic factors that contribute to the successful deliverance of

communication. The social aspects of modeling language using significant

communication partners provide the right conditions for language acquisition using ACC

(von Tetzchner, 1997). Goossens, Crain, and Elder (1992) advocated children need

interaction from their AAC system in an aided language learning environment where

balance exists between the input of language and what the child is able to use for

language expression.

Communication challenges can be solved through the function of the ability to

communicate (von Tetzchner & Grove, 2003). Renner (2003) explained that language

challenges must include alternative means of communication to assist children in using

their own abilities for a real communicative purpose. Aided language interventions meet

communicative challenges using language partners and scaffold the child's ability to

achieve communication with others during language acquisition (PODD Communication

Books, 2008). PODD enables the child to understand others and be understood through

the systematic interaction available through the use of the communication book tailored

to the child's developmental level (Porter, 1997) as a light-tech system. Strategies and

concepts of the PODD are also available for high-tech speech-generating devices in

dynamic display communication devices using page sets.

The purpose of PODD is to increase the receptive and expressive communication

to be more specific, efficient, and intelligible through its use and to increase

independence in social settings. Thus, long-term outcomes for AAC use for

communication include communicative autonomy (von Tetzchner & Grove, 2003),

communicative accessibility, and communication competence (Light, 1989).

Communication autonomy means the person using AAC has independence and

ownership of language production without numerous restrictions and with freedom of

intent. Communicative accessibility means the people in the surrounding environment

can understand the alternative communication device and can assist and scaffold during

acquisition as well as allow the person using AAC to have maximum control of

communication patterns. Communication competence means competence is demonstrated by the person using AAC in the areas of lingustics, operation of chosen AAC device, social awareness, and strategic competence (PODD Communication Books, 2008).

PODD uses various forms tailored to the needs of the individual AAC user. Book styles consist of one page opening, two page opening, and two page opening plus a side panel with the size adjusted to fit the child's range of visual skills and the range of daily life activities. Symbols used are the Picture Communication Symbols (PCS) associated with the Boardmaker program with one symbol chosen to represent the same word in all sections. Partner-assisted scanning is used where a communication partner points, shows, or speaks the names of items in the book, and the child indicates yes or no responses and relies on visual or auditory cues or a combination of both.   Scan patterns may be linear, column with item, or section and column with item. Color-coded categories are based on pragmatic function, such as indicating when something is wrong; semantic associations, such as personal preferences for daily needs and activities; and parts of speech in order to build phrases and sentences. Operational instructions are included on a main navigational index with page turning instructions. Activity pages provide frequent interactions with normal daily activities with links to more specific preferences prepared for each individual child. Lists are included in every section of PODD to broaden vocabulary including familiar people, places, activities, and preferences. Additional blank list spaces are included to add new vocabulary as written lists.

Time required to communicate each message is dependent upon the communication intent, the child's personality, the context required for interpretation, and

when and where the message is communicated. Therefore, the first pages of PODD are words and phrases linked to previous utterances and communication patterns of the child. With a partner-assisted method where the partner provides auditory scanning, the first page is intended to link to quick chat vocabulary on the second page.

Aided language stimulation uses expressive language a child either speaks or signs and adds symbols, as in Pragmatic Organization Dynamic Display. Children see the system modeled by people in their environment, have many opportunities to practice communicating messages in their natural world with prompts and cues provided by language partners, receive feedback for attempts to communicate and messages received correctly, and have opportunities to expand vocabulary and types of messages they previously could deliver.

Language partners play an essential role in ensuring the success of the communication intervention as well as the gradual immersion of the system into the child's environment. These partners include familiar people in the child's world as well as the trainers of the AAC users. McPhee and Porter (1996) and Porter (2002) suggested the trainers should be professionals who orient the family, caregivers, and staff working with the child to the system and teach strategies for using the PODD communication book. Some helpful strategies for teaching AAC to family members are explaining why it is necessary to use another form of communication and videotaping the partners and children using the device as a self-modeling technique. Children, parents, and professionals using the AAC may join a group with other parents using the AAC system to provide added support for the users. Having an experienced user work with the child and partner to scaffold and model the technique in person offers great support. Sessions

to slowly teach the procedures and methods along with many opportunities to practice

and be observed using the system by a more experienced partner foster successful

communication.

The Pragmatic Organization Dynamic Display (PODD) is an effective

communication tool used to augment a child's natural language abilities with scaffolds of

supports to enhance both expressive and receptive language. Its strengths in strategies

include features such as navigational pages to help the child go to specific category pages

with color-coded tabs and operational commands, list pages, predictive links to lead the

child to the next part of the communication message, and conversational repairs and

clarification in order to provide specific feedback when the message intent is not

understood correctly. Using these strategies across settings helps the child build

confidence and generalization through encouragement to initiate using the ACC and

begin to work through communication challenges (PODD Communication Books, 2008).

Statement of Purpose

The research reviewed indicated a great extent of communication delays in

children with autism spectrum disorders and embraced the need to scaffold and support

any natural mode of communication and to provide additional assistive technology

devices, whether low or high tech, to further augment and enhance communication to

increase the effectiveness of the reciprocal interactions between language partners.

Communication modalities include picture symbols such as PECS, sign language,

verbalizations, text-to-speech devices, and computer programs often in combination with

each other. Studies show that natural forms of communication do not lessen with the

introduction and implementation of a new form of language enhancement. Training for

communication partners who assist the AAC user and the AAC user is essential to ensure the success of the communication tool.

Studies showing the effectiveness of language enhancement programs that are high tech have been done as well as picture symbol communication programs (PECS). The Pragmatic Organization Dynamic Display (PODD) is a newer picture symbol communication system which includes increased semantic and syntactic components. Anecdotal reports are included in the program without the evidence of formal research on the effectiveness of the program. A study designed to chart the implementation of PODD across multiple settings with a single subject would investigate and validate the effectiveness of this picture symbol communication system. Therefore, the purpose of this research study is to evaluate the efficacy of Pragmatic Organization Dynamic Display (PODD) and its effect on enhancement of communication on individuals with autism. The study addressed the following questions:

1. What were the preferred communication choices of the subject before and after intervention?

2. What levels of prompting did the subject need before and after intervention in order to communicate?

Method

Design and Subject

This study was a single subject multiple baseline across settings design. The multiple settings included two school settings in the morning and one afternoon setting at the subject's home. The three settings were observed on the same day for each day of

observation. Data collection indicated a total of seventy-one observations of thirty

minutes each over a period of eleven weeks. The first setting was the hallway route the

subject took daily to take tea orders for his job and deliver mail. The second setting was

the snack setting in the cafeteria. The third setting was the subject's home environment.

Current Characteristics and Performance Level of the Subject

The subject of this study was a ten-year-old boy with autism, Tourette's

syndrome, OCD, ADHD, and with significant communication needs. He uses a

combination of vocalizations, signs, and pictures in order to communicate his wants and

needs. He is able to articulate most sounds in isolation and can produce some final

sounds of CVC words in a structured setting with prompts. However, he requires

significant prompting in order to include all elements of multi-syllable words and

produce sounds intelligibly at the word level. His speech is highly unintelligible for

unfamiliar listeners and when the subject matter is unknown. The subject's signs can

also be somewhat difficult to understand at times. He uses mainly nouns when

expressing himself but can identify a wider variety of word forms in pictures.

The subject can answer where, who, what, when, and why questions with 80-85%

accuracy when provided with four choices. He is also able to answer yes/no questions

with 85-90% accuracy without support. The subject has been doing very well using

pictures to complete structured language activities. He is learning to sort pictures based

on their representation of a person, place, time, thing, or action. He has learned this skill

quickly, and his accuracy is as follows: people (70-100), places (50-70%), time (60-

80%), things (0-30%), and actions (45-60%). He has just begun sorting things. He will

then use pictures he has sorted to fill in the blanks of some basic sentences and a short

story. He is recognizing the picture icons for the fill in the blanks and accurately choosing an appropriate picture to use with 70-80% accuracy. The subject needs to develop his expressive language skills using pictures as well as speech and signs to adequately express himself in both structured and unstructured situations.

The subject's behavior has remained inconsistent during the current school year. He adjusted well to the structure and routine in the beginning of the school year. He continues to engage in impulsive behaviors and requires constant supervision for safety. He is easily distracted when working and will often obsess about an object, event, or picture on his schedule (e.g. toilets, plumbing, water plants, using the bathroom, scissors). His tics continue to occur and vary in intensity/frequency based on the day. At school, no consistent pattern exists as to when the tics occur. The subject interacts with 5th grade peers for homeroom. He is supposed to attend homeroom with an assistant for approximately 20-25 minutes as tolerated and when his behavior is appropriate. However, his behavior has not demonstrated he can stay in the classroom as intended at the time of this study. His school day was reduced to half days during the latter part of the study due to escalating negative behaviors in the afternoons. New behavioral interventions are being implemented and data is being collected to decide whether or not the student will remain in public school. An alternative placement is being considered at the present time.

Instrument for Data Collection and AAC Intervention

The instrument for data collection was a chart adapted from the county's assistive technology specialist for collecting the number of incidences of expressive language utterances in the form of signing, vocalizing, gesturing, and use of the AAC intervention

during each observation. Collection of the type of prompting was also charted for each language utterance: spontaneous, response to question, or cued. The subject's mother and one-on-one aide created a document of behaviors specific to the subject and specified them as communication attempts, tics, and sensory-seeking behaviors to provide clarification for the observers. The AAC intervention was the Pragmatic Organization Dynamic Display (PODD), a low-tech AAC using picture symbols in a specifically-organized notebook to facilitate partner-assisted communication. Communication partners responsible for implementation of the intervention included the subject's one-on-one aide, teachers, and therapists in his special education program; other staff members in his school environment; his home clinicians; and family members. Orientation to PODD was provided to the teacher, one-on-one aide, and mother as the main communication partners by the county's assistive technology specialist. The one-on-one aide and the mother further provided the encouragement and modeling of the procedures to other language partners interacting with the subject in their settings. Additional personalized forms of PODD were generated over the course of the study customized for the subject's interactions in a particular setting.

Procedure

A cover letter, description of the AAC intervention and purpose of the study, data collection sheet, and permission to conduct the study were sent to the superintendent of the county, principal of the subject's school, and the subject's parent. Once permission was granted by the school division, individual school, and parent of the subject; observations were set up to collect baseline data. The assistive technology team working with the subject met to customize the PODD book for the subject and devise a plan for

implementation. The researcher observed each session of the study. A communication disorders graduate student who worked as the data collection assistant observed some of the sessions alongside the researcher. The data collection student was trained by the researcher to use the instrument to record data for the study. The observers did not have interaction with the subject during observations. No emotional or physical harm came to the subject at any time during the study. Participation was voluntary and confidentiality was maintained at all times during the study. No names of participants involved with the subject were included in results reported in the study.

The baseline data were collected for the first two weeks of the study in the three settings. PODD was implemented at that time into the snack setting. The intervention of PODD was implemented into the home environment at the end of week five and into the hallway/job setting during week eight. Additional personalized forms of PODD were generated over the course of the study customized for the subject's interactions in a particular setting. The subject received initial orientation and modeling of PODD during speech therapy sessions and independent lessons with his special education teacher to learn the structure of the book and symbol system. The subject received verbal prompting and gesturing to encourage him to use his book for expressive language clarification

Experimental Conditions

The modeling and implementation of Pragmatic Organization Dynamic Display book as an AAC system was the independent variable or treatment to improve the efficacy of the subject's expressive language with communication partners. This was implemented after the collection of baseline data of the subject's natural modes of

communication. The subject was not discouraged from using his natural communication preferences when the intervention was introduced. He was encouraged to use his PODD book when interacting with the communication partners as it was introduced into each new setting to practice procedures and then to clarify and interpret messages from senders to receivers.

Dependent Measures

The number of the subject's natural communication preferences of vocalizing, signing, and gesturing served as the dependent variables in the study. Many times the subject's communication attempts of expressive language resulted in misunderstood intent by the sender and a lack of understanding of the message by the receiver. Many of these preferences were spontaneous messages or responses to questions asked and were repeated again and again in the same manner of delivery whether or not the communication partner understood the content or intent. They minimized variety of details and were dependent upon the communication partner's ability to fill in the semantic and syntactical content of the message. They were also dependent upon the communication partner's knowledge of the subject's interests, activities, schedule, and frequency of familiar messages used during communication.

A data collection sheet was used to record numbers of the subject's expressive utterances as well as whether they were spontaneous, responses to questions asked, or cued by the communication partner. As the intervention was introduced and implemented as another choice for communication, the number of times the subject used PODD for communication was noted on the data collection sheet. Interobserver reliability was established by two observers in order to determine the subject's

occurrences of expressive language utterances in number and according to type and level of prompting. Interobserver reliability was not established in the first setting during baseline only due to changes in the school schedule. Event recording was used with the understanding that types of communication and levels of prompting were counted only if they were an exact match. The coefficient of agreement was calculated by dividing the smaller number of recorded instances of types or levels by the larger number of recorded instances. Interobserver agreement reached the following mean percentages of accuracy after twelve sessions conducted throughout the study: vocalizations (92%), gestures (84%), signing (87%), PODD (89%), spontaneous (81%), responses (85%), and cued speech (96%). Response results are documented in the graphs below during the periods of implementation of each intervention.

Analyses of Data

The results of the study were analyzed using descriptive statistics to determine enhanced functioning of overall communication skills using vocalizations, gestures, signing, and the new intervention of PODD. The study also determined the subject's preference for using spontaneous, response, and cued reciprocal communication within the subject's natural environment. Frequency counts and percentages were generated within each individual setting for types of communication and levels of prompting. After counting the frequency of each of the subject's expressive language utterances for each area within the multiple baseline across settings design, a mean score was calculated for types of communication and levels of prompting.

Results

The observations were graphed in four groups of equal days with two phases being a baseline phase and an intervention phase for each setting for types of communication and levels of prompting.

What were the preferred communication choices of the subject before and after intervention?

The baseline snack setting in the cafeteria occurred right after the hallway job and included the subject, his autism classroom teacher, two one-on-one aides, and another male student with autism who never interacted with the subject during snack. During this time, the group sat together at a table and interacted casually around eating a snack. Interactions included the teacher and aides asking the students for preferences for snack and drink items and talking together about activities they would do for the day or general friendly conversation. The subject was always focused on the task of eating and communicating wants and preferences related to food and drink. The adults were in close proximity with the food and drink items he desired, so his preference was to gesture during baseline with a frequency of 45 occurrences to communicate his wants and needs with a slightly higher frequency of vocalizations as indicated by a frequency of 47. The signs he used most were "more" and "eat" at a frequency of 17 occurrences. The supervising adults did not provide his requests unless he provided responses to their questions. The subject was mostly subdued while eating a desired snack.

The cafeteria snack setting was the first setting to receive the intervention of PODD. The subject responded well using the full PODD notebook where communication was focused on interacting specifically with food choices. The subject

vocalized beginning syllables of favorite snack items and gestured while pointing to

visual symbols on the PODD under the direction of his one-on-one aide to select snack

choices and to talk about meals he enjoyed. Signs the subject used were specific to food

choices. The PODD sentence strip was also used with the subject at the end of snack.

Most of the interaction with the subject occurred at the beginning and end of snack time.

Composite results indicated the subject's preference for vocalizations increased from

baseline to intervention by a frequency count of 7 or by 14.89%. Frequency of gestures

decreased by 26 or by 57.77%. His frequency of signing decreased by 1 or by 5.88%.

The subject showed a preference for using the intervention of PODD with a frequency of

38 occurrences, which was 100% higher than the subject's preference for gesturing and

137.5% more than his preference for signing (Fig. 7).

The baseline period in the home occurred in the afternoons after the subject had

been home from school for about an hour. Both the mother and clinician interacted with

the subject with the clinician being directly with him as he moved from the living room to

the kitchen. Activities included special interest activities, snack time, and sensory time

with the subject constantly engaging his mother and clinician in order to make his wants

and needs known. When he set up his own sensory activities, he disengaged from his

caregivers only making an occasional communication attempt when a song would change

on the CD or radio. The subject's mother constantly engaged her son in conversation by

asking him questions. He sought her attention constantly using vocalizations with a

frequency of 82, gestures with a frequency of 32, and signing at a frequency of 40. The

level of questioning and conversational attempts varied depending on which clinician was

working with the subject. As the subject began vocalizations or familiar signs, familiar

communication partners quickly completed sentences to discuss the subject's wants and

needs.

The home setting was the second setting to receive the intervention of PODD

after the mother customized the PODD book for her son and the intended setting. The

researcher noted a difference in usage of PODD depending on whether or not the parent

was present to encourage the clinician caring for the subject to use PODD. The

researcher noted a difference in the comfort level of using PODD among clinicians as

noted by the drop of implementation on certain dates. The mother of the subject

continued to refine picture selections to add to the book. Examples included job tasks,

work items, activities, and places her child wanted to go in the afternoons. During this

time of intervention the same two clinicians worked with the subject and used the PODD

consistently to discuss the transitions and changes in his schedule and anticipate what

activity they would do next together. Composite results indicated the subject's

vocalizations from baseline to intervention increased by a frequency count of 109 or by

132.9%. Frequency of gestures increased by 23 or by 71.87%. His frequency of

occurrences of signing decreased by 5 or by 12.5%. The subject showed a preference for

PODD with a frequency of 163, which was 196.36% higher than the subject's preference

for gesturing and 365.7% higher than his preference for signing (Fig. 7).

The baseline period of the school hallway job setting occurred at the

beginning of the school day and included doing a mail collection job and also collecting

tea orders from teachers. All teachers and administrators greeted the subject and solicited

responses from him. While delivering mail, the subject took tea orders twice a week on a

chart. The subject was expected to ask the professionals if they wanted tea and record the

response on the sheet. The subject's greatest preference for types of communication was vocalizations with a frequency of 27. His frequency of using gestures was 18 and signing was 10.

The hallway job setting was the third setting to receive the intervention of PODD. A smaller PODD book was developed for the subject before this intervention that was easier to carry around the building and was customized to contain specific information he could use to interact with others on his job route. He was encouraged to sign the request for tea to the teachers in addition to pointing to the PODD pictures. The interaction was structured in the same way for the subject and repeated with each person he encountered. The one-on-one aide verbally prompted the subject and pointed to each picture several times to get him to use the PODD. He seemed to drool and appear lethargic during this setting as compared to other times of day. Composite results indicated the subject's vocalizations increased from baseline to intervention by a frequency count of 45 or by 166.66%. Frequency of gestures increased by 2 or by 11%. Frequency of occurrences signing increased by 10 or by 100%. The subject showed a preference for using the intervention of PODD with a frequency of 32 occurrences, which was 60% higher than the subject's preference for gesturing and signing (Fig. 7).
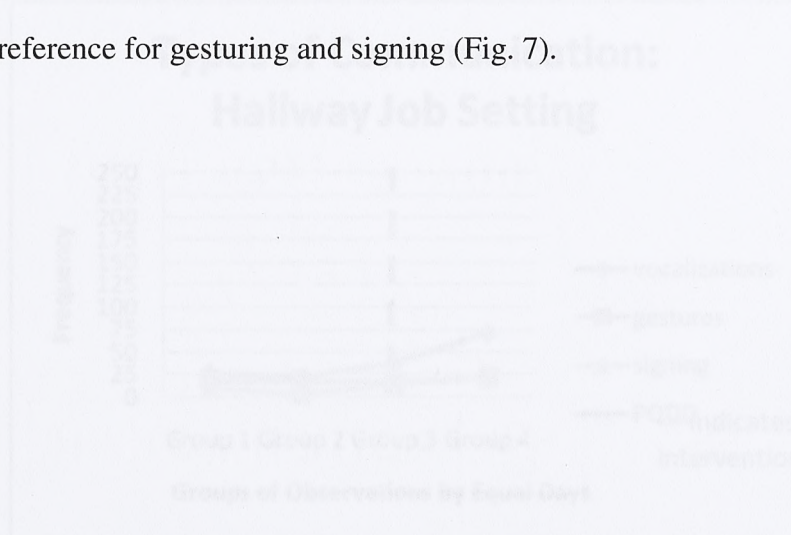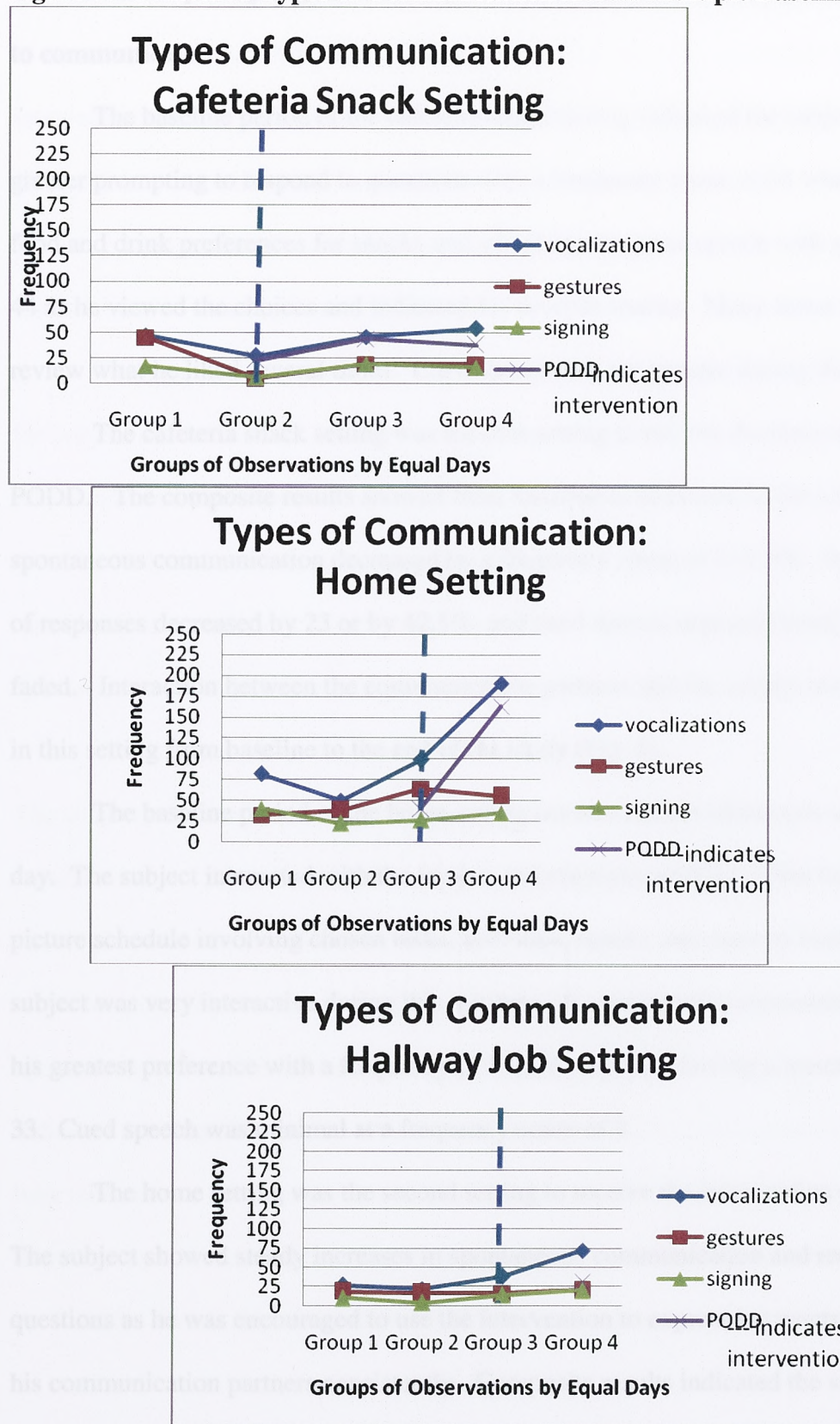
Figure 7: Combined Types of Communication Across Multiple Baseline

Types of Communication: Cafeteria Snack Setting

Frequency (250, 225, 200, 175, 150, 125, 100, 75, 50, 25, 0)

vocalizations
gestures
signing
PODD indicates intervention

Groups of Observations by Equal Days (Group 1, Group 2, Group 3, Group 4)

Types of Communication: Home Setting

Frequency (250, 225, 200, 175, 150, 125, 100, 75, 50, 25, 0)

vocalizations
gestures
signing
PODD indicates intervention

Groups of Observations by Equal Days (Group 1, Group 2, Group 3, Group 4)

Types of Communication: Hallway Job Setting

Frequency (250, 225, 200, 175, 150, 125, 100, 75, 50, 25, 0)

vocalizations
gestures
signing
PODD indicates intervention

Groups of Observations by Equal Days (Group 1, Group 2, Group 3, Group 4)

What levels of prompting did the subject need before and after intervention in order to communicate?

The baseline period of the cafeteria snack setting indicated the subject needed greater prompting to respond to questions with a frequency count of 54 when indicating food and drink preferences for snacks and added spontaneous speech with a frequency of 44 as he viewed the choices and indicated his favorite snacks. Many times he would review what he liked several times. Cued speech was not present during this setting.

The cafeteria snack setting was the first setting to receive the intervention of PODD. The composite results showed from baseline to intervention the subject's spontaneous communication decreased by a frequency count of 4 or 9%. His frequency of responses decreased by 23 or by 42.5%, and cued speech appeared briefly and then faded. Interaction between the communication partners and the subject was inconsistent in this setting from baseline to the end of the study (Fig. 8).

The baseline period of the home setting occurred in the afternoons after the school day. The subject interacted with the mother and clinician working in the home using a picture schedule involving chosen tasks, activities, snacks, and sensory breaks. The subject was very interactive during this setting with spontaneous communication being his greatest preference with a frequency of 77 and responses having a lesser frequency of 33. Cued speech was minimal at a frequency count of 3.

The home setting was the second setting to receive the intervention of PODD. The subject showed steady increases in spontaneous communication and responses to questions as he was encouraged to use the intervention to express his wants and needs by his communication partners consistently. Composite results indicated the subject's

spontaneous communication increased from baseline to intervention by a frequency count

of 64 or by 83.1%. His frequency of responses to questions and requests using the

intervention increased by 91 or by 27.57%, and cued speech decreased by 3 or 100%.

The subject expressed himself spontaneously as his greatest preference in this setting and

with responses to questions asked using PODD. Cued speech faded in this setting after
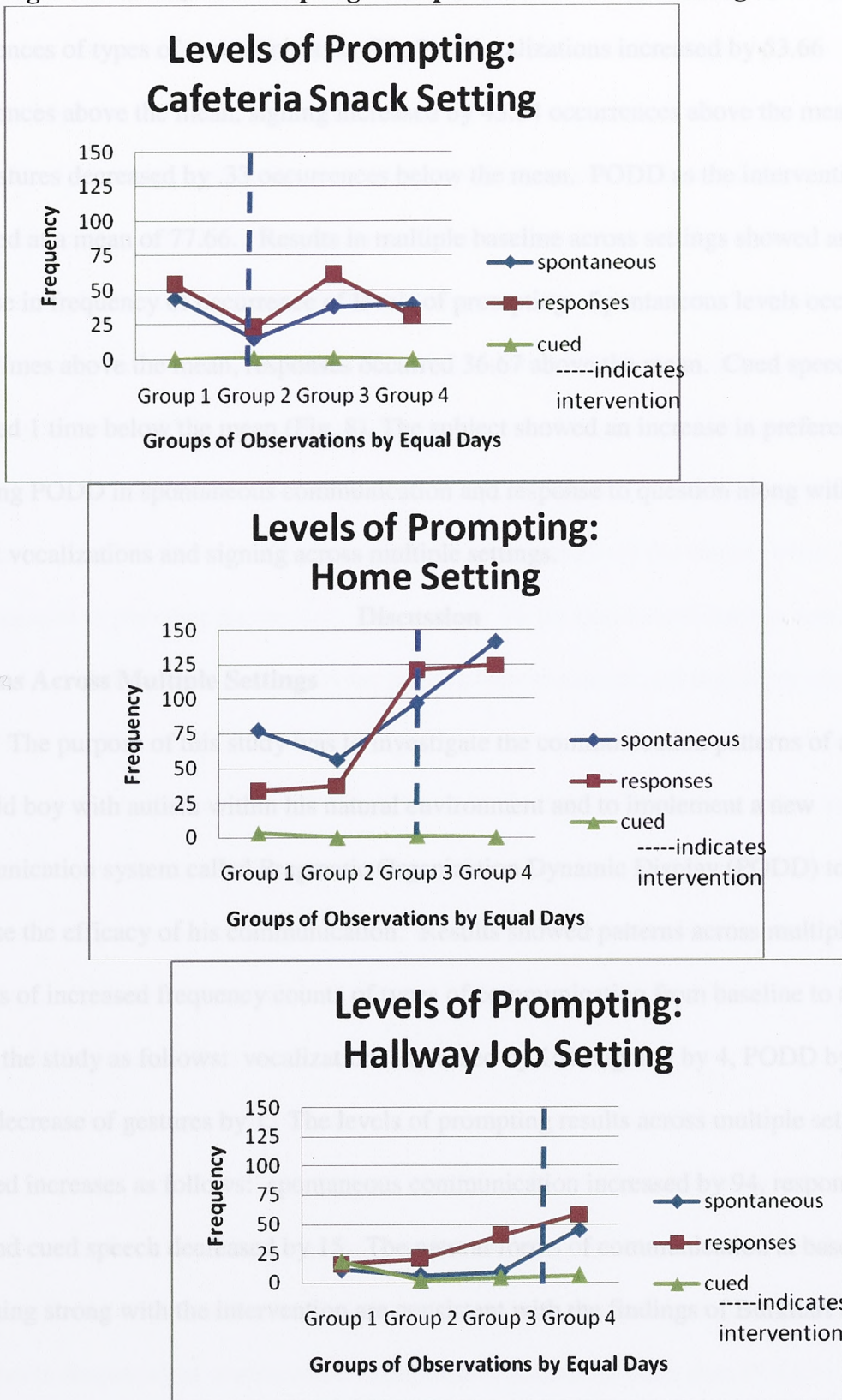
the intervention was implemented (Fig. 8).

The baseline period of the levels of prompting in the hallway job setting indicated

the subject needed mostly cued speech with a frequency of 18 in order to perform his job,

which included verbal prompting to greet teachers and ask for tea orders. The one-on-

one aide and teachers then solicited responses to questions with a frequency of 16 from

the subject to complete the social interaction. The subject was less likely to initiate

spontaneous communication having a frequency of 11 when interacting with staff.

The hallway job setting was the third setting to receive the intervention of PODD.

The subject exhibited an increase in responses to requests as well as spontaneous

communication. He declined in his frequency for cued speech. The PODD required a

structured interaction between the communication partner and the subject beginning with

questions posed by the partner requiring responses using PODD. The subject

spontaneously vocalized as he pointed to the picture symbols. Composite results

indicated the subject's spontaneous communication increased from baseline to

intervention by a frequency count of 34 or by 30.9%. His frequency of using responses

increased by 42 or by 262.5%, and his frequency of using cued speech decreased by 12 or

by 66.66%. To use the intervention of PODD, the subject needed a higher level of

prompting to respond to questions and requests while spontaneously vocalizing as he

focused on the picture symbols and pointed to additional symbols he liked (Fig. 8).

Figure 8: Levels of Prompting Multiple Baseline Across Settings

**Levels of Prompting:
Cafeteria Snack Setting**

Frequency

150
125
100
75
50
25
0

Group 1 Group 2 Group 3 Group 4

Groups of Observations by Equal Days

- spontaneous
- responses
- cued
-----indicates intervention

**Levels of Prompting:
Home Setting**

Frequency

150
125
100
75
50
25
0

Group 1 Group 2 Group 3 Group 4

Groups of Observations by Equal Days

- spontaneous
- responses
- cued
-----indicates intervention

**Levels of Prompting:
Hallway Job Setting**

Frequency

150
125
100
75
50
25
0

Group 1 Group 2 Group 3 Group 4

Groups of Observations by Equal Days

- spontaneous
- responses
- cued
-----indicates intervention

Results in multiple baseline across settings showed an increase in frequency of occurrences of types of communication (Fig.7). Vocalizations increased by 53.66 occurrences above the mean, signing increased by 43.34 occurrences above the mean, and gestures decreased by .33 occurrences below the mean. PODD as the intervention occurred at a mean of 77.66. Results in multiple baseline across settings showed an increase in frequency of occurrence of levels of prompting. Spontaneous levels occurred 31.33 times above the mean, responses occurred 36.67 above the mean. Cued speech occurred 1 time below the mean (Fig. 8). The subject showed an increase in preference for using PODD in spontaneous communication and response to question along with his natural vocalizations and signing across multiple settings.

Discussion

Patterns Across Multiple Settings

The purpose of this study was to investigate the communication patterns of a ten-year-old boy with autism within his natural environment and to implement a new communication system called Pragmatic Organization Dynamic Display (PODD) to increase the efficacy of his communication. Results showed patterns across multiple settings of increased frequency counts of types of communication from baseline to the end of the study as follows: vocalizations increased by 161, signing by 4, PODD by 233, and a decrease of gestures by 1. The levels of prompting results across multiple settings revealed increases as follows: spontaneous communication increased by 94, responses by 110, and cued speech decreased by 15. The natural forms of communication at baseline remaining strong with the intervention are consistent with the findings of Burkhart (1993)

in saying that children continue to develop and use speech even in the presence of augmenting communication and using some form of assistive technology.

Strategy Models

  The first setting had the lowest frequency of usage of PODD as a communication tool by the subject, which was a frequency of 45.66 below the mean, during the intervention phase possibly due to increased lethargy and drooling of the subject possibly caused by early morning medications. The second setting had the least increased frequency with the PODD intervention from its first set of implementation session to the end of the study, which was an increase of 15. The increase was possibly due to a lack interaction with PODD initiated by communication partners with the subject when they were engaged in planning for the day. The strategy for the two school settings was based on a model called the routines and choice making intervention model that allows the child to establish familiar routines that have a high frequency of occurrence within a structured environment that builds on predictability (Green, et al., 2003). When the routine was interrupted or the pacing of the sequence changed on the job route or during the snack session, the subject was unable to transition as anticipated and as he had practiced on other days, which could have affected the data.

Increased Communication

  The third setting had the greatest increases of usage of PODD for communication between language partners and the subject, which was 85.34 above the mean, which may be due to multiple communication partners using the intervention more consistently and directly with the subject under the direction of the mother as the trainer. The greatest increases in frequency of communicative expressive utterances other than PODD

occurred in the third setting as follows: vocalizations, which was 85.5 above the mean;

signing, which was11.34 above the mean; gestures, which was 23.67 above the mean;

spontaneous communication, which was 65.67 above the mean; and responses, which

was 53 above the mean.   The increases in total communication with the subject in the

third setting may be due to the increase of topics of discussion offered to the child and

increase of choice activities used to motivate the child to focus on interactive tasks

involving communication with partners. Bergman (2005) indicated children with ASD

perseverate on objects or just the parts of object and can focus attentively on these objects

or incorporate them into repetitive motions or activities. The subject's narrow

perseverations and special interests of moving large objects, going to the store to see

plumbing supplies, working with PCP pipes, moving wood outdoors, cleaning brush, and

cutting weeds were offered as tasks he could choose or as motivators to get him to

complete a task required of him, so he would immediately focus on the PODD and the

conversation partner at the mention of the item or activity and initiate conversation about

the task or item with the conversation partner. He would even take the PODD book in

hand while vocalizing to move the attention of the communication partner toward the

desired activity.

Fading of Negative Behaviors

The subject's inappropriate behaviors were reduced in this setting as noted by the

researcher, which supports Koegel, Koegel, and Dunlap (1996) in their views that

increasing communication opportunities is a proactive way to reduce tantrum behaviors.

In the home setting, when the subject exhibited frustration, he quickly reached for PODD,

the intervention, to make his request known. This observation is consistent with the

Califero (1995) study of four families using a PCS system as a second language in the home. Results showed increased communication interactions in three families and decreased distress in the child using the AAC system in all four families.

Wait time was a factor for the subject in all settings. If communication partners moved quickly and were able to move the subject through communication and tasks in the same manner without interruption, he could move in the required sequence without becoming frustrated and exhibiting inappropriate behaviors such as yelling, pushing or pulling items he was not allowed to touch or pushing, pulling, or hitting his communication partner. Volkmar (1997) would agree that individuals with ASD depend on sameness and can be easily agitated when simple routines or items in their world are interrupted or rearranged. However, inconsistent with this finding by Volkmar, when the schedule or routine changed at school or at home, the subject was able to adjust to the change if it was explained to him by the communication partner and then reinforced by moving items on his schedule and then redirecting his attention to a new task using the picture schedule, verbalizations, signing, and the PODD. A combined effort of communication types actually helped the subject cope with an interruption in his routine in the process of transitioning to a new situation. Negative behaviors were reduced using this strategy.

Customizing the Intervention

Charting the process for constructing the PODD for the subject is interesting to note. The book began as a complete bound copy of the program before breaking into smaller PODD books unique to the subject and used for each of the various settings. This is modeled after Light and Binger's (1989) building communicative competence model

of intervention which plans and accounts for operational, social, linguistic, and strategic competencies. The subject's books were generated and fine-tuned or customized in each setting as the study progressed to provide new strategies for use, language choices, easier usage, and to encourage more social interactions in each setting. A new strategy as presented by Beukelman and Mirenda (2008) suggests success using visual scene displays (VSD). The subject showed greater preference for PODD as the book incorporated more and more personalized photographs, pictures, and environmental samplings. In addition, the size of icons and numbers presented on the page changed over time. Video modeling and video self-modeling was not used as a strategy to teach the subject how to use PODD and may have been an effective modeling technique to encourage greater success in all settings, as research has shown with Akulliam and Bellini (2007) for both the subject and communication partners.

Training of Communication Partners

McPhee and Porter (1996) and Porter (2002) suggest the trainers should be professionals who orient the family, caregivers, and staff working with the child to the system and teach strategies for using the PODD communication book. The main communication partners initially using PODD with the subject were the mother and one-on-one aide. They received an informal training orientation conducted by the technology specialist. Follow-up assistance was provided. They, in turn, attempted to instruct and encourage other communication partners, both familiar and unfamiliar, to use PODD. It would be interesting to see if having a more intense and formal training program for PODD would increase its usage with the subject.

Beliefs and Attitudes

Consistent with Romski and Sevcik (2005), the belief system and attitudes of the professionals and family members using the AAC device with the subject affected its success in the setting, as shown with the subject's mother and one-on-one aide.   An exciting development in the study was an increase in the usage of PODD with two other clinicians working with the subject in the home after gaining experience with practice and seeing for themselves a meaningful conversation generated with the subject as a result of their implementation of the intervention. Likewise, in both school settings, when the smaller PODD books were created and implemented, the communication partners began to use PODD to a greater extent and said they felt a greater comfort zone with the smaller book that related to items and activities in their setting.

Limitations of the Study

Results of the study were affected by factors that produced inconsistencies in the data collection process. The schedule and job the subject performed in the school settings were altered somewhat on occasion when the subject was tired or a staff member was absent. The remaining staff members were not always informed in advance of the change, so they were required to adjust the schedule and activities. This interrupted the interaction with the subject using the intervention. The flow of the regular conversational exchange changed when the subject exhibited inappropriate behaviors, which could have affected data collection and impeded the use of the intervention. The effects of medication on the subject in the mornings as opposed to afternoons may explain inconsistencies in data results.

Recommendations

Recommendations for the subject involved in the study are as follows:

1. Continue use of PODD in multiple settings with more consistency and integration of instruction after formal training is provided for the subject and all communication partners.

2. Use PODD to generate evidence for VAAP.

3. Consider video modeling or video self-modeling to train subject in use of PODD

Recommendations for future studies are as follows:

1. Conduct more research to test the efficacy of communication using PODD as the intervention for aided communication with multiple subjects.

2. Conduct a functional behavior analysis of incidences of tantrum behaviors in children with autism to see if there is a functional relationship between implementation of PODD, an intervention intended to increase communication of wants and needs, and incidences of negative and inappropriate behaviors.

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Appendix A

Permission Letter to Superintendents

December 3, 2009

Dear Superintendent of Fluvanna County Public Schools,

I am a Graduate student in Curriculum & Instruction Specialist Special Education General Curriculum K-12 at Longwood University. I have completed requirements to also receive the Autism Virginia State Certification as of December 2009.

I am currently planning to do my graduate thesis in the spring of 2010. I am seeking your permission to do a single-subject research entitled, "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism." In this study, I would like to observe Caleb Holmes's communication interactions with partners in his daily life. I would observe him in three settings: (1) self-contained autism classroom, (2) general education setting, and (3) home environment. I would not interact with participants but will observe and record the frequency of his communication attempts and whether or not the message was received. I would also chart the types of communication attempts. I understand Pragmatic Organization Dynamic Display (PODD) will be implemented into Caleb's communication interactions at school and home over the next months. I will observe and chart the implementation process and attempt to evaluate his preferences and the efficacy of the PODD as a mode of communication for him. I will need to observe twice a week in the three different settings for thirty minutes in each setting in the same day. I have been granted permission from my building principal, Kathi Driver, to do the school observations during my first period planning period. I will seek parent approval for convenient times I may conduct the home observations. The data collection tool is attached to this letter along with a description of the study.

There are no risks to the student in his participation of this study and confidentiality is guaranteed. The results will only be shared with the Longwood Thesis Committee without the identity of the student revealed.

This study is voluntary and the parents may withdraw their consent and discontinue participation in the research study at any time. No costs of any kind or compensation will be accrued to the parents or school for the child's participation.

I am available to answer any questions concerning procedures or protocols of this study. Please consider offering your consent as indicated at the end of this letter and return to me.

Thank you for your consideration.
Sincerely,

Karen Feathers
C & I Special Education Masters Program at Longwood University
434-842-1115
Karen.feathers@live.longwood.edu

Consent for Participation

_____I give my consent for Karen Feathers to conduct a single-subject research study entitled "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism" for thesis research study.

_____I do not give my permission for Karen Feathers to conduct a single-subject research study entitled "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism" for thesis research study.

_____   _____
Administrator Signature   Date

Appendix B

Permission Letter to Building Administrator

December 3, 2009

Dear Building Administrator of Central Elementary Schools,

I am a Graduate student in Curriculum & Instruction Specialist Special Education General Curriculum K-12 at Longwood University. I have completed requirements to also receive the Autism Virginia State Certification as of December 2009.

I am currently planning to do my graduate thesis in the spring of 2010. I am seeking your permission to do a single-subject research entitled, "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism." In this study, I would like to observe Caleb Holmes's communication interactions with partners in his daily life. I would observe him in three settings: (1) self-contained autism classroom, (2) general education setting, and (3) home environment. I would not interact with participants but will observe and record the frequency of his communication attempts and whether or not the message was received. I would also chart the types of communication attempts. I understand Pragmatic Organization Dynamic Display (PODD) will be implemented into Caleb's communication interactions at school and home over the next months. I will observe and chart the implementation process and attempt to evaluate his preferences and the efficacy of the PODD as a mode of communication for him. I will need to observe twice a week in the three different settings for thirty minutes in each setting in the same day. I have been granted permission from my building principal, Kathi Driver, to do the school observations during my first period planning period. I will seek parent approval for convenient times I may conduct the home observations. The data collection tool is attached to this letter along with a description of the study.

There are no risks to the student in his participation of this study and confidentiality is guaranteed. The results will only be shared with the Longwood Thesis Committee without the identity of the student revealed.

This study is voluntary and the parents may withdraw their consent and discontinue participation in the research study at any time. No costs of any kind or compensation will be accrued to the parents or school for the child's participation.

I am available to answer any questions concerning procedures or protocols of this study. Please consider offering your consent as indicated at the end of this letter and return to me.

Thank you for your consideration.
Sincerely,

Karen Feathers
C & I Special Education Masters Program at Longwood University
434-842-1115
Karen.feathers@live.longwood.edu

Consent for Participation

_____I give my consent for Karen Feathers to conduct a single-subject research study entitled "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism" for thesis research study.

_____I do not give my permission for Karen Feathers to conduct a single-subject research study entitled "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism" for thesis research study.

_____   _____

Administrator Signature   Date

Appendix C

Permission Letter to Parents of Participant

December 3, 2009

Dear Parents of Participant in the Single-Subject Design Research Study,

I am a Graduate student in Curriculum & Instruction Specialist Special Education General Curriculum K-12 at Longwood University. I have completed requirements to also receive the Autism Virginia State Certification as of December 2009.

I am currently planning to do my graduate thesis in the spring semester of 2010. I am seeking your permission to do a single-subject research entitled, "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism," where I observe your child's communication interactions with partners in his daily life. I would observe your child in three settings: (1) self-contained autism classroom, (2) general education setting, and (3) home environment. I would not interact with participants but will observe and record the frequency of his communication attempts and whether or not the message was received. I would also chart the types of communication attempts. I understand Pragmatic Organization Dynamic Display (PODD) will be implemented into your child's communication interactions at school and home over the next months. I will observe and chart the implementation process and attempt to evaluate his preferences and the efficacy of the PODD as a mode of communication for your child. I will need to observe twice a week in the three different settings for thirty minutes in each setting in the same day. I will seek your approval for convenient times I may conduct the home observations. The data collection tool is attached to this letter.

There are no risks to your child in his participation of this study and confidentiality is guaranteed. The results will only be shared with the Longwood Thesis Committee without the identity of your child revealed.

This research study is voluntary and you may withdraw your consent and discontinue participation in the research study at any time. No costs of any kind or compensation will be accrued to you for consent for your child's participation.

I am available to answer any questions concerning procedures or protocols of this study. Please consider offering your consent as indicated at the end of this letter and return to me.

Thank you for your consideration.

Sincerely,

Karen Feathers
C & I Special Education Masters Program at Longwood University
434-842-1115
Karen.feathers@live.longwood.edu

Consent for Participation

_____I give my consent for my child, _____, to participate in the thesis research study entitled "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism."

_____I do not give my permission for my child,_____, to participate in the thesis research study entitled, "Efficacy of Pragmatic Organization Dynamic Display (PODD) and Its Effect on Enhancement of Communication on Individuals with Autism."

_____   _____
    Parent Signature   Date

_____   _____
    Witnessed By   Date

Appendix D

Language Sample of Expressive Utterances

Language Sample of Expressive Utterances

Name: Date: Recorder:

Setting: Reason for Collection:

*Write word intent for each utterance in blanks. Take notes in all applicable sections.

Time:	Spontaneous	Responses	Imitation	Cued	Other	V=Voice/Word G=Gesture S=Sign VO=Voice Output/Vocalizations P=PODD	Intelligible: Yes Unintelligible: No	Utterance Length	Note
						_____ VGSVOP			
						_____ VGSVOP			
						_____ VGSVOP			
						_____ VGSVOP			
						_____ VGSVOP			
						_____ VGSVOP			
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					VGSVOP			
					VGSVOP			
					VGSVOP			
					VGSVOP			

Notes:

Single Subject's Behaviors

		OCD	TIC	Sensory	Communication
1	Yell		X		
2	Bark		X		
3	Grind Teeth	X	X	X	
4	Drooling *(maybe for spit or reduced it)*			?	
5	Pushing up on teeth			X	
6	Rocking			X	
7	Body Slamming	X		X	
8	Repositioning in seat			X	
9	Picking fingers	X		X	
10	Picking nose			X	
11	Pinching nose	X	X	X	
12	Digging in Eye			X	
13	Looking at hands	X	X	X	
14	Locking fingers		X	X	
15	Cupping fingers		X	X	
16	Shoulder shrug		X		
17	Pulling clothes		X	X	
18	Bobbing head		X	X	
19	Swinging head			X	
20	Head jerks		X		
21	Smelling fingers	X		X	
22	Growling		X		
23	Facial grimace		X		
24	Shoulder twitching		X		
25	Sniffing/smelling things	X		X	
26	Genital pulling, rubbing, playing, humping	X	X	X	
27	Flipping his ears			X	
28	Flipping other peoples ears	X		X	
29	Invading personal space	X	X	X	X
30	Rocking on knees	X		X	
31	Sitting chair on toes (rocking)			X	
32	Gasping		X		
33	Beeping		X		
34	Pinching toes	X	X	X	
35	High pitched – low volume squeal		X		X
36	Checking doors (cars, house, etc.)	X			
37	Jolting doors, partitions	X		X	X
38	Checking light switches	X			
39	Toilets	X		X	X
40	Flushing items (eye, glasses, etc.)	X			X

Appendix E

Single Subject's Behaviors

Single Subject's Behaviors

		OCD	TIC	Sensory	Communication
1	Yell		X		
2	Bark		X		
3	Grind Teeth	X	X	X	
4	Drooling *(maybe the result of medication)*			?	
5	Pushing up on teeth			X	
6	Rocking			X	
7	Body Slamming	X		X	
8	Repositioning in seat			X	
9	Picking fingers	X		X	
10	Picking nose			X	
11	Pinching nose	X	X	X	
12	Digging in Eye			X	
13	Looking at hands	X	X	X	
14	Locking fingers	X	X	X	
15	Cupping fingers	X	X	X	
16	Shoulder shrug		X		
17	Pulling clothes		X	X	
18	Bobbing head		X	X	
19	Swinging head			X	
20	Head jerks		X		
21	Smelling fingers	X		X	
22	Growling		X		
23	Facial grimace		X		
24	Shoulder twitching		X		
25	Sniffing/smelling things	X		X	
26	Genital pulling, rubbing, playing, humping	X	X	X	
27	Flipping his ears			X	
28	Flipping other peoples ears	X		X	
29	Invading personal space	X	X	X	X
30	Rocking on knees	X		X	
31	Sitting chair on toes (rocking)			X	
32	Gasping		X		
33	Beeping		X		
34	Pinching toes	X	X	X	
35	High pitched – low volume squeal		X		X
36	Checking doors (cars, house, etc.)	X			
37	Jolting doors, partitions	X		X	X
38	Checking light switches	X			
39	Toilets	X		X	X
40	Flushing items (eye, glasses, etc.)	X			X

41	Cutting (everything and anything)	X		X	X
42	Electrical (plugging and unplugging)	X			
43	Music (repeats same song, stanzas)	X		X	X
44	Food (spits out)	X		X	
45	Food (eats out of trash can, off floor)	X			
46	Water Play			X	
47	Dumping stuff (water, food, etc.)	X		X	X
48	Extreme water temperatures			X	
49	Licks floors	X		X	
50	Blows nose w/out tissues	X		X	
51	Blows nose until it bleeds	X		X	
52	Plays with boogers			X	
53	Rubbing flipping hair (his and others)	X		X	
54	Pushing on his fingernails			X	
55	Head jerks		X		
56	Repeating ?'s needing confirmation	X			X
57	Tapping	X	X	X	
58	Touching chests (boobs)	X			X
59	Keys	X			
60	Breaking keys in locks, etc.	X		X	
61	Kicking			X	X
62	Stomping			X	X
63	Hitting self			X	X
64	Hitting others				X
65	Slamming items (doors, chairs, anything)	X	X	X	X
66	Refusal to take meds				X
67	Refusal to do work				X
68	Laughing	X		X	X
69	Repeating actions	X		X	
70	Organizing items to his specs.	X			X
71	Writing on himself	X		X	X
72	Needing to stand instead of sitting	X		X	X
73	Pushing			X	X
74	Must see when directed to stay away	X		X	X
75	Darting	X			X
76	Kicking door jambs	X		X	X
77	Making sure items are in working order (water fountains, lights, microwaves, etc.)	X		X	X
78	Repeat motions (same tract)	X			

79	Throwing things	X		X	X
80	Opening and closing windows	X		X	X
81	Hiding stuff				X
82	Tapping Chest	X		X	
83					
84					
85					
86					
87					
88					
89					
90					

Updated by Mother and One-on-One Aide 12-5-09