

The iPad as an Alternative Reinforcer during Functional Communication Training:
Effects on Self-Injury and Aggression

by

Catherine Acotto

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved March 2014 by the
Graduate Supervisory Committee:

Kathleen M. McCoy, Chair
Sarup R. Mathur
Stanley H. Zucker

ARIZONA STATE UNIVERSITY

August 2014

ABSTRACT

The present study used a multiple baseline design across settings to examine the effects of using an iPad as an alternative reinforcer on self-injury and aggression when reinforcement for appropriate communication was denied following Functional Communication Training in an adolescent with Autism Spectrum Disorder (ASD), Intellectual Disability (ID), and severe aggression. The study also assessed collateral effects of the intervention on the use of self-management to control aggression. Data indicate the use of an iPad as an alternative reinforcer decreased the duration of self-injury and physical aggression in an adolescent in a big box store, grocery store, and classroom. Instances of self-injury and aggression remained low during maintenance sessions and a six month post-hoc analysis. Collateral gains in self-management were made during treatment and maintenance sessions.

DEDICATION

To my Daughter Emily, I want to acknowledge you for your patience and understanding throughout this process, knowing it wasn't easy. I love you.

ACKNOWLEDGMENTS

I would like to express my deepest gratitude to Dr. Kathleen McCoy, my advisor and dissertation chair, for guiding me throughout this journey. Her mentoring approach provided me with the independence to discover things on my own while giving me the support and guidance I needed to be successful in my academic endeavors.

I wish to acknowledge the help provided by the members of my Dissertation Advisory Committee, Dr. Sarup Mathur and Dr. Stanley Zucker.

To Dana Bender, Emma's one-on-one assistant, I appreciate all the support you willingly gave to this project.

I would like express appreciation to my husband, Carmen Acotto, who spent many sleepless nights by my side, reassuring me when I needed it most.

I would like to thank my Mother, Donna DePasquale for your support and ongoing encouragement.

Finally, I would like to express my gratitude to Emma and her family for giving me the opportunity to complete this project. Their dedication and commitment to helping Emma is inspiring.

TABLE OF CONTENTS

	Page
LIST OF FIGURES	vi
CHAPTER	
1 INTRODUCTION	1
Overview of Autism	1
Aggression	2
2 REVIEW OF THE LITERATURE	6
Search Process	6
Behavioral Interventions	6
Functional Communication Training	8
Schedule Thinning	9
Alternative and Augmentative Communication	12
Speech Generating Devices	13
iPad	14
Self-Management	15
Conclusion	16
Statement of the Problem	18
3 METHODOLOGY	19
Background	19
Participant	20
Context	21
Experimental Design	21
Experimental Procedures	23

CHAPTER	Page
Interobserver Agreement	24
Implementation Fidelity	25
Data Analysis	25
4 RESULTS AND DISCUSSION	26
Preference Assessments	26
iPad Training	26
Settings	27
Self-Management	32
Maintenance	33
Post-Hoc Analysis	33
Social Validity	34
Discussion	34
5 IMPLICATIONS	38
Limitations	40
Future Research	41
REFERENCES	43
APPENDIX	51
A SELF-MANAGEMENT TASK ANALYSIS	51
B PREF. ASSESS. IMPLEMENTATION INTEGRITY FORM	53
C PREFERENCE ASSESSMENT DATA FORM	55
D iPad TASK ANALYSIS	51
E SIB AND AGGRESSION DURATION RECORDING FORM	59
F TREATMENT INTEGRITY FORM	61
G SOCIAL VALIDITY QUESTIONNAIRE	63
H INTERNAL REVIEW BOARD EXEMPTION	65

LIST OF FIGURES

Figure	Page
1. Duration of SIB/Aggression across Settings	27

Chapter 1

INTRODUCTION

Overview of Autism

Over the past several decades, the prevalence of children classified as having an autism spectrum disorder (ASD) has continued to rise. According to the Center for Disease Control (CDC) an average of 1 in 150 children in multiple areas of the United States were found to have an ASD (CDC, 2012). Researchers with the Health Resources and Services Administration (HRSA), Centers for Disease Control (CDC) and Massachusetts General Hospital recently published a new estimate of the prevalence of autism indicating approximately 1 in 88 children have an ASD (CDC, 2012).

Today, children with ASD represent the second most common serious developmental disability after mental retardation (CDC, 2012). Between the years of 1998 and 2007, the number of 6 – 21 year-old students with ASD receiving special education services in public schools increased nearly four-fold, from 53,644 to 256,863 (Office of Special Education Programs, 2010).

Autism Spectrum Disorder is typically characterized by impairments in social interaction, communication, and restricted repertoires of behaviors and interests that occur on a continuum of impairment from mild to severe (American Psychiatric Association, 2002). Individuals with ASD are at risk for developing challenging behaviors such as aggression, self-injury, and tantrums due to communication deficits (Farmer & Aman, 2011; Matson & Shoemaker, 2009; Murphy, Healy, & Leader, 2009). Challenging behaviors such as aggression can be a major obstacle for those who are responsible for their education and can wreak havoc in the daily lives of the families who care for them (Durand & Merges, 2001). Aggression has been found to be more common

among individuals with Intellectual Disability (ID) than among those in the general population (Holden & Gitleson, 2006, Hudson & Chan, 2002; Lowe, Allen, Jones, Brophy, Moore, & James, 2007; Moss, Emerson, Kiernan, Turner, Hatton, & Alboroz, 2000) with an added risk factor for aggression for those individuals with a dual diagnosis of ASD and ID (Hill & Furnis, 2006; McClintock, Hall, & Oliver, 2003).

Aggression

Aggression by individuals with developmental disabilities is a learned behavior or set of behaviors that serves as a way to communicate. The individual has learned that aggressing towards another individual achieves a desired outcome i.e., the aggressive behavior becomes functionally related to the consequences that reliably follow it (Foxx & Meindl, 2007).

Typically the desired outcome is to gain attention from a recipient or bystanders (Thompson, Fisher, Piazza, & Kuhn, 1998), to gain access to tangible reinforcers (DeLeon, Fisher, Herman, & Crosland, 2000), to escape or avoid an unpleasant situation or demand (Horner, Day, Sprague, O'Brien, & Heathfield, 1991), or to achieve multiple desirable outcomes (Braithwaite & Richdale, 2000).

Severe and persistent challenging behaviors can be detrimental to effective education, social development, and community inclusion (Fox, Dunlap, & Buschbacher, 2000; Horner et al., 1991). Historically most community and educational placements are hesitant to accept individuals who exhibit extreme aggression. These behaviors are a potential threat to personal safety and the safety of others. Staff burnout and effects on resistance to work with individuals who are extremely aggressive may drain services where limited funds are available. Persistent aggression may contribute to the individual having a 'reputation' for 'being' aggressive and as a result staff may behave in a different manner towards the individual. Studies carried out by Freeman (1994), Hastings and

Brown (2002), and Jenkins, Rose, and Lovell (1997) all suggest that direct care staff who are exposed to more frequent and severe levels of challenging behaviors (including physical aggression) are at increased risk of stress. The presence of stress in service providers has been linked to negative interactions with service users (Lawson & O'Brien, 1994). This may result in restrictive environments and the use of intrusive procedures such as prolonged isolation/time out, excessive medication, shock, surgery (e.g., removing teeth so that the person cannot bite), or elaborate restraint in order to manage the aggression (Duncan, Matson, Bamburg, Cherry, & Buckley, 1999; de Zubicaray & Clair, 1998; Jacobson and Ackerman, 1993).

Education programs designed to teach individuals who display challenging behaviors such as aggression and self-injury require extensive training. Training needs to focus on interventions designed to decrease the challenging behavior prior to teaching other academic or community based skills. Many times educators attempt to address academics and community based skills without implementing specific interventions to address the problem behavior first. This type of implementation typically causes the problem behavior to escalate and leaves teachers and parents overwhelmed.

Aggressive behavior is a leading cause of residential placement, interferes with classroom learning, places tremendous stress on families, and results in reduced opportunities for independent functioning and interpersonal relationships (Bailey, McComas, Benavides & Lovasz, 2002). Early and effective intervention can reduce challenging behaviors by 80-90% (Horner et al.1991); however in the absence of intervention challenging behaviors tend to persist throughout adulthood (Murphy et al., 2009).

Behavioral intervention research has repeatedly demonstrated learning more effective and efficient communication can significantly reduce challenging behaviors such as

severe aggression and self-injury. One of the most researched behavioral interventions for the treatment of severe aggression and self-injury is Functional communication training (FCT) (Carr & Durand, 1985; Hagopian, Contrucci Kuhn, Long, Rush, 2005; Tiger & Hanley, 2004; Tiger, Hanley, & Heal, 2006; Hanley, Iwata, Thompson, 2001; Fisher, Kuhn, & Thompson, 1998; Fisher, Thompson, Hagopian, Bowman, Krug, 2000; Hagopian, Fisher, Sullivan, Acquisito, & LeBlanc, 1998). Functional communication training teaches an individual an alternative response in the form of expressive communication, such as, pictorial symbols, vocalizations, manual signs, or a speech generating device (Carr & Durand, 1985; Tiger, Hanley, & Bruzek, 2008). The alternative response is reinforced using a dense (e.g., Fixed Ratio 1:1, response: reinforcer) schedule of reinforcement during the initial stages of training and then thinning the schedule (e.g., Fixed ratio 3:1, response:reinforcer) as the individual begins to communicate more independently using the newly taught system (Carr & Durand, 1985; Hagopian, Contrucci Kuhn, Long, Rush, 2005; Tiger & Hanley, 2004; Tiger, Hanley, & Heal, 2006; Hanley, Iwata, Thompson, 2001; Fisher, Kuhn, & Thompson, 1998; Fisher, Thompson, Hagopian, Bowman, Krug, 2000; Hagopian, Fisher, Sullivan, Acquisito, & LeBlanc, 1998). Although this intervention is one of the most well established in the literature, research is limited on the effects of FCT on aggression and self-injury when the schedule of reinforcement is thinned. The majority of FCT studies were conducted in controlled environments instead of natural settings, facilitating the use of a dense schedule of reinforcement during the intervention.

Autism intervention methods should be effective, practical, and transportable; should lead to substantial collateral gains in multiple areas of development; and should facilitate generalization and spontaneous use of acquired skills (Koegel, Harrower, & Koegel, 1999). Although functional communication training has proven to be an effective

intervention at reducing problem behaviors under controlled conditions, research is needed on the use of FCT in natural environments with more manageable reinforcement schedules.

Autism interventions should lead to substantial collateral gains in multiple areas of development and facilitate spontaneous use of acquired skills. Although the primary objective of this study was to examine the effects of using an iPad as an alternative reinforcer during delayed or unavailable reinforcement, the examiner also assessed for collateral gains in self-management. Self-management is inherently motivating and reinforcing to the individual when communicating preferences with others and choosing leisure activities. Therefore it was hypothesized that the participant would make collateral gains in self-management when using the iPad as an alternative reinforcer when reinforcement communicated for was unavailable.

Chapter 2

REVIEW OF THE LITERATURE

Search Process

The following review was constructed through a systematic procedure to retrieve relevant articles. An electronic search of citations through Academic Search Premier (EBSCO Host), ERIC, PsycInfo, MedPub, and Wilson Web was conducted using the keywords: *autism, Functional Communication Training, Schedule Thinning, Behavior Interventions, Reinforcement, Tolerance to delayed reinforcement, and Self-Management*. The electronic search was to peer reviewed journals encompassing the years 1985 to 2011. An ancestral search based on the reference lists of obtained articles was conducted for relevant citations.

Behavioral Interventions

Brosnan and Healey (2011, p. 439) separate behavioral interventions into three categories:

- (1) *Antecedent manipulations and changes in instructional context:*
including video priming and environmental enrichment, prompting procedures, progressive time delay, photographic activity schedules, interspersed requests, choice-making, and scheduling using the Premack Principle.
- (2) *Reinforcement based strategies:* picture exchange communication system (PECS), functional communication training (FCT), differential reinforcement procedures, non-contingent reinforcement (NCR), and differential negative reinforcement procedures (DNR).
- (3) *Consequential control:* extinction, overcorrection, response cost, time out, blocking, and contingent electric shock.

For the purposes of this study, approaches based on two of the aforementioned categories were combined to form an intervention to reduce self-injury and aggressive and behavior.

Different behavioral interventions have been used and evaluated over the past 40 years to decrease severe aggression and self-injury. Functional communication training and extinction are two of the most common and well established interventions in the literature for severe behavior problems (Carr & Durand, 1985; Deleon et al., 2000; Mancil, 2006; Durand, 1999). FCT initially involves assessing the function of the problem behavior to determine how the behavior operates on the environment (i.e. access to escape, attention, tangibles, sensory induction/reduction). Subsequently, the individual is taught an alternative, functional communicative response (FCR), based on the identified function, to replace the problem behavior (e.g. to gain access to attention, instead of hitting someone, the individual exchanges a card). This response is then typically trained with a dense schedule of reinforcement (e.g. fixed-ratio of 1:1 response-reinforcer relation (Kelley, Lerman, & Van Camp, 2002), evaluated to demonstrate its effectiveness and finally schedule thinning procedures are applied to make the intervention more practical in the natural environment (e.g. Hanley, Iwata, & Thompson, 2001).

Consequence based strategies are a critical component included in behavior intervention plans to address responding when the problem behavior occurs during treatment. Extinction is the most commonly used and effective consequence based procedure (Borrero, Vollmer, & Borrero, 2004; Borrero, & Vollmer, 2006; Braithwaite & Richdale, 2000; Carr, Chrichton, & Binkoff, 1980; Lerman & Iwata, 1996; & Thompson et al., 1998). Extinction is a behavior reduction procedure in which reinforcement for a previously reinforced behavior is discontinued, resulting in a decrease in the future

probability of that behavior (Cooper, Heron, & Heward, 2007). As extinction does not teach the individual new behavior, this intervention is usually implemented as part of a treatment package.

Functional Communication Training

FCT and extinction are commonly used together to treat behaviors maintained by social attention or access to tangibles. Extinction will frequently fail to result in a sufficient reduction in problem behavior when used in isolation. Hagopian et al. (1998) reported the implementation of FCT with 27 participants at an inpatient unit specializing in the treatment of severe behavior disorders. FCT without extinction was applied as a treatment in 11 of the participants program and was not effective in reducing problem behavior below 90% of baseline levels in a single case. FCT with extinction was implemented with 16 participants and resulted in at least 90% or greater reductions in problem behavior in all 16 cases.

FCT is a highly effective and commonly used treatment for individuals with intellectual disabilities, ranging from mild to profound, who engage in severe problem behaviors such as self-injury and aggression (Baily et al., 2002; Carr & Durand, 1985; Mazaleski & Lerman, 1997; Fisher et al., 1992; Hagopian et al., 1998; Kurtz et al., 2003; Wacker et al., 1990). Challenging behavior significantly decreased when individuals with autism were taught to request reinforcement using an AAC system that produced the same function as their challenging behavior (Carr & Durand, 1985; Durand & Carr, 1992; Dunlap, Robbins & Kern, 1994; Koegel & Koegel, 1996). A continuous schedule of reinforcement (e.g., immediate reinforcement for every functional communicative response) is initially implemented and then systematically thinned.

Although the use of continuous reinforcement in FCT results in the rapid and clinically significant reductions in problem behavior, the approach also presents as a

challenge to maintenance and generalization (Hanley, Iwata, & Thompson, 2001). Teaching tolerance to delayed or denied reinforcement is critical to the successful integration of FCT into everyday practices for caregivers and educators. Parents and teachers are unable to sustain the continuous reinforcement causing the problem behavior to increase or return to pre-treatment rates. Many problem behaviors occur when an individual is denied access or has to wait for a highly desired item. Schedule thinning is used following FCT as a means to formally program for generalization and maintenance by exposing the individual to conditions that more closely resemble the natural environment. The purposes of schedule thinning are (a) to lower the overall rate of the functional communication response (FCR), (b) to maintain the strength of the FCR, and (c) to prevent resurgence of problem behavior during times when the FCR is not reinforced (Fisher et al., 1998; Fisher, O'Connor, & Kurtz, 2000; Hagopian et al., 2005; Hagopian, Toole, Long, Bowman, & Lieving, 2004; Hagopian et al., 1998; Hanley et al., 2001; Roane, Fisher, Sgro, Falcomata, & Pabico, 2004; Tiger & Hanley, 2004).

Schedule Thinning

Schedule thinning procedures have become recognized as an important component of FCT due to likely situations when reinforcement for communication is delayed or denied. This delay in reinforcement may occur for a variety of reasons: (a) The requested reinforcer is not readily available (e.g., food requiring preparation), (b) inappropriate to deliver the requested reinforcer (e.g., escape from health- or hygiene-related tasks), or (c) the child may request reinforcement more often than is practical for care providers to deliver. When repeated attempts to gain attention through communication are unsuccessful, an individual is likely to try another response that previously maintained the requested reinforcer (e.g., aggression). When reinforcement is denied or delayed, the

effectiveness of the communication response decreases and the likelihood destructive behavior will return to pretreatment levels increases.

Despite the importance of programming for schedule thinning within FCT, only a small proportion of studies included a description of these procedures (Tiger et al., 2008). A review of 76 studies on FCT published between 1985 and 2009 found only 19 studies (29%) included a description of a schedule thinning phase.

Four different schedule thinning procedures were discussed in the literature (a) delay schedules, which involve introducing delays to reinforcement following the emission of the target communication response (e.g., Fisher et al., 1992); (b) chain schedules, which, involve increasing the number of demands that must be completed before requests for a break will be honored (also described as “demand fading” or “response chaining”, (e.g., Lalli, Casey, & Kates, 1995); (c) multiple schedules, wherein the duration of a signaled reinforcement component is progressively decreased while the duration of a signaled extinction component is increased (e.g., Hanley et al., 2001); and (d) response restriction, which involves restricting access to the communication response (or device) for progressively longer periods of time (Roane et al., 2004).

Only a few studies have incorporated schedule thinning procedures following (FCT) and all reported disruption of communication or increases in problem behavior when the schedule of reinforcement was thinned (Hagopian et al., 2005; Fisher et al., 1993; Hagopian et al., 1998; Hanley et al., 2001). One strategy for addressing persistent increases in problem behavior associated with reinforcement thinning during FCT is to incorporate additional treatment components. These components have included the provision of an alternative work activity during the delay to reinforcement (Fisher, Thompson, Hagopian, Owens, & Slevin, 2000), and the use of punishment for problem behavior (e.g., Fisher et al., 1993; Hagopian et al., 1998). These procedures were

implemented following FCT and were not effective at maintaining low levels of problem behavior when the reinforcement schedule was thinned.

Another strategy for addressing persistent increases in problem behavior associated with reinforcement thinning is the use of supplemental treatment components (e.g., non-contingent access to alternative or competing stimuli) in conjunction with schedule thinning (Fisher et al., 1993; Fisher et al., 1998; Fisher, et al., 2000; Hagopian et al., 2005; Hagopian et al. 1998; LeBlanc, Hagopian, Marhefka, & Wilke, 2001). Providing access to competing stimuli allowed schedule thinning to proceed more rapidly, while maintaining lower levels of problem behavior and communicative responding relative to when such stimuli were not available (Fisher et al., 1998; Fisher et al., 2000; Hagopian et al., 2005; Hagopian, Wilson, & Wilder, 2001; LeBlanc et al., 2001; Roane et al., 2004). Providing access to stimuli that produce reinforcement and compete with the maintaining reinforcer during times when the preferred reinforcer is not immediately available may function as an abolishing operation (AO) for problem behavior and thus decrease the probability that problem behavior will recur during schedule thinning (Hagopian et al., 2005; Hagopian et al., 2001; LeBlanc et al., 2001; Roane et al., 2004).

Since the publication of Hagopian et al. (1998), research has led to several advances in the application of FCT. Rooker, Jessel, Kurtz, and Hagopian (2013) extended the research by Hagopian et al. (1998) by examining the effects of FCT used alone and in combination with alternative reinforcement (e.g., noncontingent and differential) with 58 patients with developmental disabilities. The alternative reinforcer was implemented in conjunction with FCT, not once a predetermined criteria was met following FCT. Results of this study indicated the use of alternative reinforcement (NCR, DRA, or DRO) in combination with FCT resulted in an 80% reduction in problem behavior for those who were unresponsive to FCT. The addition of alternative reinforcement to FCT

facilitated schedule thinning and low levels of problem behavior during thinning in all cases in which alternative reinforcement was introduced and used in conjunction with FCT. One explanation is that access to the alternative reinforcer reduced the motivating operation for both problem behavior and the alternative communication response. When schedule thinning was introduced, problem behavior was less likely to reemerge when the communication response was not reinforced. FCT is among the most common reinforcement-based treatments for challenging behavior in the behavioral literature (Tiger et al., 2008) and far exceeds the American Psychological Association's criteria for empirically supported treatments for problem behavior in children with intellectual and developmental disabilities, and for children with autism spectrum disorders (Kurtz, Boelter, Jarmolowicz, Chin, & Hagopian, 2011). FCT is an empirically supported intervention integrating the principles of Applied Behavior Analysis and Alternative and Augmentative Communication (AAC) to treat challenging behaviors such as aggression and self-injury.

Alternative and Augmentative Communication

Research on the effects of teaching those with limited communication to use AAC had been well established in the literature several years prior to the introduction of Functional Communication Training. Alternative and Augmentative Communication (AAC) refers to communicative systems or strategies which may be used to supplement an individual's existing speech or as a primary communication alternative to speech (Rispoli, Franco, Van Der Meer, Lang, and Camargo, 2010). Alternative and Augmentative Communication can include unaided communication (e.g. hand or body signals) or aided communication. Aided communication involves the use of external equipment with a communicative function, such as the exchange of pictures or activation of a speech generating device (SGD). Alternative and Augmentative Communication

gives individuals a strategy for expressing choice and preferences in the absence of verbal language; therefore reducing the risk of challenging behaviors.

Given that communication deficits are prevalent and often persistent in people with developmental disabilities, such individuals are frequently candidates for augmentative and alternative communication (AAC) interventions. Those who have significant communication delays can use AAC devices to request, comment, or answer questions as well as interact socially with others. Speech-generating devices (SGD) such as the Apple iPad can be an effective way to communicate with others. The use of AAC is common practice and includes many options for expressing needs and making choices to provide an improved quality of life and independence.

Speech-generating devices. Speech-generating devices (SGDs) are increasingly used as (AAC) options for individuals with developmental disabilities who have limited or no spoken language (Lancioni et al., 2007; Mirenda, 2003; Schlosser & Blischak, 2001; Sigafoos, Didden, & O'Reilly, 2003). Speech generating devices typically consist of a computer based processing unit with a visual display. The visual display might hold a number of vocabulary items (e.g., photographs, line drawings, or printed words). The devices are programmed to produce digitized (i.e., recorded) or synthesized speech output corresponding to each vocabulary item. Touching the line drawing of a glass of water from the visual display, for example, might produce corresponding speech output such as, "I would like to have a drink of water please". Research supports the use of SGD's with those diagnosed with ASD. Van der Meer and Rispoli (2010) reviewed 23 studies that collectively provided SGD intervention to 51 children (3 to 16 years of age) with autism spectrum disorders (ASD). The majority of these studies (78%) provided conclusive evidence that children with ASD can be taught to use various types of SGDs to request preferred items. Over the last few years an increase in the use of the Apple

iPhone, iPod, and iPad as speech generating devices due to AAC application software such as Proloquo2Go and Touch Chat has emerged.

Apple iPad. In recent years, the Apple iPad has emerged as a popular educational and communication device for individuals on the autism spectrum as well as for others who have expressive speech challenges. The increase use of iPads may be due to the diverse applications specific to the needs of those with ASD, portability, large touch screen, ease in individualizing and programming, and a lack of social stigma due to their frequent use by neurotypical individuals (van Laarhoven, Johnson, van Laarhoven-Myers, & Grider, 2009).

Although iPads have been widely used and supported by many educators, therapist, and parents, empirical research is only now beginning to emerge in the literature. Kagohara , van der Meer, Ramdoss , O'Reilly, Lancioni , Davis , Rispoli, Lang, & Marschik, Sutherland, Green, & Sigafos (2013) conducted a review of studies involving the iPod, iPad and the iPhone. Fifteen studies were found and all reported positive outcomes using the iPod and iPad. The studies addressed five domains (a) academic, (b) communication, (c) employment, (d) leisure, and (e) transitioning across school settings. The participants ranged from 4 to 27 years of age and diagnosed with autism spectrum disorder (ASD) and/or intellectual disability. The use of iPods or iPads aimed to either (a) deliver instructional prompts or (b) teach the person to operate an iPod Touch or iPad as a SGD to access preferred stimuli. Since the Kagohara et al. (2012) study, one additional study by Neely, Rispoli, Camargo, Davis, & Boles (2013) compared the effects of traditional teaching methods to instruction via the iPad on challenging behavior and academic engagement. The results found students challenging behaviors decreased and academic engagement increased under the iPad condition while challenging behavior

remained high and academic engagement low under the traditional instruction condition.

In addition to education and communication applications, the iPad has many applications that are motivating, can be operated independently, and are similar to neurotypical activities. These preferred applications present additional ways the iPad can benefit those with ASD. Reports are emerging children with autism find portable handheld devices reinforcing so using them in treatment may increase the child's motivation to participate in and respond to interventions (Goldsmith & LeBlanc, 2004). More specifically, children often use these technological devices to engage in highly preferred activities like watching movies or playing video games. The child may come to associate these positive experiences with the device itself, thus making interventions that use the device more enjoyable and interesting (Goldsmith & LeBlanc, 2004). Further, children with autism may prefer to engage in interventions using these devices because these individuals are especially adept at mechanical tasks like working electronic devices (e.g., Goldstein, Beers, Siegel, & Minshew, 2001; Kanner, 1943).

Highly preferred applications like You Tube may be used as a reinforcer to help teach new skills, decrease challenging behaviors, and as an independent leisure activity. Given the numerous applications available and with new applications forthcoming on the market daily, empirical studies are needed to establish best practices when using the iPad as part of any program, e.g., self-management.

Self-management

Self-management contributes to independence, self-determination, and overall quality of life for those with developmental disabilities (Fullerton, 1995). Individuals with disabilities need to be able to control their own behaviors to achieve independence successfully and to share a common environment with other people at school, work, and

home and in society. Self-management strategies empower students to control their own behavior instead of relying on parent or teacher prompts or external interventions, and they assist students in generalizing what they learn in various natural settings (Koegel et al., 1999).

Self-management can be defined as the responses made by people in order to maintain or change their own behaviors (Dickerson & Creedon, 1981) or the process used by people to control their own behaviors (Browder & Shapiro, 1985). Self-management strategies are effective and efficient strategies used to enhance the abilities of students, involving antecedent cue regulation, self-instruction, self-monitoring, self-evaluation and self-reinforcement (Brooks, Todd, Tofflemoyer, & Horner, 2003; McLaughlin, 1984; Schloss & Smith, 1994). These strategies are more effective when the goal is to increase a target behavior than attempting to decrease a behavior.

Lee, Simpson & Shogren (2007) conducted a meta-analysis on self-management research for children and adolescents with ASD from 1992 to 2001. The majority of studies focused on young children with autism and improving social skills. They found support for the efficacy of self-management interventions in increasing appropriate behaviors among students with autism.

Quality of life considerations are essential in planning for individuals with autism and other disabilities (Hurlbutt & Chalmers, 2002; Turnbull & Turnbull, 2001; Ward & Meyer, 2000; Wehmeyer & Schwartz, 1997). Self-management is the goal of many interventions but often not considered or researched in conjunction with aggression and SGDs used as (AAC) for those with ASD and comorbid ID.

Conclusion

Aggression can present as a significant problem behavior in individuals with a diagnosis of developmental disability, including ASD and Intellectual Disability (ID).

Behavioral intervention research has repeatedly demonstrated learning more effective and efficient communication can reduce challenging behaviors such as severe aggression and self-injury. Central to the concept of positive behavior support is the importance of providing effective communication skills and opportunities for choice. The deliberate creation of choice making opportunities encourages socially appropriate power and control. Many with ASD are without an intact communication system, therefore opportunities to make choices and express their needs is limited (Kern et al., 1998) leading to problem behaviors such as aggression. Early intervention using evidence based interventions is critical. The more time it takes for an individual to be given an opportunity to communicate using an AAC system, the more restricted their world becomes.

Autism intervention methods should be effective, practical, and transportable; should lead to substantial collateral gains in multiple areas of development; and should facilitate generalization and spontaneous use of acquired skills (Koegel et al., 1999; Schreibman & Winter, 2003). Effective approaches such as (FCT) that reduce problem behavior while increasing socially acceptable means of communication can offer an individual better opportunities that promote independence, potentially leading to an improved quality of life for the individual and related care providers (Carr et al., 2002).

FCT has been labeled as one of the most effective and commonly used reinforcement based interventions for decreasing challenging behaviors (Carr & Durand, 1985; Hagopian, Contrucci, Kuhn, Long, Rush, 2005; Tiger & Hanley, 2004; Tiger, Hanley, & Heal, 2006; Hanley, Iwata, Thompson, 2001; Fisher, Kuhn, & Thompson, 1998; Fisher et al., 2000; Hagopian, Fisher, Acquisto, & LeBlanc, 1998), yet limited research on effective interventions have been produced when the schedule of reinforcement is thinned, leaving the intervention essentially ineffective in natural environments. Research is

abundant on using AAC to improve communication, resulting in the reduction of challenging behaviors. Yet limited empirical evidence utilizing the iPad as a SGD and effects on challenging behavior is found in the literature. The connection between the lack of communication and challenging behaviors and the significant impact on the quality of life these challenges create is evident. Individuals diagnosed with ASD and ID who exhibit severe aggression and self-injury present with diverse and complex characteristics. Yet, research on effective evidence based interventions to treat this complex disorder has focused on one.

Statement of the Problem

Although individually many factors have been shown to be successful with increasing or decreasing straightforward behavior, a more complex approach may need to be taken to address the complicated nature of non-verbal individuals with autism comorbid with Intellectual Disabilities and related issues such as aggression. Sophisticated combinations of proven strategies need to be generated to address multifaceted behavioral issues experienced by individuals with multilayered challenges. The purpose of this study was to provide answers to the following questions:

- 1.) Will the use of an iPad as an alternative reinforcer decrease self-injury and aggression when reinforcement for communication is unavailable or denied?
- 2.) Will collateral gains in self- management be obtained without direct instruction?

Chapter 3

METHODOLOGY

Background

Emma, a 17 year old classified as autistic with comorbid ID and limited expressive language skills, displays extreme aggressive and self-injurious behavior when reinforcement for requested objects is denied or delayed. Emma's aggression had become so extreme that unless the behavior was significantly reduced and under control, she was likely to be committed to an institution. Prior to the study presented in this paper, Emma's severe aggression and self-injury were occurring 4 out of 5 days a week, 2 events per day, for a total duration of 2 hours out of a 5 hour school day. These behaviors served multiple functions including escape from demands and gaining attention but most occurred when she was denied access to preferred objects and activities. Emma's severe self-injury and aggression involved hitting her head on any hard surface with enough force to break the skin and/or cause damage to the object (i.e., holes in walls were common). Other aggressive behaviors included throwing herself to the ground and repeatedly hitting the back of her head and back against the floor, biting others and herself, pinching, scratching, hair pulling and screaming. Her one-on-one paraeducator and classroom teacher used physical restraint when necessary to keep Emma and others safe. Emma remained in physical restraint until she was calm for 5 seconds and then released.

Preference assessment, iPad training, baseline, intervention, and maintenance sessions were conducted in Emma's classroom with the examiner and her one on one assistant who was assigned to her at all times. Emma did very little with her peers and preferred to stay in her own area with her assigned assistant. Emma sat at the same table most of the day and transitioned only for community outings with her assistant and

examiner although she was free to move around the classroom as she would choose but only did so when looking for a preferred object. Emma's iPad was placed within her visual field at all times and carried by her assistant if Emma moved to other areas.

Prior to the intervention utilized in this study, Functional Communication Training (FCT) using the iPad as a speech generating device had been implemented and resulted in a 10% reduction in aggression and 5% reduction in self-injury from baseline.

Although problem behaviors decreased as a result of FCT, they continued to persist when Emma's communication was not immediately reinforced. Emma was not making any gains towards tolerating delayed or unavailable reinforcement using delay fading as the schedule thinning procedure. Emma, however, was highly motivated to use the iPad and had learned to communicate her preferences, indicate her protests, make choices, answer simple questions, engage in an appropriate activity independently, and for the first time have some control over her environment in a socially acceptable manner. The intervention described in this study aimed to increase Emma's time for tolerating delayed or unavailable reinforcement in the community, specifically a big box store and a grocery store and later the classroom. Social validity was based on the desire of her family to include Emma on family outings which in turn would improve Emma's independence and quality of life.

Participant

As noted earlier, Emma is a 17-year-old female who had been diagnosed with autism at age 3. Emma has attended two private special education day schools for children with ASD and severe behavior disorders after attending preschool and kindergarten in a public school setting. Both private schools Emma attended specialized in the treatment of students with autism and severe behavior disorders however neither program

provided interventions effective in reducing Emma's severe aggression and self-injurious behaviors to manageable levels.

Context

Although going into the community was one of the few activities Emma enjoyed and until recently could do with her family, Emma had not participated in any outings with her school or her family in over a year due to the increasing severity of her aggression and self-injury which had become too difficult to manage in public places. Emma displayed aggression and self-injury anytime she was unable to purchase an item (s) from the store or told it was time to leave before she was ready. In addition, the family was having problems leaving the house when Emma was home because of Emma's desire to go with them.

Experimental Design

A single-subject multiple baseline across settings design examined the effects of using an iPad as an alternative reinforcer on severe aggression and self-injury when reinforcement for communication was delayed or unavailable following FCT. Collateral gains in self-management were also assessed. Pre-treatment sessions were conducted to determine high preference iPad applications and to ensure independent use of the iPad. Baseline, treatment, and maintenance sessions were conducted in a big box store (i.e., Walmart), a grocery store, and the participant's classroom.

Response definition and measurement. Self-injury and aggression are defined as one target behavior because Emma rarely displayed these behaviors in isolation. She typically alternates between both behaviors throughout the duration of the episode. Self-injury and aggression are operationally defined as any attempt or instance of throwing herself on the ground and repeatedly banging her head and back, hitting her head with her knee, her hips with her elbows, biting herself, hitting or kicking others, biting,

scratching with nails, pinching, head butting, grabbing others or their clothes, and/or pulling hair occurring in isolation or in any combination together, lasting at least 5 seconds in duration. Count as a separate occurrence if self-injury and aggression ceased for 2 minutes or more. A stopwatch was used to record the duration of self-injury and aggression in minutes and was converted to seconds in all sessions.

Collateral gains in self-management were assessed during baseline, intervention, and maintenance sessions. Self-management was defined as any instance of Emma reaching for the iPad, pulling the iPad back to her, unlocking, navigating, and choosing a preferred application (i.e, music, videos, educational) on the iPad after reinforcement for communication was denied. Emma needed to demonstrate independence in 5 out of 5 steps to meet the operational definition of self-management. However, a task analysis of the steps required for Emma to independently self-manage her behavior (see Appendix A) was used to record percentage of steps mastered.

Data collection and instrumentation. During the preference assessment sessions the preference assessment implementation guide (see Appendix B) was used as a quick reference for Emma's one on one assistant to record high preference applications on the iPad. Step by step instructions were outlined and reviewed with the paraeducator. The preference assessment recording form (see Appendix C) asked for the title of the applications Emma engaged in and the duration of engagement. A stop watch and the iPad were also used during these sessions. A task analysis of steps required to independently use the iPad (See Appendix D) was used to probe mastery level for each step. All baseline, intervention, and maintenance sessions required the use of the iPad, stopwatch, as well as the self-injury and aggression behavior data recording form (See Appendix E). This form defined the target behavior, if Emma requested an item, the response of the examiner, the presence or absence of aggression, the duration of the

problem behavior, and if self-management was exhibited. A fidelity of implementation recording form (See Appendix F) clearly defined the required components of the intervention with a place for the observer to mark if the required component was demonstrated or absent during the intervention phases of the study.

The social validity questionnaire used in this study was a modified version from the original Treatment Evaluation Inventory-Short Form (TEI-SF) (Kelley, Heffer, Gresham, & Elliott, 1989) (See Appendix G). The questionnaire is a five-point Likert rating scale with nine statements regarding treatment procedures and effectiveness. Emma's family and her one-on-one assistant were asked to rate each statement by *indicating strongly disagree, disagree, neutral, agree, or strongly agree*.

Experimental Procedures

Preference assessment. A stimulus preference assessment was conducted using free operant observation to identify preferred applications (e.g., music, videos, educational) on the iPad for 10 consecutive days prior to baseline and treatment sessions. The preference assessment form was used to record the name of the application and the duration Emma engaged with the application during a period of unrestricted access to the iPad (Cooper et al., 2007). Inclusion criteria were those applications Emma engaged with for 5 minutes or longer and on three or more occasions. All other activities were removed from the iPad.

Baseline. Baseline condition consisted of the participant being denied immediate reinforcement for a requested food, activity, or object across three different settings. In this condition the iPad was used as a communication modality only. Duration of aggression was recorded across all three settings. Problem behaviors were treated with consequence procedures currently in place such as verbal and physical redirection,

response blocking, and physical restraint. Sessions were conducted until a stable baseline was achieved in each setting.

iPad training. A five step task analysis was used to probe independent use of the iPad. These steps included orienting to the iPad, taking the iPad, unlocking the iPad, navigating, and selecting the preferred application. Training sessions were conducted to ensure independent use of the iPad. Training sessions were conducted in the classroom setting then probed for generalization at the grocery store, and finally the big box store. All steps within the task analysis needed to be mastered in each setting. Each session was 15 minutes in duration, three times per day, five days per week. The criterion to mastery was when Emma independently completed all steps within the task analysis on the iPad 80% of trials tested over 5 consecutive sessions in three different settings.

Intervention. The intervention condition was identical to baseline except the participant was given the iPad with preferred applications during delayed or unavailable reinforcement. The participant was verbally directed to choose an activity on the iPad while she waited or was denied access to a requested item. Treatment sessions were first conducted in the big box store, until stable responding occurred, then introduced in the grocery store, and last in the classroom.

Interobserver Agreement

A second observer independently recorded data during 50% of all sessions for the purposes of measuring reliability for aggression and self-management. Percentage of agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. Percent agreement was calculated per session then averaged across all sessions. Reliability for aggression was calculated to be 95% and 90% for self-management.

Implementation Fidelity

Treatment fidelity was assessed using a checklist for each phase of the study. An independent observer recorded data during 33% of the intervention phases. Treatment fidelity measures verified the use of the intervention, which included providing the iPad, prompting the participant to activate the device, and collecting data, during all phases of the study. Data confirmed that all materials were set up and intervention procedures accurately implemented 100% of the time.

Data Analysis

As data were collected, information was entered and graphed in Excel. The graph displayed visual analysis of day-to-day variation in the data set, including the duration of aggression. Data were presented in a line graph. The y-axis, a vertical line on the left-hand side of the graph, was marked as seconds. The x-axis, a horizontal line on the bottom of the graph, was marked as sessions.

During the baseline phase, all data points were entered, and within-phase patterns (e.g., level, trend, and variability) were used to visually analyze the data points to initially determine when to implement the intervention. For the purpose of this study, the phase change line (i.e., a dashed line running vertically) was used to designate the condition when changed from baseline to intervention phase.

Chapter 4

RESULTS AND DISCUSSION

This study examined the effects of using the Apple iPad as an alternative reinforcer on aggression during delayed or unavailable reinforcement following Functional Communication Training and collateral gains in self-management in an adolescent diagnosed with ASD, ID, and severe aggression. This chapter discusses the results of this study and provides a discussion of future applications.

Preference Assessment

A stimulus preference assessment was conducted for 10 consecutive school days to identify highly preferred applications (e.g., music, games, videos) to be used during treatment sessions. Sixteen applications in addition to the camera and TouchChat (Alternative and Augmentative Application) were identified as being highly preferred and remained on the iPad during baseline and treatment sessions. You Tube was identified as Emma's most preferred application. Emma enjoyed watching videos of people going to the grocery store and Walmart after her first trip to each. She also enjoyed listening to music, and watching movie and TV episodes. A YouTube downloader application was used to save videos on the iPad so an internet connection was not needed and she could watch them in any setting. An independent observer was present for 50% of sessions to record implementation.

Implementation fidelity was measured to be 92%.

iPad Training

A five step task analysis was used to probe independent use of the iPad across three settings. Emma was probed the last three days of the preference assessment. Three probes were conducted within the classroom and three probes were conducted while riding in a car, two at the grocery store and one probe at the big box store. Emma

mastered 5 out of 5 steps on the task analysis in all environments. The iPad was kept within Emma’s visual field and accessible during all phases of the study. Emma was not expected or taught to carry and transition with her iPad. Either the researcher or her one-on-one assistant carried it for her when she was transitioning (e.g., from the classroom to the car) and shown where she could locate the machine if needed.

Settings

The effects of using an iPad as an alternative reinforcer when the requested reinforcer is delayed or unavailable were evaluated using a multiple baseline across settings design. Data analysis revealed a functional relationship between the intervention and the duration of aggression in all settings (i.e., Walmart, Grocery Store, and Classroom) for Emma. Figure 1 displays the results of using of an iPad as an alternative reinforcer on the duration of self-injury and aggression across three settings Walmart, Fry’s Grocery Store, and Emma’s classroom.

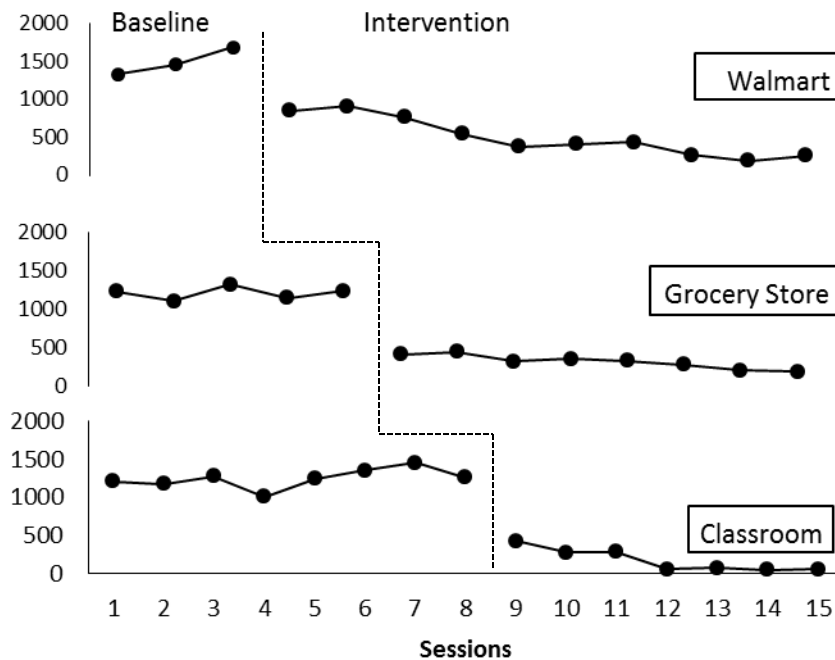


Figure 1. The effects of using an iPad as an alternative reinforcer when reinforcement for communication is delayed or unavailable on the duration of self-injury and aggression across three settings during baseline, intervention, and maintenance sessions.

Walmart. Walmart Supercenter was the big box store setting chosen for the first implementation of the intervention. Emma's family chose this location because they shop there frequently and would like to include Emma. Emma had not been to Walmart for over a year due to her excessive and inappropriate behaviors. On previous trips with her family, Emma enjoyed walking around and taking items to look at while she carried them to a different area and then would repeat the behaviors. On every trip, Emma wanted to leave the store with a few chosen items. On the rare occasion Emma was denied her chosen items or asked to leave before she was ready, she became physically aggressive with episodes lasting up to an hour. During all sessions, prior to going to Walmart, Emma was presented with a choice of two categories and asked to pick one. These categories included Toys, Books, Videos, Coloring (e.g., markers and paper). These same choices were used through the duration of the study. Emma was required to pick the category of the item from two choices. This request was to prevent her from wandering around the store. Once she chose the category she was given a visual to carry. Upon entering the store, the researcher reminded Emma of what she had chosen and where they needed to go to look for it. Once in the designated area, Emma was given 20 minutes to choose an object. Two verbal warnings, one at 5 minutes and then a count-down from 3 were given to be consistent with what her family previously used with Emma.

Baseline. The one on one assistant and the researcher were the only two adults present on all outings with Emma. Upon entering Walmart, Emma was given the picture of her chosen item to buy and then was guided by the researcher to find that area. Emma willingly went to the designated toy area. When it was time to leave, Emma was holding three toys she wanted to have. Emma was directed to put two of them back because she was only able to buy one toy. The researcher waited 3 seconds for Emma to

comply before she started to take the objects from Emma and put them away. Returning two toys resulted in Emma becoming aggressive 100% of the time. The duration of aggression was 22 minutes and 8 seconds on the first trip. The second trip to Walmart, Emma was denied access to a different area of the store than the one on her list. This decision resulted with Emma becoming aggressive for 24 minutes and 13 seconds, and in the final trip during baseline, Emma's aggression was 28 minutes and 4 seconds after being denied access for multiple toys. Emma's problem behavior was a combination of self-injury and aggression alternating between the two throughout the duration. The researcher and paraeducator kept Emma safe by putting her helmet on and trying to keep her in one area away from others. Although Emma could see the iPad she did not attempt to reach for it or use it in any way nor was the iPad given or shown to her while she displayed aggressive behaviors. Emma eventually calmed down on her own and willingly left the store. Once back in the car, Emma was given her iPad to use.

Intervention. An increase in aggression occurred by the third baseline session at Walmart, therefore this setting was the first chosen to implement the intervention. Baseline sessions continued in the grocery store and classroom while the intervention was implemented only at Walmart. The multiple baseline across settings design requires the intervention be implemented in one setting while baseline sessions continue in the other settings. All procedures remained the same across the baseline condition in the three settings; once baseline had been established the intervention was implemented when Emma was denied access to a requested reinforcer. The intervention, providing Emma an alternative reinforcer (e.g., the iPad with highly preferred applications), after she was denied access to a desired toy, Emma was told she could choose something on her iPad. The researcher unlocked the iPad and had the screen on so Emma could view preferred applications. The researcher held the iPad in front of Emma and then removed

the iPad for 3 second intervals until Emma either took the iPad or calmed down on her own. Emma took the iPad 100% of the time and engaged with preferred applications. Aggression significantly decreased to 14 minutes and 8 seconds when the intervention was first introduced. A 49% reduction in self-injury and aggression from baseline was documented when the intervention was implemented. Emma's self-injury and aggression remained low throughout the duration of the intervention with the lowest duration on session twelve for 3 minutes and 7 seconds.

Grocery Store. Baseline and intervention sessions were conducted at a local grocery store. The grocery store chain frequented by the family was selected for this study. The same grocery store location was used for all sessions throughout the duration of the study. The grocery store was a large chain with no prior arrangements or accommodations made with management. Sessions took place during normal business hours so at times the store was very busy with other shoppers. Prior to going to the store, the same procedure of making a list was used, telling Emma about the outing the day before, and giving her transition predictions prior to going to the store. Only food and drinks were choices were presented for the grocery store. Emma's paraeducator and the researcher were present for all sessions with an independent observer present 50% of sessions to record treatment fidelity and interobserver agreement.

Baseline. The one on one assistant and the researcher were the only two adults present on all outings to the grocery store during baseline with Emma. Emma was given a choice of food or drink which determined the area of the store visited. Emma typically chose and willingly went to a snack from that area in the store. In the grocery store, Emma would only pick one food choice, but then find items she wanted on her way out, usually by the check-out counter. Emma was directed to put them back and the same procedure was used as in Walmart. The researcher waited 3 seconds for Emma to comply

before she started to take the objects from Emma and put them away. Denial of snacks resulted in Emma displaying self-injurious and aggressive behaviors 100% of the time, lasting 20 minutes 32 seconds, 18 minutes 28 and seconds, 22 minutes and 6 seconds, 19 minutes and 8 seconds, 20 minutes 40 s, and 20m and 40 seconds. Although the iPad was accessible and visible Emma did not attempt to use the iPad to assist in calming herself down. The researcher had the iPad on her shoulder and although Emma could see the iPad she did not attempt to reach for or use the iPad.

Intervention. The grocery store was the second setting chosen for the intervention. This setting was chosen after Walmart because the duration of self-injury and aggression was higher in stores than in the classroom plus the parents had a greater need for control in public than in the classroom. The introduction of the iPad as the alternative reinforcer was implemented after the 5th baseline session. The duration of self-injury and aggression decreased from 20 minutes and 40seconds during the last baseline session to 6 minutes and 54 seconds during the initial intervention session, yielding a 66% reduction once the intervention was implemented. Emma's self-injury and aggression continued to decrease throughout the remaining sessions from 6 minutes and 54seconds to 3 minutes and 6 seconds.

Classroom. Sessions were conducted in Emma's classroom with the researcher and her one on one assistant present. Emma typically did not interact and does very little with her peers and preferred to stay in her own area with her assigned assistant. Emma sat at the same table most of the day and transitioned only for community outings with her assistant and researcher. She was free to move around the classroom yet does so only when looking for a preferred object. Emma's iPad was placed within her visual field at all times and carried by her assistant when she moved to other areas.

Baseline. During Baseline sessions, the researcher and Emma's one-on-one assistant were present. Sessions took place at times when Emma was permitted to get items from different rooms. Within the classroom, Emma has access to objects such as CD's, Rainbow Pegs, markers, farm animals, colored bowls which Emma routinely requested. When Emma was unable to immediately use the requested objects and told she needed to wait, self-injury and aggression resulted 100% of the time. The duration of the target behavior ranged from 20 minutes and 10 seconds during the first session to 24 minutes and 16 seconds the second to last session. Emma's self-injury and aggression were significantly decreased at Walmart after five treatment sessions and the Grocery Store after three treatment sessions. Although Emma was having success in the other environments, she continued to display self-injury and aggression lasting 20 minutes and 54 seconds. The researcher held the iPad for Emma the same as in the other two settings; Emma could see her iPad, however the examiner did not provide visual and verbal cues to use the iPad.

Intervention. The third setting chosen was the classroom which was less of a safety risk as well as the fact that continued baselines were easier to control. After steady responding was achieved in setting 2 the intervention was implemented in setting 3, the classroom. Aggression significantly decreased to 55 s and 75 s during sessions 12 and 13. Additionally, Emma started to demonstrate self-management skills by independently reaching for the iPad and engaging in a preferred activity during delayed or unavailable reinforcement.

Self-Management

In this study, self-management was defined as any instance of Emma reaching for the iPad, pulling the iPad back to her, unlocking, navigating, choosing, and engaging in a preferred activity (i.e, music, videos, educational) on the iPad during delayed

reinforcement or being denied access to a preferred object or activity. A task analysis was used to measure mastery level and recorded as percentage of steps mastered. Although Emma made progress in the mastering steps towards self-management, she needed to complete all six steps to meet the criteria for self-management. Emma demonstrated self-management by completing the required steps on the task analysis during the last two intervention sessions in setting three, the classroom.

Maintenance

Maintenance sessions were conducted in the classroom for three sessions one week post-intervention. Emma maintained low rates of aggression as the teacher and paraeducator continued to use the iPad as an alternative reinforcer during delays of reinforcement or when reinforcement was unavailable. Maintenance sessions were discontinued due to Emma's iPad breaking with a subsequent 3 month delay for repairs.

Post-Hoc Analysis

Eight months after the study ended, the examiner went to visit Emma at home and took her to Walmart. Emma independently carried her iPad until she gave it to her sister while she looked around. After the intervention, Emma continued to choose multiple items when she went to the store; however family reported not needing to purchase items for fear of her having a behavior. When it was time to leave Emma started to get upset, so her sister gave her the iPad and she immediately reached for it, pulled it to her, unlocked and navigated her iPad. Emma's mother and sister report her independently reaching for the iPad after being told it was time to leave the store. Typically they hand her the iPad as they take the items from her to put back on the shelves. Emma's family continues to use the iPad as an alternative reinforcer and have taken her to a few other places.

Social Validity

Emma's family and one-on-one assistant were given a copy of a social validity questionnaire one week after the intervention was terminated due to Emma's iPad breaking. The family and paraprofessional found the intervention very beneficial, easy to implement, and continue to use strategies from the intervention months later.

Discussion

The purpose of the current research was to evaluate the effects of using an Apple iPad as an alternative reinforcer on severe aggression when reinforcement for communication is delayed or unavailable during FCT in an adolescent with ASD, ID, and severe aggression. Results of this study support the research on FCT as an effective intervention for individuals with severe problem behaviors (Hagopian et al., 1998; Carr & Durand, 1985; Fisher et al., 1993) and the use of AAC decreases severe problem behaviors (Carr & Durand, 1985; Durand & Carr, 1992; Dunlap, Robbins & Kern, 1994; Koegel & Koegel, 1996). During FCT, Emma's severe aggression and self-injury were reduced when she received immediate reinforcement for all communication using the iPad as a speech generating device. Although Emma learned to use the iPad as a speech generating device and was able to communicate her wants to others, she continued to struggle when reinforcement was delayed or unavailable.

Delayed or unavailable reinforcement is a major challenge to the application of FCT in natural environments such as classrooms and community settings. Functional communication training uses continuous reinforcement for appropriate communication. Providing continuous reinforcement is not sustainable in natural environments making FCT difficult to implement unless in a clinic or one on one setting. In the situation with Emma, the researcher and her one-on-one assistant were unable to provide continuous

reinforcement for communication and any time Emma was denied reinforcement she became aggressive. She was making little to no progress with thinning the schedule of reinforcement and facing possible institutionalization.

Research is limited on effective ways to facilitate tolerance to delayed or denied reinforcement when traditional schedule thinning methods are ineffective. Two studies appear in the literature at this time; one discusses the use of an alternative work activity (Hagopian, Boelter, & Jarmolowicz, 2011) and the other more recent study reports results of the use of an alternative reinforcer (Rooker et al., 2013). Rooker et al. (2013) extends the research by using an alternative reinforcer in conjunction with FCT to facilitate delayed or denied reinforcement. Although Emma's aggression decreased overall, she continued to display aggression when her communication using the iPad was not reinforced. This limitation inhibits maintenance and generalization making sustainability of appropriate behavior difficult. Research has started to address this limitation by examining FCT when used in combination with alternative reinforcement (Rooker et al., 2013).

The results of this study extend and support the findings from Rooker et al., (2013) and Hagopian et al. (2011), concluding that FCT when used in combination with alternative reinforcement is effective in reducing and maintaining low levels of problem behavior when schedule thinning is unsuccessful. The results of this study demonstrate using an iPad as an alternative reinforcer was effective in decreasing aggressive behaviors when requested reinforcement was delayed or unavailable following FCT. During baseline, the duration of aggression averaged 1487s (25 m), 1185s (20 m), and 1247s (21 m) in Walmart, a grocery store, and the classroom, respectively. In treatment, the average duration of aggression dropped to 526 s (9 m) for a 64% decrease in aggression from baseline, 300s (5 m) for a 74% decrease, and 235s (4 m) for an 81%

decrease in aggression in Walmart, a grocery store, and classroom. Emma engaged in aggression 100% of the time when denied access to objects she had requested in all three settings, however the duration of the problem behavior significantly decreased during treatment. Aggression remained low during maintenance sessions and eight months later. Additionally, Emma started to demonstrate the ability to self-manage her behavior by independently reaching for her iPad when denied access to a requested object.

The results of this study are significant because of the

- Limited research on interventions with the adolescent population, specifically those with severe autism and comorbid ID and extreme aggression, the
- Need for research on studies conducted in natural environments
- Collateral gains in self-management, and
- Lack of research on maintaining low levels of problem behavior when reinforcement for requested objects is denied or delayed when thinning the schedule of reinforcement
- Emerging literature on using the iPad as a SGD, educational tool, and to reinforce a desired behavior

Emma was 17 years old by the time she received appropriate educational and behavioral programming. Parents report this was the first time in many years Emma made progress at school and they felt like someone besides them understood their daughter. Prior to treatment, Emma's extreme physical aggression significantly impacted her family, her education, and her independence. Emma spent the majority of her day in one room with her one-on-one assistant and half of the day displaying severe aggression and self-injury. More restrictive residential placements were being considered due to the difficulty in finding staff to work with her. She continued to display high rates of aggression and self-injury when she was denied access to objects she

requested using her iPad. FCT is effective at reducing problem behaviors because the target behavior (i.e., using the iPad as a SGD) is continuously reinforced until a designated criterion is met. This can be problematic as the individual comes to expect the requested items and is unable to tolerate times when requested objects are unavailable.

As a result of the intervention, Emma was able to remain in her current school placement as her episodes of self-injury and aggression continue to be manageable, even though not diminished completely. Emma continues to use her iPad to communicate, record videos, and self-manage her own behaviors. She goes on outings to the store and Walmart and continues to use her iPad to improve her quality of life and independence.

Chapter 5

IMPLICATIONS

Over the past two decades, a wide range of behavioral and developmental interventions have been designed and implemented to improve the various symptoms associated with ASD. Without appropriate interventions, the resulting deficits in social understanding, basic functional communication skills, and appropriate social behavior can limit the educational progress of children with ASD (National Research Council, 2001).

Positive Behavior Support is an applied science that focuses on the use of proactive and instructional, educational methods to promote socially desirable behavior for the purpose of improving an individual's life (Carr et al., 2002). Functional communication training is a PBS method effective for reducing problem behavior and increasing socially acceptable replacement behaviors. However, the application of FCT in natural environments has proven to be ineffective at maintaining low levels of problem behavior and high rates of communication. The use of continuous reinforcement makes FCT the most effective procedure in the literature for reducing problem behaviors. Unfortunately, the use of continuous reinforcement is not realistic or sustainable in natural settings. Schedule thinning procedures have been used to address this issue in a few studies with mixed success, therefore most studies on FCT don't mention the issue. This is a problem, a problem for the teachers and parents who look to research to find evidence based treatments they can easily implement and use to create a positive change for those they are trying to teach. At first glance, FCT is one of those treatments. However, with limited research on effective ways to address tolerance to unavailable or delayed reinforcement common in the natural environment, FCT is not a viable treatment in applied settings.

Over the last few years researchers have started to focus on identifying methods for building for maintenance over time and across settings while thinning the schedule of reinforcement. Unfortunately, most researchers that have attempted to do this have conducted such studies in analogue settings or added a punishment component to get clinically significant results (Bambara & Kern, 2005). There is a critical need for studies assessing the implementation of FCT and methods for increasing tolerance to delays to reinforcement in natural settings.

The purpose of this study was to advance the utility of FCT in the natural setting without the use of punishment. The use of punishment may be effective in treating severe behavior problems resistive to reinforcement procedures; yet is unethical and prohibited in most classrooms. Teaching tolerance to delayed or denied reinforcement is a common challenge for many teachers and parents; yet research is limited on effective treatments. The aim of the present study was to design an intervention absent of punishment, effective at reducing and maintaining low levels of problem behavior. Research on using an alternative reinforcer to facilitate tolerance to delayed or denied reinforcement is new yet promising when used in conjunction with FCT.

The results of this study demonstrate the use of an alternative reinforcer was effective at reducing severe self-injury and aggression as well as maintaining low levels of problem behaviors when reinforcement was delayed or denied. The use of an alternative reinforcer to increase tolerance to delayed reinforcement is a simple concept; therefore requiring little time and resources for parents and teachers to implement.

The iPad with highly preferred applications was chosen as the alternative reinforcer for this intervention. The iPad was chosen because Emma was already using it as a speech-generating device and had started to independently engage in some of the applications. Many individuals with ASD have demonstrated skills and interests never

seen before they started using an iPad. The iPad is used as a speech-generating device for many with ASD, yet can also be used in educational and home programs as reinforcement. This study demonstrates the versatility of the iPad and gives parents and teachers an additional strategy to address problem behaviors.

Limitations

The single case study was conducted with one participant in three different environments, affecting the generalizability of the results. The participant in this study was 17 years old with severe ASD, ID, as well as self-injury and aggression. She uses an iPad as a SGD and made progress using her iPad to request preferred items; yet she continued to display severe self-injury and aggression when reinforcement for requested items was not immediate. Individuals with ASD and ID who exhibit significant communication deficits are at an increased risk for challenging behaviors if they are not provided an AAC system to assist them in expressing their needs to others. Emma did not receive an AAC system until she was 16 years old.

Functional communication training, using the iPad as a SGD reduced Emma's aggression and self-injury, supporting the well-established literature on the effects of AAC on problem behaviors. The severity of Emma's aggression, her age, and diagnosis in addition to being the only participant contribute to the lack of generalization to other populations not similar to Emma. Replication of the study with individuals who are similar to Emma in age, severity of behavior, and diagnosis would strengthen the validity of the research demonstrating the effects of the intervention on adolescents with severe ASD, ID, and extreme challenging behaviors.

One significant limitation of this study was the lack of planning if the device broke and is inoperable until repaired. Unfortunately, Emma's iPad broke and was out for repair through the end of the school year. Emma's mother purchased a nook and the school

provided a kindle. She was provided photographs similar to the ones on her iPad to continue with communication progress. The examiner and one-on-one assistant continued to take Emma on outings to Fry's and Walmart using the schools kindle with preferred videos and problem behaviors remained low. Fry's average duration was 3 minutes and Walmart was 4 minutes. More time was needed to specifically track for self-management since Emma started making gains in self-management the last two sessions in the classroom.

Future Research

There is a need for effective interventions for adolescents since most research in the literature focuses on children and school age, even with the large population of adolescents with ASD, ID, and challenging behaviors. Many adolescents similar to Emma were born and diagnosed before the push for early intervention and have never been provided with effective educational and behavioral programming. Other adolescents, unlike Emma, were not given a last chance before being placed in a residential facility or institution.

Research needs to be conducted in natural environments such as the classroom and/or community setting. FCT has been in the literature and labeled an one of the most common and effective treatments for problem behavior since 1985; yet it has taken 20 years to reveal the effectiveness of the intervention is limited to controlled environments and the use of continuous reinforcement. The following can be applied to the literature

- Functional Communication Training is effective when used with continuous reinforcement
- Thinning the schedule of reinforcement using procedures currently in the literature such as delay fading is not effective alone to maintain low levels of

problem behavior. A punishment procedure needs to be used to maintain treatment levels.

- Supplemental components such as using an alternative reinforcer combined with FCT can enhance FCT during times when reinforcement is delayed or unavailable.

The results of this study further support the limited and new research on interventions to facilitate the application of FCT in natural environments by addressing the challenge of delayed or denied reinforcement for appropriate communication. This study aimed to examine the effects of using an alternative reinforcer on self-injury and aggression when reinforcement for communication is delayed or unavailable. The iPad was chosen as the alternative reinforcer due to many iPad applications being highly preferred by the participant, versatility as a SGD, portability, and ease of implementation. The results of this study support previous findings indicating the use of an alternative reinforcer was effective at reducing severe self-injury and aggression when reinforcement for communication was delayed or unavailable across three settings. This intervention was effective and relatively easy to implement in natural environments making the intervention applicable for teachers and parents.

References

- American Psychiatric Association. (2002). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington D.C., American Psychiatric Association
- Bambara, L. M., & Kern, L. (2005). *Individualized supports for students with problem behaviors: Designing positive behavior support plans*. New York: Guilford Press.
- Braithwaite, K. L., Richdale, A. L. (2000). Functional communication training to replace challenging behaviors across two behavioral outcomes. *Behavioral Interventions, 15*, 21-36.
- Brooks, A., Tood, A. W., Tofflemoyer, S., & Horner, R. H. (2003). Use of functional assessment and a self-management system to increase academic engagement and work completion. *Journal of Positive Behavior Interventions, 5*, 144-152.
- Borrero, C. S. W., Vollmer, T. R., & Borrero, J. C. (2004). Combining descriptive and functional analysis logic to evaluate idiosyncratic variables maintaining aggression. *Behavioral Interventions, 19*, 247–262.
- Borrero, C. S. W., & Vollmer, T. R. (2006). Experimental analysis and treatment of multiply controlled problem behavior: A systematic replication and extension. *Journal of Applied Behavior Analysis, 39*, 375–379.
- Brosnan, J. & Healy, O. (2011). A review of behavioral interventions for the treatment of aggression in individuals with developmental disabilities. *Research in Developmental Disabilities, 32*, 437-446.
- Browder, D. M. & Shapiro, E. S. (1985). Applications of self-management to individuals with severe handicaps: A review. *Journal of the Association for Persons with Severe Handicaps, 10*, 200-208.
- Carr, E. G., Crighton, C. D., & Binkoff, J. A. (1980). Escape as a factor in the aggressive behavior of two retarded children. *Journal of Applied Behavior Analysis, 13*, 101– 117.
- Carr, E. G., & Durand, V. M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis, 18*, 111–126.
- Carr E. G., Dunlap G., Horner, R. H., Koegel, R. L., Turnbull, A. P., Sailor, W. (2002). Positive Behavior Support: Evolution of an Applied Science. *Journal of Positive Behavior Interventions, 4*, 4-16.
- Center for Disease Control. (2012). Prevalence of Autism Spectrum Disorders: Autism
- DeLeon, I., Fisher, W. W., Herman, K. M., & Crosland, K. C. (2000). Assessment of a response bias for aggression over functionally equivalent appropriate behavior. *Journal of Applied Behavior Analysis, 33*, 73–77.

- de Zubicaray, G., & Clair, A. (1998). An evaluation of differential reinforcement of other behavior, differential reinforcement of incompatible behavior, and restitution for time management of aggressive behaviors. *Behavioral Interventions, 13*, 157–168.
- Dickerson, E. A., & Creedon, C. F. (1981). Self-selection of standards by children: the relative effectiveness of pupil-selected and teacher-selected standards of performance. *Journal of Applied Behavior Analysis, 14*, 425-433.
- Duncan, D., Matson, J. L., Bamburg, J. W., Cherry, K. E., & Buckley, T. (1999). The relationship of self-injurious behavior and aggression to social skills in persons with severe and profound learning disability. *Research in Developmental Disabilities, 20*, 441–448.
- Dunlap, G., Kern-Dunlap, L., Clarke, S., & Robbins, F. R. (1994). Some characteristics of nonaversive intervention for severe behavior problems. In E. Schopler & G. B. Mesibov (Eds.), *Behavioral issues in autism* (pp. 227–245). New York: Plenum Press.
- Durand, V. M. (1999). Functional communication training using assistive devices: recruiting natural communities of reinforcement. *Journal of Applied Behavior Analysis, 32*, 247-267
- Durand, V. M., & Carr, E. G. (1992). An analysis of maintenance following functional communication training. *Journal of Applied Behavior Analysis, 25*, 777-794.
- Durand, V. M. & Merges, E. (2001). Functional communication training: a contemporary behavior analytic intervention for problem behaviors. *Focus on Autism and Other Developmental Disabilities, 16* (2), 110-119.
- Farmer, C. A., & Aman, M. G. (2011). Aggressive behavior in a sample of children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 1*, 317–323.
- Fischer, S. M., Iwata, B. A., & Mazaleski, J. L. (1997). Noncontingent delivery of arbitrary reinforcers as treatment for self-injurious behavior. *Journal of Applied Behavior Analysis, 30*, 239-24
- Fisher, W. W., DeLeon, I. G., Rodriguez-Catter, V., & Keeney, K. M. (2004). Enhancing the effects of extinction on attention-maintained behavior through noncontingent delivery of attention or stimuli identified via a competing stimulus assessment. *Journal of Applied Behavior Analysis, 37*, 171–184.
- Fisher, W. W., Kuhn, D. E., & Thompson, R. H. (1998). Establishing discriminative control of responding using functional and alternative reinforcers during functional communication training. *Journal of Applied Behavior Analysis, 31*, 543–560.

- Fisher, W. W., O'Connor, J. T., Kurtz, P. F., DeLeon, I. G., & Gotjen, D. L. (2000). The effects of noncontingent delivery of high- and low-preference stimuli on attention-maintained destructive behavior. *Journal of Applied Behavior Analysis*, *33*, 79–83
- Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1993). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis*, *25*, 491–49.
- Fisher, W. W., Thompson, R. H., Hagopian, L. P., Bowman, L. G., & Krug, A. (2000). Facilitating tolerance of delayed reinforcement during functional communication training. *Behavior Modification*, *24*, 3–29.
- Fox, L., Dunlap, G., & Buschbacher, P. (2000). Understanding and intervening with children's interfering behavior: A comprehensive approach. In A. M. Wetherby & B. M. Prizant (Eds.), *Autism spectrum disorders: A transactional developmental perspective, Volume 9* (pp. 307-332). Baltimore: Brookes Publishing Company.
- Foxx, R. M., & Meindl, J. (2007). The long-term successful treatment of the aggressive/destructive behaviors of a pre-adolescent with autism. *Behavioral Interventions*, *22*, 83–97.
- Freeman, M. (1994). The differential impact on carers dealing with challenging behaviours. *Journal of Community and Applied Social Psychology*, *4*, 181–187.
- Fullerton, A. (1995). Promoting self-determination for adolescents and young adults with autism. *Journal of Vocational Rehabilitation*, *5*, 337–346.
- Goldsmith, T. R., & LeBlanc, L. A. (2004). Use of technology in interventions for children with autism. *Journal of Early and Intensive Behavior Intervention*, *1*, 166
- Goldstein, G., Beers, S. R., Siegel, D. J., & Minshew, N. J. (2001). A comparison of WAIS-R profiles in adults with high-functioning autism or differing subtypes of learning disability. *Applied Neuropsychology*, *8*(3), 148-154.
- Hagopian, L. P., Fisher, W. W., Sullivan, M. T., Acquisti, J., & LeBlanc, L. A. (1998). Effectiveness of functional communication training with and without extinction and punishment: A summary of 21 inpatient cases. *Journal of Applied Behavior Analysis*, *31*, 211–235.
- Hagopian, L. P., Crockett, J. L., van Stone, M., DeLeon, I. G., & Bowman, L. G. (2000). Effects of noncontingent reinforcement on problem behavior and stimulus engagement: The role of satiation, extinction, and alternative reinforcement. *Journal of Applied Behavior Analysis*, *33*, 433-445.
- Hagopian, L.P., Contrucci Kuhn, S. A., Long, E. S., & Rush, K. S. (2005). Schedule thinning following communication training: Using competing stimuli to enhance tolerance to decrements in reinforcement density. *Journal of Applied Behavior Analysis*, *38*(2), 177-193.

- Hagopian, L. P., Boelter, E. W., & Jarmolowicz, D. P. (2011). Reinforcement Schedule Thinning Following Functional Communication Training: Review and Recommendations. *Behavior Analysis in Practice, 4*(1), 4-16.
- Hagopian, L. P., Toole, L. M., Long, E. S., Bowman, L. G., & Lieving, G. A. (2004). A comparison of dense-to-lean and fixed lean schedules of alternative reinforcement and extinction. *Journal of Applied Behavior Analysis, 37*, 323–337.
- Hagopian, L. P., Wilson, D. M., & Wilder, D. A. (2001). Assessment and treatment of problem behavior maintained by escape from attention and access to tangible items. *Journal of Applied Behavior Analysis, 34*, 229-232.
- Hanley, G.P., Iwata, B.A., & Thompson, R.H. (2001). Reinforcement schedule thinning following treatment with functional communication training. *Journal of Applied Behavior Analysis, 34*(1), 17-31.
- Hanley, G. P., Piazza, C. C., & Fisher, W. W. (1997). Noncontingent presentation of attention and alternative stimuli in the treatment of attention-maintained destructive behavior. *Journal of Applied Behavior Analysis, 30*, 229-237.
- Hastings, R. P., & Brown, T. (2002). Coping strategies and the impact of challenging behaviors on special educators' burnout. *Mental Retardation, 40*, 148–156.
- Hill, J., & Furnis, F. (2006). Patterns of emotional and behavioral disturbance with autistic trait in young people with severe intellectual disabilities and challenging behaviors. *Research in Developmental Disabilities, 27*, 517–528.
- Holden, B., & Gitleson, J. P. (2006). A total population study of challenging behavior in the county of Hemarck, Norway: Prevalence and risk factors. *Research in Developmental Disabilities, 27*, 456–465.
- Horner, R. H., Day, H. M., Sprague, J. R., O'Brien, M., & Heathfield, L. T. (1991). Interspersed requests: A non-aversive procedure for reducing aggression and self-injury during instruction. *Journal of Applied Behavior Analysis, 24*, 265–278.
- Hudson, C., & Chan, J. (2002). Individuals with intellectual disability and mental illness: A literature review. *Australian Journal of Social Issues, 37*(1), 31–49.
- Hurlbutt, K., & Chalmers, L. (2002). Adults with autism speak out: Perceptions of their life experiences. *Focus on Autism and Other Developmental Disabilities, 17*, 103–111
- Jacobson, J. W., & Ackerman, L. J. (1993). Who is treated using restrictive behavioral procedures? A population perspective. *Research in Developmental Disabilities, 14*, 51–65.
- Jenkins, R., Rose, J., & Lovell, C. (1997). Psychological well-being of staff working with people who have challenging behaviour. *Journal of Intellectual Disability Research, 41*, 502–511.

- Kagohara, D.M., van der Meer L, Ramdoss, S., O'Reilly, M.F., Lancioni, G.E., Davis, T.N., Rispoli, M., Lang, R., Marschik, P.B., Sutherland, D., Green, V. A., & Sigafoos, J. (2013). Using iPods and iPads in teaching programs for individuals with developmental disabilities: a systematic review. *Research in Developmental Disabilities, 34*, 147-156.
- Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child 2*, 217-250 (1943)
- Kelley, D., Lerman, D. C., & Van Camp, C. M. (2002). The effects of competing reinforcement schedules on the acquisition of functional communication. *Journal of Applied Behavior Analysis, 35*, 59-63
- Kern, L., Vorndran, C. M., Hilt, A., Ringdahl, J. E., Adelman, B. E., & Dunlap, G. (1998). Choice as an intervention to improve behavior: A review of the literature. *Journal of Behavioral Education, 8*, 151-169.
- Koegel, L. K., Harrower, J. K. & Koegel, R. L. (1999). Support for children with developmental disabilities in full inclusion classrooms through self-management. *Journal of Positive Behavior Intervention, 1*, 26-34.
- Kurtz, P.F., Boelter, E.W., Jarmolowicz, D.P., Chin, M.D., & Hagopian, L.P. (2011). An analysis of functional communication training as an empirically supported treatment for problem behavior displayed by individuals with intellectual disabilities. *Research in Developmental Disabilities, 32* (6), 2935-2942.
- Kurtz, P. F., Chin, M. D., Huete, J. M., Tarbox, R. S. F., O'Connor, J. T., Paclawskyj, T. R., & Rush, K. S. (2003). Functional analysis and treatment of self-injurious behavior in young children: A summary of 30 cases. *Journal of Applied Behavior Analysis, 36*, 205-219.
- Lalli, J. S., Casey, S., & Kates, K. (1995). Reducing escape behavior and increasing task completion with functional communication training, extinction, and response chaining. *Journal of Applied Behavior Analysis, 28*, 261-268.
- Lancioni, G.E., O'Reilly, M.F., Cuvo, A.J., Singh, N.N., Sigafoos, J., Didden, R. (2007). PECS and VOCA to enable students with developmental disabilities to make requests: An Overview of the literature. *Research in Developmental Disabilities, 28*, 468-488
- Lawson, D. A., & O'Brien, R. M. (1994). Behavioral and self-report measures of burnout in developmental disabilities. *Journal of Organizational Behavior Management, 14*, 37-54.
- LeBlanc, L. A., Hagopian, L. P., Marhefka, J. M., & Wilke, A. E. (2001). Effects of therapist gender and type of attention on assessment and treatment of attention-maintained destructive behavior. *Behavioral Interventions, 16*, 39-57.

- Lee, S., Simpson, R. L., & Shogren, K. A. (2007). Effects and implications of self-management for students with autism: A meta-analysis. *Focus on Autism and Other Developmental Disabilities, 22*, 2–13.
- Lowe, K., Allen, D., Jones, E., Brophy, S., Moore, K., & James, W. (2007). Challenging behaviours: Prevalence and topographies. *Journal of Intellectual Disability Research, 51*, 625–636.
- Mancil, G. R. (2006). Functional communication training: a review of the literature related to children with autism. *Education and Training in Developmental Disabilities, 41*(3), 213–224.
- Matson, J. L., & Shoemaker, M. (2009). Intellectual disability and its relationship to autism spectrum disorders. *Research in Developmental Disabilities, 30*, 1107– 1114.
- McClintock, K., Hall, S., & Oliver, C. (2003). Risk Markers associated with challenging behaviors in people with intellectual disabilities: A meta-analytic study. *Journal of Intellectual Disability Research, 47*, 405–416.
- Mirenda, P. (2001). Autism, augmentative communication, and assistive technology: What do we really know? *Focus on Autism and Other Developmental Disabilities, 16*, 141–151.
- Moss, S., Emerson, E., Kiernan, C., Turner, S., Hatton, C., & Alboroz, A. (2000). Psychiatric symptoms in adults with learning disability and challenging behavior. *British Journal of Psychiatry, 177*, 452–456.
- Murphy, O., Healy, O., & Leader, G. (2009). Risk factors for challenging behaviour for children with autism spectrum disorder in Ireland. *Research in Autism Spectrum Disorders, 3*, 474- 482.
- Neely, L., Rispoli, M., Camargo, S., Davis, H., & Boles, M. (2013). The effect of instructional use of an iPad on challenging behavior and academic engagement for two students with autism. *Research in Autism Spectrum Disorders, 7*, 509–516.
- Office of Special Education Programs (2007). [IDEA Part B data]. Students ages 6 through 21 served under IDEA, Part B, by disability category and state: Fall 2007. Retrieved from www.ideadata.org.
- Rispoli, M.J., Franco, J.H., van der Meer L., Lang, R., & Camargo, S.P. (2010). The use of speech generating devices in communication interventions for individuals with developmental disabilities: a review of the literature. *Developmental Neurorehabilitation, 13* (4), 276–293.
- Roane, H. S., Fisher, W. W., Sgro, G. M., Falcomata, T. S., & Pabico, R. R. (2004). An alternative method of thinning reinforcer delivery during differential reinforcement. *Journal of Applied Behavior Analysis, 37*, 213–218.

- Rooker, G. W., Jessel, J., Kurtz, P.F., & Hagopian, L. P. (2013). Functional communication training with and without alternative reinforcement and punishment: An analysis of 58 applications. *Journal of Applied Behavior Analysis, 46*, 708-722.
- Schlosser, R. W., & Blischak, D. M. (2001). Is there a role for speech output in interventions for persons with autism? *Focus on Autism and Other Developmental Disabilities, 16*, 170-178.
- Schloss, P. J., & Smith, M. A. (1994). Applied behavior analysis in the classroom. Boston: Allyn and Bacon
- Schreibman, L., & Winter, J. (2003). Behavioral intervention therapies. *The Exceptional Parent, 33*, 64-69, 71.
- Sennott, S., & Bowker, A. (2009). Autism, AAC, and Proloquo2Go. *Perspectives on Augmentative and Alternative Communication, 18*, 137-145.
- Shirley, M. J., Iwata, B. A., Kahng, S., Mazaleski, J. L., & Lerman, D. C. (1997). Does functional communication training compete with ongoing contingencies of reinforcement? An analysis during response acquisition and maintenance. *Journal of Applied Behavior Analysis, 30*, 93-104.
- Sigafoos, J. (2000). Communication development and aberrant behavior in children with developmental disabilities. *Education and Training in Mental Retardation and Developmental Disabilities, 35*, 168-176.
- Sigafoos, J., Didden, R., & O'Reilly, M. (2003). Effects of speech output on maintenance of requesting and frequency of vocalizations in three children with developmental disabilities. *Augmentative and Alternative Communication, 19*, 37-47.
- Tiger, J. & Hanley (2004). Tiger, J.H., & Hanley, G.P. (2004, Winter). Developing stimulus specifying stimuli. *Journal of Applied Behavior Analysis, 37*(4), 517-521
- Tiger, J., Hanley, P., & Bruzek, J. (2008). Functional Communication Training: A Review and Practical Guide. *Journal of Applied Behavior Analysis, 1* (1), 16-23.
- Tiger, J.H., Hanley, G.P., & Heal, N.A. (2006, Winter). The effectiveness of an preschoolers' preferences for variations of multiple-schedule arrangements. *Journal of Applied Behavior Analysis, 39*(4), 475-48
- Thompson, R. C., Fisher, W. W., Piazza, C. C., & Kuhn, D. E. (1998). The evaluation and treatment of aggression maintained by attention and automatic reinforcement. *Journal of Applied Behavior Analysis, 31*, 103-116.
- Turnbull, H. R., & Turnbull, A. P. (2001). Self-determination for individuals with significant cognitive disabilities and their families. *The Journal of the Association for Persons with Severe Handicaps, 26*, 56-62.

- Wacker, D. P., Steege, M., Northup, J., Reimers, T., Sasso, G., Berg, W. K. (1990). A component analysis of functional communication training across three topographies of severe behavior problems. *Journal of Applied Behavior Analysis, 23*, 417-429.
- Ward, M. J., & Meyer, R. N. (2000). Self-determination for people with developmental disabilities and autism: Two self-advocates' perspectives. *Focus on Autism and Other Developmental Disabilities, 14*, 133-139.
- Wehmeyer, M. L., & Schwartz, M. (1998). The relationship between self-determination, quality of life, and life satisfaction for adults with mental retardation *Education and Training in Mental Retardation and Developmental Disabilities, 33*, 3-12.
- van der Meer, L.A. & Rispoli, M. (2010). Communication interventions involving speech-generating devices for children with autism: a review of the literature. *Developmental Neurorehabilitation, 13* (4), 294-306.
- van Laarhoven, T., Johnson, J. W., van Laarhoven-Myers, T., Grider, K. L., & Grider, K. M. (2009). The effectiveness of using a video iPod as a prompting device in employment settings. *Journal of Behavioral Education, 18*, 119-141.
- Zhou, L., Goff, G. A., & Iwata, B. A. (2000). Effects of increased response effort on self-injury and object manipulation as competing responses. *Journal of Applied Behavior Analysis, 33*, 29-40.

APPENDIX A
SELF-MANAGEMENT TASK ANALYSIS

Natural Prompt: "You need to wait", etc. Emma is denied access

Task Analysis of Self-Management

Put an X under the required prompting level for each step.

Skill	Physical Prompt	Visual Prompt (i.e., gestures, pointing)	Verbal Prompt (i.e., Choose something on your iPad)	Independent
Reaches for iPad				
Unlocks iPad				
Navigates iPad				
Selects iPad application				

APPENDIX B

PREFERENCE ASSESSMENT TREATMENT INTEGRITY FORM

Fidelity of Implementation

Preference Assessment

Instruction	Mark (+) if demonstrated	Mark (-) if Absent
1. iPad is present		
2. Emma has unrestricted access to iPad		
3. iPad is programmed with Applications		
4. Stop watch is used to time the duration of engagement with app		
5. Duration of session is 20 minutes		
6. Data sheets are used during session		

Materials:

1. Preference Assessment Form
2. iPad
3. Stop Watch

APPENDIX C
PREFERENCE ASSESSMENT FORM

APPENDIX D
IPAD TASK ANALYSIS

Task Analysis for Independent use of the iPad

Put an X under the required prompting level for each step.

Skill	Physical Prompt	Visual Prompt (i.e., gestures, pointing)	Verbal Prompt (i.e., Choose something on your iPad)	Independent
Orients to iPad				
Reaches for iPad				
Turns on iPad				
Unlocks iPad				
Navigates iPad				
Selects iPad application				

APPENDIX E

DURATION RECORDING FORM FOR SIB AND AGGRESSION

Date: _____

Target Behavior: Self-Injurious behaviors are defined as any instance of banging head against objects, other people, or own knee, biting self, and throwing body against objects. Aggression is defined as hitting, biting, scratching, pinching, or head butting others. These behaviors can occur in isolation or in any combination to count as one event.

Duration: Start the timer at the onset of either self-injury and/or aggression and stop the timer when the participant has refrained from displaying the target behavior for 5 consecutive seconds.

Request Activity	Denied Immediate Reinf	Granted Imm. Reinf	SIB/AGG Present	SIB/AGG Absent	Duration

APPENDIX F
TREATMENT INTEGRITY FORM

	Mark (+) if demonstrated	Mark (-) if Absent
1. iPad is present		
2. Emma has unrestricted access to iPad		
3. Examiner or 1:1 assistant carry iPad for Emma		
4. Stop watch is used to time the duration of behavior		
5. Emma denied access to requested item		
6. iPad shown to Emma after 30 sec wait time		
7. Data recording forms used		

APPENDIX G
SOCIAL VALIDITY QUESTIONNAIRE

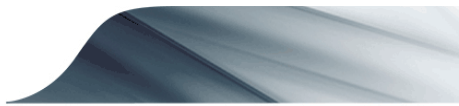
Please read each statement and choose one the one that best describes the extent you agree or disagree with each statement using the following scale

1-Strongly Disagree 2-Disagree 3-Undecided 4-Agree 5-strongly agree

	1	2	3	4	5
I find this treatment to be an acceptable way of dealing with Emma's problem behavior					
This treatment was easy to implement and understand.					
I will continue to use these procedures at home and/or in school					
This treatment has made a positive behavior change					
I felt comfortable using these procedures					
I would recommend this treatment to others					

Modified from the Treatment Evaluation Inventory-Short Form (TEI-SF)
(Kelley et al., 1989)

APPENDIX H
INTERNAL REVIEW BOARD EXEMPTION



To: Kathleen Mccoy
ED

From: Mark Roosa, Chair
Soc Beh IRB

Date: 12/18/2012

Committee Action: **Exemption
Granted**

IRB Action Date: 12/18/2012

IRB Protocol #: 1211008551

Study Title:

The above-referenced protocol is considered exempt after review by the Institutional Review Board pursuant to Federal regulations, 45 CFR Part 46.101(b)(1) .

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.