TEACHING DELAYED GRATIFICATION: REDUCING TEMPER TANTRUMS OF CHILDREN WITH AUTISM SPECTRUM DISORDERS AFTER FUNCTIONAL COMMUNICATION TRAINING

By

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Abstract

This study examined the extent to which using functional communication training (FCT) in a delayed gratification context reduced temper tantrums in children with autism spectrum disorders (ASD). Three children with ASD whose mean age was 3 and a half year old participated in the study. In the first phase, a functional behavioral assessment (FBA) was conducted to identify the functions of the participants' temper tantrums. Then, a stimulus preference assessment was utilized to determine the appropriate reinforcers to be used in each treatment session. Next, a multiple baseline across participants design was used to reduce temper tantrums and increase the use of appropriate communication behaviors, i.e., FCT. Once FCT was taught, delayed gratification interventions were implemented by manipulating three conditions: (a) a fixed time delay (FD), (b) a progressive time delay with verbal praises (PDVP), and (c) a progressive time delay with visual cues (PDVC). A multiple baseline, multi-element design across participants was used to compare the three conditions and determine which was the most effective in teaching delayed gratification. The behavioral changes in participants' temper tantrums, use of alternative communicative behaviors taught by FCT, and the ability to wait were measured through direct observations by two independent observers. The results showed that the progressive time delay with visual cues (PDVC) was the most effective intervention that promoted the participants' ability to wait and decreased their temper tantrums. Based on the evaluation of the findings, implications and future research directions are discussed.

Keywords: autism spectrum disorders (ASD), fixed time delay (FD), functional communication training (FCT), progressive time delay with visual cues (PDVC), progressive time delay with verbal praises (PDVP)

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CHAPTER 1: INTRODUCTION

Overview

Children's behavior is derived from a subtle interplay between cognitive processing and social learning (Feldman, Dollberg, & Nadam, 2011). This dissertation study examines this interplay in children with autism spectrum disorders (ASD) while teaching the concept of delayed gratification to them in a clinical setting. The research evaluated the children's abilities to self-regulate during a function-based behavioral assessment, i.e., *functional communication training* (FCT) under three conditions that vary the types of delays the children must understand. The overall goal of teaching delayed gratification was to allow children with ASD to experience the effects of new social expectations on their perception and understanding of our society, i.e., the implications of *situated cognition* (see Greeno, 1989). Introducing the concept of delayed gratification may highlight the importance of emotional regulation, thereby preventing the future occurrence of problem behaviors and aiding children with ASD as well as their educators.

This introductory chapter begins by defining ASD and other relevant terminology used within this dissertation study. Subsequently, the research topic is briefly introduced by describing the problems facing young children with ASD within the context of developmental psychology. Justification for the study, the study purpose and experimental design, and research questions and their related hypotheses are provided. In the second chapter, the existing literature examining the behavioral learning of children with ASD through FCT is reviewed, and the current research on delayed gratification and the interplay between FCT and delayed gratification is discussed. Then, the third chapter thoroughly describes the methodology of the study. Limitations of the study and the preliminary findings based on the pilot study are also examined in the fourth

chapter. The fifth chapter evaluates data and shows the results of the study. Finally, the last chapter discusses implications, limitations, and future research directions.

Background of the Problem

Definition of ASD and Main Concerns Related to Its Diagnosis

Definition of Autism Spectrum Disorders (ASD). *Autism spectrum disorders* (ASD) is an umbrella term that covers a wide range of autistic diagnoses including autism, Asperger's syndrome, and pervasive developmental disorders not otherwise specified (PDD-NOS; American Psychiatric Association [APA], 2000). Based on the current definition provided by the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed., text manual; *DSM-V-TM*; APA, 2013), ASD is a neurodevelopmental disorder that significantly impairs social interaction, communication skills, and behavior patterns. Children with ASD, in general, exhibit the following core symptoms: high levels of problem behaviors such as hitting, biting, yelling, and screaming (Peters-Scheffer, Didden, Korzillius, & Sturmey, 2011; Sevlever & Gillis, 2010; Sigafoos, 2000); a failure to develop peer relationships (Mancil & Boman, 2010; Virués-Ortega, 2010); delays in the development of language and communication skills (Leung, Mak, Lau, Cheung, & Lam, 2010; Sevlever & Gillis, 2010); and the exhibition of repetitive behaviors or activities (APA, 2000; Mancil, 2006; Matson et al., 2011; Reichle, Johnson, Monn, & Harris, 2010; Virués-Ortega, 2010).

Because the disorders negatively impact development in the areas of cognition and behavior (APA, 2000; Horner, Carr, Strain, Todd, & Reed, 2002; Lerman, Addison, & Kodak, 2006; Mancil, 2006; Mancil & Bowman, 2010), research has shown that the vast majority of children with ASD have difficulties with complex learning and social communication tasks and

tend to show high levels of impulsivity and violent behavior (Kuhn, Hardesty, & Sweeny, 2009; Matson, Matson, & Rivet, 2007; Matson et al., 2011; Reichle et al., 2010; Sevlever & Gillis, 2010). Studies have also indicated that these problem behaviors are lifelong, so intensive behavioral training is needed for children with them (Mancil & Boman, 2010; Matson, Dempsey, & Fodstad, 2009; Vollmer, Northup, Ringdahl, LeBlank, & Chauvin, 1996).

Major concerns of an ASD diagnosis. The cause of ASD is still uncertain (Matson et al., 2011), and research has shown a progressive increase in the number of children diagnosed with it over the last several decades (Mancil, 2006; Matson et al., 2009; National Professional Development Center on ASD, 2009; Zachor & Ben Itzchak, 2010). According to the Center for Disease Control and Prevention (CDC; CDC, 2014), 1 in 68 children is likely to develop ASD. Other studies have estimated that between 1 in 250 and 1 in 1,000 children are diagnosed with ASD (Mancil, 2006; Matson et al., 2011). The Autism Society of America (ASA; ASA, 2007) noted that 1.5 million children and adolescents in the United States are diagnosed with autism. As a result, the need for behavior intervention and educational services targeting children with ASD has increased over time. Simultaneously, the cost for educating those children has also risen due to population growth (Baker, 2006; Bolick, 2011; Matson & Sturmey, 2011; Matson et al., 2011; Wilkinson, 2012).

There is growing awareness that the increasing size of this population may be overestimated because of the broad definition of ASD given by the *DSM-V* (Wing, Gould, & Gillberg, 2011). On January 23, 2012, the APA broadcasted that autism would be redefined by the end of the year. As a result, the fifth edition of the *DSM* (*DSM-V*) was published on May 18, 2013, replacing the *DSM-IV-TR*. The new definition just shows one diagnostic category: Autism Spectrum Disorders (ASD). This category consolidates the five subtypes that previously existed

in the *DSM-IV-TR*: autism, Rett's disorder, child disintegrative disorder (CDD), Asperger's syndrome, and PDD-NOS (Wing et al., 2011). The definition of a triad of impairments in the *DSM-V* shows only two problems: impaired social interaction and communication as one joint problem and restricted behavior pattern. The current manual divides them into three categories: impaired social interaction, impaired social communication, and restricted behavior pattern. The proposed changes provide a more restricted guideline for ASD diagnosis than the one that previously existed (Wing et al., 2011). Because subtype classifications for various forms of autism no longer exist in the current edition, various researchers have argued that the DSM-V may lack empirical support (Wing et al., 2011).

DSM-V and the changes of DSM-IV-TR diagnostic criteria. In the United States, psychiatric diagnoses are classified by the *DSM* (Rogers & Vismara, 2008; Wilkinson, 2012; Wing et al., 2011). The previous edition, *DSM-IV-TR* (APA, 2000), covered a wide range of psychiatric disorders for children, adolescents, and adults. It thoroughly described the causes of each disorder, statistics in terms of demographic information, and empirical studies concerning the optimal treatment methodology (APA, 2000). Mental-health professionals used the *DSM-IV-TR* to identify their patients' problems and available treatments. The manual served as the ultimate guidebook for mental-health professionals because (a) it was the most standardized manual and (b) clinical professionals frequently had referenced it when discussing inadequate information or flaws in their diagnoses (Rogers & Vismara, 2008; Wilkinson, 2012).

As previously mentioned, the committee that reviewed and wrote the *DSM-V* announced changes in the diagnostic criteria for ASD (see APA, 2012). The purpose of this announcement was to (a) reveal major changes in the diagnosing of ASD and (b) invite suggestions to be taken

into consideration before the manual is published (Wing et al., 2011). Table 1 describes the differences in diagnostic criteria between the *DSM-IV-TR* and *DSM-V*.

Table 1

Proposed Diagnostic Criteria Changes for Autism Spectrum Disorder (ASD)

DSM-IV-TR	DSM-V
Five subcategories: autism, Asperger's syndrome, pervasive developmental disorders-not otherwise specified, childhood disintegrative disorder, and Rett's disorder	One category: Autism Spectrum Disorders
Three domains of autistic symptoms: social impairment, language/communication impairment, and restricted interests and repetitive behaviors	Two domains of autistic symptoms: social communication impairment and restricted interests and repetitive behaviors
No genetic cause (e.g., fragile X). Levels of language and intellectual disability and presence of seizures and/or gastrointestinal (GI) problems are evaluated in addition to the diagnosis	Genetic cause (e.g., fragile X) is possible. Levels of language and intellectual disability and presence of seizures and/or GI problems will individually be evaluated in addition to the diagnosis
No subcategory is given other than the five disorder subcategories	Social communication disorder will be added as a new category, which will allow for a diagnosis of disability in social communication without the presence of repetitive behavior

Note. Adapted from APA, 2012.

Dr. Fred Volkmar (2010) at Yale University evaluated 372 children, adolescents, and adults who were diagnosed with high-functioning autism to see how many of them would still fall under that diagnosis with the changed definition. Volkmar found that only 45% of the participants would qualify under the new ASD diagnosis. The findings also showed that approximately 75% of the participants with autism, 75% with Asperger's syndrome, and 85% with PDD-NOS would not be diagnosed with ASD based on the *DSM-V*'s definition (Volkmar,

2010). The results confirmed the prediction that the number of people diagnosed with ASD will likely decrease once the proposed changes take place in May 2013.

As of 2014, it is still uncertain in what ways the *DSM-V* narrowing of the criteria will affect the rate of ASD diagnosis (Carey, 2012; Wilkinson, 2012; Wing et al., 2011), but mental health professionals have predicted that the major challenge will be that children who are classified with mild or high-functioning autism may not be eligible for special education and health services (Carey, 2012; Volkmar, 2010; Wilkinson, 2012). Wing et al. (2011) argued that behavioral interventions for those high-functioning children will still be necessary even after the new changes take place, because the problems of social interaction are frequently exhibited by people with high-functioning autism. According to Wing et al. (2011), behavioral issues caused by impaired social interaction always need special attention from educational and mental professionals. In addition, the authors emphasized that the deficit of social interaction must be recognized and evaluated by an experienced clinician in early childhood (Wing et al., 2011).

Because the proposed changes may restrict eligibility for health and educational services for the population with ASD, mental health experts who conduct clinical diagnosis of ASD need to provide accurate judgment for determining the child's eligibility when the diagnosis takes place in early childhood (Wing et al., 2011). Additionally, based on the results of clinical diagnoses, future studies will need to consider the following two factors: (a) Identifying effective behavioral treatments in early childhood will become increasingly important so that reducing problem behaviors and increasing task engagement in children with ASD can promote their future learning (Peters-Scheffer et al., 2011; Matson et al., 2011; Matson & Sturmey, 2011; Virués-Ortega, 2010; Zachor & Ben Itzachak, 2010); and (b) Based on the current findings, both mental health and educational professionals in the field of autism need to put substantial efforts

into developing empirically supported behavioral treatments, i.e., behavioral strategies that show therapeutic change in approved settings, because both efficacy studies and understanding the effectiveness of psychosocial interventions are crucial for clinical and educational practice (Matson & Neal, 2009; Matson et al., 2011).

Aligned with these future concerns, the main goal of the proposed study is to establish an early behavioral intervention for children with ASD for improving their social functioning. The vast majority of children with ASD have attention deficit disorder (Grindle & Remington, 2005; Matson et al., 2011; Reichle et al., 2010), hyperactivity (Dominick, Davis, Lainhart, Tager-Flusberg, & Folstein, 2007; Harding, Wacker, Berg, Lee, & Dolezal, 2009; Horner et al., 2002; Mancil, 2006), and impulsiveness (Belden, Thompson, & Luby, 2008; Dominick et al., 2007; Harding et al., 2009; Matson et al., 2011; Potegal & Davidson, 2003; Reichle et al., 2010). These three problems block their ability to learn about societal values, so researchers and mental health professionals have been developing various teaching mechanisms for children with ASD's social learning (Matson et al., 2011; Reichle et al., 2010).

Delayed Gratification as a Teaching Method for Emotion Regulation

In the context of developmental psychology, *delayed gratification* is the concept of foregoing immediate satisfaction to gain something more desirable (Mischel, 1961). If a child chooses to have two marshmallows after waiting for ten minutes instead of having one right away, that child exhibits delayed gratification (Mischel, Shoda, & Rodriguez, 1989). Teaching delayed gratification has come to several scholars' attention, because studies have shown that toddlers who demonstrated better abilities to delay gratification used more self-regulatory skills by the time they reach preschool age (Feldman et al., 2011; Hoerger, Quirk, & Weed, 2011;

Mischel et al., 1989; Peake, Hebl, & Mischel, 2002; Shoda, Mischel, & Peake, 1990). The studies of both Mischel et al. (1989) and Peake et al. (2002) have shown that the measured outcome (based on a condition in which the child is asked to wait) indicated that children who showed greater ability to delay gratification early in life showed higher intelligence and social competence in later life as compared to children who showed less delayed gratification ability as preschoolers. In addition, preschool-aged children who forwent immediate pleasure to receive greater rewards demonstrated higher levels of social competence in their later lives (Kelley et al., 2011; Peake et al., 2002). Because of these indications that learning how to delay gratification early in life is a crucial factor in the development of social-emotional aptitude, the strategic use of procedures that teach the toleration of delayed gratification has gained importance.

Temper tantrums and Behavioral Management Problems

Major characteristics of temper tantrums. The operational definition of *temper tantrums* is the expression of whining, crying, yelling, throwing things, or swinging arms and legs in response to aversive stimuli, such as the denial of a wanted object or a change in schedule (Dominick et al., 2007; Mancil, 2006; Potegal & Davidson, 2003; Virués-Ortega, 2010; Vollmer et al., 1996). These behaviors tend to be extremely intense at onset, and some children lose self-control and increase their aggression or self-injurious behavior (SIB) during such expressions (Belden et al., 2008; Dominick et al., 2007; Potegal & Davidson, 2003). Temper tantrums are considered early signs of socially frustrating behavior that can easily lead children to engage in future antisocial behavior. Thus, behavioral management of temper tantrums is important in early life, and research has shown that the use of behavioral strategies to teach children how to

regulate negative emotions reduced problem behaviors and promoted self-control skills (Belden et al., 2008; Green et al., 2011; Mancil, 2006; Matson et al., 2011; Potegal & Davidson, 2003).

Why temper tantrums are problematic. It is not uncommon for any child to express negative emotions in the form of temper tantrums, especially between the ages of 1 1/2 and 4 years (Belden et al., 2008; Green, Whitney, & Potegal, 2011; Harrington, 2004; Potegal & Davidson, 2003). However, severe temper tantrums are likely to manifest with other aggressive behaviors, and sometimes, this can lead to potential danger if children are unable to self-regulate their negative emotions (Belden et al., 2008; Dominick et al., 2007; Green et al., 2011; Vollmer et al., 1996). Vollmer et al. (1996) argued that intense temper tantrums can negatively affect a child's quality of life for a variety of reasons. First, the relationship between parent and child may become strained, because the behavior creates a negative social climate as described by Gerald Patterson's (2002) *coercion model*. Second, when parents have difficulty controlling temper tantrums at home, it may also be challenging to control them in public places, such as school. Third, if the temper tantrums are prolonged, they can create substantial behavioral problems such as self-injurious behaviors (SIB) or physical aggression (Belden et al., 2006; Green et al., 2011; Mancil, 2006; Potegal & Davidson, 2003; Reichle et al., 2010). In short, temper tantrums can cause behavioral problems, and children who do not have good emotional regulation strategies are likely to have both temper tantrums and maladaptive behaviors later (Feldman et al., 2011; Green et al., 2011).

Temper tantrums are a particularly concerning problem behavior for children with ASD, because these children frequently use severe temper tantrums as their primary communication mode and develop a high level of aggression and violent behavior (Belden et al., 2008; Dominick et al., 2007; Harding et al., 2009; Horner et al., 2002; Kuhn et al., 2009; Mancil, 2006; Matson et

al., 2011; Potegal & Davidson, 2003; Zachor & Ben Itzchak, 2010). From a review of 30 articles on autism research, Mancil (2006) found that 64% of the participants diagnosed with ASD engaged in temper tantrums, including behaviors such as hitting, hand biting, yelling, and property destruction. Other studies found that primary caregivers reported that their children's temper tantrums provided a window into their intense emotional distress and aggressive behaviors, because their communication and social skills deficits inhibited their emotional regulation (Belden et al., 2008; Horner et al., 2002; Matson et al., 2011; Potegal & Davidson, 2003).

This behavior not only inhibits the learning of essential communication and social skills in children with ASD, but it may also direct the children toward long-term, serious difficulties. Primary caregivers often struggle with how to decrease or stop such behavior. Despite the growing need for behavioral management for problem behaviors, little attention has been paid to extreme tantrums as a predictor of future antisocial behavior (Belden et al., 2008; Dominick et al., 2007; Green et al., 2011; Mireault & Trahan, 2007; Potegal & Davidson, 2003). However, behavioral interventions that minimize young children's temper tantrums and teach them how to regulate negative emotions have gained importance (Belden et al., 2008; Dominick et al., 2007; Feldman et al., 2011; Green et al., 2011; Harding et al., 2009; Tiger, Fisher, & Bouxsein, 2009; Virués-Ortega, 2010). In addition, there has been a growing awareness that exploring the concept of *self-control* as a means of developing one's competence has become more and more crucial both in academic and social domains in child development (Feldman et al., 2011; Green et al., 1989; Harding et al., 2009).

Behavioral Assessments in Autism Research

Behavior analysts and other professionals have given a great deal of attention to treating the core symptoms of ASD and have extensively researched different behavioral treatments to address this issue (Betz, Higbee, & Reagon, 2008; Callahan, Shukla-Mehta, Magee, & Wie, 2010; Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Mancil & Boman, 2010; Matson et al., 2011). A research review of recent trends in autism indicated that function-based assessments, i.e., developing behavioral support plans based on the function of behavior, have been effective, so the focus on this area is likely to continue (Callahan et al., 2010; Granpeesheh et al., 2009; Matson et al., 2011; Zachor & Ben Itzachak, 2010). Function-based assessments are well established in the literature and have been heavily researched in the field of applied behavioral science and education (Athen & Vollmer, 2010; Mancil, 2006; Mancil & Boman, 2010; Matson et al., 2011; Tiger, Fisher, Toussaint, & Kodak, 2009).

Functional behavioral assessment (FBA). *Functional behavioral assessment* (FBA), which is widely used by many professionals, is a method for determining how a behavior relates to its environment. By identifying the underlying purpose of a child's problem behavior, a psychologist or educational professional can target an alternative behavior to replace the problem behavior while serving the same purpose (Mancil & Boman, 2010; Tiger, Fisher, Toussaint et al., 2009). The intervention must include effective prevention or development of alternative behaviors that are socially acceptable (Fisher, Thompson, Hagopian, Bowman, & Krug, 2000; Hanley, Iwata, & McCord, 2003; Horner & Carr, 1997; Matson et al., 2011; Tiger, Hanley, & Bruzek, 2008). Through the process of teaching the child the alternative behavior, he or she will begin to exhibit that behavior instead. Used widely with children with developmental disabilities, FBA and other behavioral interventions have played a major role in promoting positive

behavioral support for children in the United States and in preventing the escalation of negative behavior (Mancil, 2006; Matson et al., 2011; Reichle et al., 2010; Tiger, Hanley, & Bruzek, 2008).

Defining the function of behavior. In 1977, Carr developed this function-based approach by examining various hypotheses that explained the occurrences of problem behaviors. In the study, the author observed cases in which the participant's problem behavior was maintained by either biological or, more commonly, environmental variables. Carr (1977) emphasized the importance of direct observation of human behavior for treatment efficacy, following Skinner's (1953) idea that any behavior is scientifically measureable. Later, Carr and Durand (1985) evaluated a study in which academic demands were presented, and rates of problem behavior occurrences varied as a function of the verbal statement that was used to deliver the academic demand. Both of these studies were designed to identify the function of an individual's aberrant behavior. By looking at the different participant responses during the various test conditions, the authors concluded that each problem behavior served a function. Thus, developing a deeper understanding of the function was important in treating the problem behavior.

Functional analysis (FA). Functional analysis is a part of FBA that allows researchers to directly observe the function of behavior, which occurs as a result of the direct manipulation of environmental variables in applied settings (Iwata, 1994). First, the cause of the problem behavior must be identified through direct observation (Carr, 1977; Iwata et al., 1982/1994). According to Carr (1977) and other researchers, all behaviors serve a function, and there are four conditions that establish the function of these behaviors (Carr & Durand, 1985; Iwata et al., 1982/1994). These conditions are (a) the attention condition (gaining a person's attention), (b) the tangible condition (the ability to access the most preferred item or activity), (c) the escape or

demand condition (avoiding what is being requested), and (d) the alone condition (sensory stimulation). Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994) conducted studies on children with developmental disabilities in which problem behavior activities were introduced in these four different conditions to see which condition or conditions increased the problem behavior. In the *attention* condition, the experimenter focused attention on the child when problem behavior was exhibited. In the *demand* condition, the experimenter first requested that the child perform a specific activity. If the child refused, the experimenter then showed an example of what was being requested (i.e., *modeling*). Next the child was asked to copy the action until the problem behavior was evoked. In the *alone* condition, the experimenter pretended to be invisible to see whether the problem behavior occurred. In the *play* condition, which is considered a control condition, the child was given free access to all activities and was allowed to choose his or her preference.

The experiments were analogue assessment procedures for identifying the function of the participants' aberrant behaviors. Iwata et al. (1982/1994) found that participants were likely to exhibit aberrant behavior in one of the four conditions. Their method of determining how behaviors function became known as *functional analysis (FA)*. Many scholars have described the FA procedure developed by Iwata et al. (1982/1994) as a paradigm shift for the field of behavior analysis (Carr & Durand 1985; Hanley et al., 2003; Iwata & Dozier, 2008; Tiger, Fisher, Toussaint et al., 2009; Vollmer et al., 1996; Vollmer et al., 1999). Some scholars noted that the methodology was not innovative, but rather a compilation and extension of the work of others (Borrero & Borrero, 2008; Tiger, Fisher, Toussaint et al., 2009), but few can deny the tremendous impact this methodology has had in the field (Iwata & Dozier, 2008; Iwata et al., 1994). Currently, this technique is widely used as a baseline measure for target behaviors

(Borrero & Borrero, 2008; Harding et al., 2009; Iwata & Dozier, 2008; Reichle et al., 2010; Tiger, Fisher, Toussaint et al., 2009; Vollmer et al., 1996).

Despite its strengths, one of the inherent limitations of the FA methodology is that it may increase the frequency and magnitude of severe problem behaviors to unacceptable or unsafe limits prior to a successful decline in the temper tantrum behavior (Hanley et al., 2003; Iwata & Dozier, 2008; Iwata, 1994; Iwata et al., 1982/1994; Tiger, Fisher, Toussaint et al., 2009). Clinicians are responsible for using their best judgment as to which type of treatment to implement before the problem behavior becomes too intense.

Functional communication training (FCT). *Functional communication training* (FCT) has been recognized as a way to minimize destructive behaviors (e.g., temper tantrums) caused by ASD and other developmental disorders (Fisher et al., 2000; Harding et al., 2009; Kurtz, Boelter, Jarmolowicz, Chin & Hagopian, 2011; Mancil, 2006; Mancil & Boman, 2010; Tiger et al., 2008) and to maximize language development, socialization, and intellectual skills (Ingvarsson & Hollobaugh, 2010; Leaf, Sheldon, & Sherman, 2010; Mancil & Boman, 2010; Matson et al., 2007; Matson et al., 2011; Paul, 2008; Tiger et al., 2008). FCT rests on the premise that a problem behavior is learned behavior maintained by an environmental variable. Once the environmental variable maintaining the problem behavior is identified, a communication response that allows a participant to access the environmental variable will be taught. In other words, the communication response is the alternative behavior that replaces the problem behavior. As the participant uses the alternative behavior, he or she is less likely to be engaged in the problem behavior (Carr & Durand, 1985; Fisher et al., 2000; Harding et al., 2009; Kurtz et al., 2011; Mancil, 2006; Mancil & Boman, 2010; Tiger et al., 2008). The main purpose for differentiating alternative behaviors is to reinforce socially appropriate behaviors, not

inappropriate ones. The logic behind this is that learning the alternative behavior will gradually train the child to avoid the use of the problem behavior. For example, the experimenter would teach the children to say, "Please see me," when they want attention rather than yelling loudly. The premise of FCT rests on a FBA of what function each problem behavior serves and the belief that problem behaviors are maintained by environmental variables (Carr & Durand, 1985; Fisher et al., 1993; Fisher et al., 2000; Hagopian, Kuhn, Long, & Rush, 2005; Harding et al., 2009; Mancil & Boman, 2010; Tiger et al., 2008).

Carr and Durand (1985) introduced FCT as a behavioral treatment for the problem behaviors of children with developmental disabilities. The training consists of two steps: (1) identifying the function of the problem behavior, and (2) teaching an appropriate communication skill that serves the same function as the problem behavior. For example, if a child cries loudly to get a cookie, his or her parent or teacher will suggest a vocal response that brings the same result as the temper tantrums: "If you want to have one, say, 'May I please have a cookie.'" The underlying assumption of FCT is that any challenging behaviors exhibited by children with ASD are communicative, so the suggested appropriate behaviors to replace them are intended to serve the same communicative purpose as the challenging behavior. By showing substantial reductions in problem behaviors and successful acquisitions of communication, the authors found that FCT was a beneficial, systematic intervention for replacing inappropriate behaviors with socially accepted ones (Carr & Durand, 1985).

Since that first study, FCT has become a well-established treatment and has been evaluated for its effectiveness by different research teams (Fisher et al., 1993; Fisher et al., 2000; Harding et al., 2009; Kurtz et al., 2011; Lalli, Casey, & Kates, 1995; Mancil, 2006; Mancil & Boman, 2010; Tiger et al., 2008). Fisher et al. (1993) examined the use of FCT with three

variations—FCT, FCT with extinction, and FCT with punishment—to reduce problem behaviors in four children with mental retardation and autism. Their findings suggested that the treatment efficacy of FCT was greater when FCT was used with *extinction* in the form of ignoring the child if he or she refused to comply with a demand and displayed the problem behavior, or with *punishment* in the form of prohibiting access to the child's favorite item or activity. Similar to Fisher et al.'s (1993) study, Lalli et al. (1995) evaluated the effects of FCT on decreasing behavior maintained by an escape condition in three participants who were diagnosed with mental retardation and autism. The FCT was used to teach the children a verbal, communicative response that would enable them to escape from a task. The results indicated that FCT decreased occurrences of the participants' problem behaviors to near zero while successfully teaching them a verbal replacement behavior. These studies emphasized that psychological treatments for decreasing aggressive behaviors and increasing more functional forms of communication are important for children with ASD.

Justification of the Study

The FCT methodology has been better documented, researched, and effectively demonstrated than other behavioral treatments as a positive strategy for reducing problem behaviors in children with ASD (Carr & Durand, 1985, Fisher et al., 1993; Fisher et al., 2000; Harding et al., 2009; Kurtz et al., 2011; Lalli et al., 1995; Mancil, 2006; Mancil & Boman, 2010; Matson et al., 2007; Matson et al., 2009; Matson et al., 2011; Tiger et al., 2008). Although researchers across disciplines have continuously argued that FCT may be a central tool for improving the daily learning of children with ASD regarding novel phenomena (Mancil & Boman, 2010; Matson et al., 2011; Tiger et al., 2008; Vollmer et al., 1996), some have noted that FCT has potential limitations (Fisher et al., 2000; Orman, 2009; Reichle et al., 2010). The basic

structure of FCT is that the child is taught to be in charge of his or her schedule of reinforcer during the sessions; that is, they learn how to control receiving the reward they desire (Fisher et al., 2005; Harding et al., 2009; Tiger et al., 2008; Virués-Ortega, 2010). However, this is often not possible in real-life situations. Thus, a major drawback of FCT as a treatment is that the children will likely exhibit their problem behavior again when the reinforcer for appropriate behaviors is not immediately available. The training, which derives from traditional, "in-class" instruction, shows the flaw that it may not be highly generalizable to other situations without planning and interventions for generalization.

A possible behavioral strategy to approach social learning for children with ASD is to introduce the concept of delayed gratification by using trained professionals to teach the children the benefits of delayed gratification over immediate gratification (Athens & Vollmer, 2010; Lee, Lan, Wang, & Chiu, 2008; Vollmer, Borrero, Lalli, & Daniel, 1999), and to systematically reward their attention to social learning (Grindle & Remington, 2005; Kelley, Lerman, Fisher, Roane, & Zangrillo, 2011). There has been growing interest in teaching delayed gratification, especially for those with developmental disabilities (Vollmer et al., 1999; Matson et al., 2011; Orman, 2009; Reichle et al., 2010), but few studies to date have found techniques to teach children how to tolerate delays while learning to behave in a socially accepted manner. By evaluating various teaching mechanisms for delaying gratification, the proposed study will build a foundation for using developmentally based strategies as a means of broadening the social learning of children with ASD.

Delayed Gratification and Current Trends in Autism Research

Researchers in both Applied Behavior Analysis (ABA) and developmental psychology have recently suggested that evaluations of impulsivity and the ability to delay gratification may help children with ASD avoid future maladjustment (Feldman et al., 2011; Lee et al., 2008; Matson et al., 2011; Orman, 2009; Reichle et al., 2010). Impulsive behavior occurs when an individual favors immediate reinforcer over delayed reinforcer (Fisher et al., 2000; Lee et al., 2008; Mischel, 1961; Vollmer et al., 1999). The research asserts that the ability to delay gratification in early life is closely related to one's self-control of emotion, which can be a predictor of socially acceptable behavior in later life (Mischel et al., 1989; Reichle et al., 2010).

Acknowledging the limitations of FCT, researchers in applied behavioral analysis have suggested that evaluations of delayed gratification abilities might be relevant to the behavioral training of children with ASD (Fisher et al., 2000; Grindle & Remington, 2005; Matson et al., 2011; Reichle et al., 2010; Vollmer et al., 1999). Those studies have indicated a close association between children's abilities to delay gratification and their self-control, but specific mechanisms that promote the toleration of delayed gratification for children with ASD, including recognizing progress toward a long-term reward, have not been fully established.

Fisher, Piazza, and Chang (1996) examined whether there was a correlation between delayed reinforcer and behavioral management in children with ASD. The authors suggested that different lengths of time passing before reinforcer might influence how frequently a child engages in problem behaviors. They concluded that the time-delayed reinforcer significantly decreased the participants' problem behavior. However, the authors did not specifically focus on correlations between delayed reinforcer and positive behavioral management.

Vollmer, Borrero, Larri, and Daniel (1999) evaluated techniques used to teach children with autism and other developmental disabilities improved social behaviors (i.e., task engagement and verbal requests) by manipulating the magnitudes and delays of reinforcer. The authors determined that functional behavioral supports and positive behavioral interventions were important strategies for teaching socially appropriate behaviors. However, they concluded that the extent to which teaching delayed gratification was an effective behavioral treatment was uncertain, because one of their two participants showed no difference in results between immediate and delayed reinforcer procedures.

Overall, more studies should be conducted to develop behavioral interventions that teach emotional regulation to children with ASD (Kelley et al., 2011; Matson et al., 2011; Reichle et al., 2010), because there is little empirical evidence on the extent to which the concept of delayed gratification is related to regulate intense negative emotion (Athens & Vollmer, 2010; Matson et al., 2011; Orman, 2009). This proposed study will contribute to filling in that research gap.

Purpose of the Study

Unless children with developmental disabilities are taught strategies of how to delay gratification beforehand, FCT will be ineffective. Fisher et al. (2000) concluded that being able to wait (i.e., delay gratification) is an important concept to learn during FCT, because delayed gratification is related to self-regulating negative emotions. As a way of increasing the treatment efficacy of FCT, there has been growing interest in understanding the way in which the concept of delayed gratification relates to FCT (Athens & Vollmer, 2010; Fisher et al., 2000; Grindle & Remington, 2005; Matson et al., 2011; Orman, 2009; Reichle et al., 2010; Shogren & Turnbull, 2006; Vollmer et al., 1999). However, only limited research has systematically examined how teaching delayed gratification encourages the reduction of problem behaviors and the

development of the precursors of self-determination (e.g., task engagement, decision making, and self-regulation) in young children with ASD. The intent of the proposed study, therefore, is to develop an effective, function-based behavioral strategy for children with ASD that employs FCT to teach children how to delay gratification in the context of a temper tantrums outburst. The FCT methodology is an empirically supported treatment for children with ASD and other developmental disabilities (Harding et al., 2009; Mancil, 2006; Mancil & Boman, 2010; Tiger et al., 2008) and it includes behavioral management strategies that have been effective in managing disruptive behaviors in children with ASD. On the other hand, various mechanisms that teach tolerance of delayed reinforcer to reduce temper tantrums have not been evaluated.

This study's purpose is achieved through three steps: (a) identifying the function of the participants' temper tantrums during a baseline measure drawn from an FA, (b) refining FCT assessment procedures for children with ASD and examining if FCT is effective in decreasing temper tantrum behavior in children with ASD during the treatment course, and (c) examining ways in which combining FCT treatments with delayed reinforcer procedures can be used as a strategy for reducing the occurrences of temper tantrum behavior, increasing the use of replacement behaviors, and teaching the participants the concept of delayed gratification. The study will develop a method for reducing the frequency of temper tantrum behavior in children with ASD while promoting the self-regulation skills of children with ASD by applying various delayed gratification conditions to temper tantrum behavior.

Proposed Experiment Design

This study uses two designs: multiple baselines across participants and a multi-element design (i.e., alternating treatment design) across participants. The first design examines the efficacy of FCT in reducing temper tantrums. The second design compares the multiple

treatment conditions used to teach delayed gratification. These designs illuminate which interventions significantly decrease the problem behaviors and encourage appropriate replacement behaviors.

Independent and Dependent Variables

The independent variables of study are the behavioral interventions (i.e., treatment conditions) in relation to the behaviors being observed. They are (a) FCT and (b) the three types of delayed gratification conditions (i.e., fixed time delay, progressive time delay with verbal praises, and progressive time delay with visual cues). The conditions are chosen in the study because (a) FCT is considered a standard clinical practice in ABA research (Tiger et al., 2008; Reichle et al., 2010) and (b) the delayed gratification conditions have not been fully evaluated as treatment conditions in applied settings.

Three dependent variables of the study are as follows: (a) the temper tantrum behavior across all conditions, (b) the alternative communicative response during the treatment conditions, and (c) the ability to wait across the delayed gratification conditions (i.e., the tolerance of short-time waiting for the reinforcer). All dependent variables were recorded as the percentage of behavior occurrence across all phases. Thus, 10 second partial interval coding of behavior observation was used to measure all dependent variables because (a) the researcher's primary goal is to estimate temper tantrum behavior within a short time interval and (b) data observers can record an occurrence if more than 2 target responses occur at any point during the given time interval. In clinical settings, data observers are responsible for collecting more than one target behavior concurrently, which makes frequency data collection infeasible (Meany-Daboul, Roscoe, Bourret, & Ahearn, 2007). For this reason, a partial interval recording, which is often

called *time sampling*, has frequently been used by school professionals and behavior analysts to estimate target responses (Gast, 2010; Meany-Daboul et al., 2007).

Table 2

Research Questions

Question #	Question Type	Question Text
1	Demonstration	Is there a clinically significant reduction of temper tantrum behavior and significant increase of communicative response from the baseline when FCT is implemented?
2	Comparative Analysis	Do progressive time-delay procedures result in a clinically significant decrease in temper tantrum behavior displays by children with ASD, compared to the fixed time-delay procedure? (a) Do the two progressive time-delay procedures result in a decrease of temper tantrums exhibitions by children with ASD? (b) Do the two progressive time-delay procedures result in an increase in compliance (i.e., the toleration of waiting) by children with ASD?
3	Comparison	Are the two progressive time-delay procedures more effective than the fixed time-delay procedure in teaching delayed gratification to children with ASD? Among the three conditions, which one does show the most clinically significant reduction of temper tantrum behavior?

Research Questions and Hypotheses

The proposed study addresses three research questions and their related hypotheses. A summary of those questions is presented in Table 2.

Research Question 1: FCT

The first question is a *demonstration question* across all phases. It examines the ways in which the implementation of the FCT and delayed gratification procedures (i.e., the independent variables) changes the target behavior of the participants (i.e., the dependent variables; Gast,

2010). The question asks, “Is there a significant reduction of temper tantrum behavior and increase of communicative response from the baseline when FCT is implemented?”

Considering the fact that the treatment efficacy of FCT has been well established by the literature, it is predicted that the target problem behavior will decrease for all participants following FCT. On the other hand, just in the beginning, it is hypothesized that the problem behaviors will slightly increase across the delayed gratification conditions, because the lack of reinforcer after the use of appropriate replacement behaviors will function as aversive conditioning for all the participants. The significance of the changes between baseline and FCT and between baseline and delayed gratification will be examined based on visual inspection of the data.

Research Question 2: Three Delayed Gratification Conditions (All Conditions)

The second question is a *comparative analysis question* across all phases. It evaluates whether a relationship exists when each procedure (i.e., the independent variable) is utilized with a given component on the participants’ target behavior (i.e., the dependent variable; Gast, 2010). Across all conditions, the reinforcer will be placed at a short distance away, so the participants are close enough to observe it. However, they will not be allowed to access it until the successful completion of a given task. The question is to evaluate that the children are likely to use temper tantrums less once the reinforcer is exposed, but the percentage of 10-second intervals of temper tantrums occurrences during the FCT phase is likely to decrease more than during the delayed gratification phase.

Comparative analysis question during the delayed gratification phase (two progressive time-delay conditions). The progressive time-delay procedure will consist of two components: one with verbal praises and one with visual cues. The question asks, “Do the

progressive time-delay procedures result in a greater decrease of temper tantrums exhibitions by children with ASD?" The same question may also be stated as follows: "Do the progressive time-delay procedures result in a greater increase in the ability of waiting by children with ASD than the fixed time-delay procedure?"

It is hypothesized that the progressive time-delay condition with verbal praises and visual cues will show a faster reduction of temper tantrum behavior than the fixed time-delay condition. It is also predicted that the condition with verbal praises and visual cues will result in a higher percentage of waiting than the one without visual cues.

Research Question 3: Delayed Gratification (All Three Conditions)

The third question is a *comparative question,* which evaluates whether one procedure works better than another one (Gast, 2010). In other words, the question asks under which conditions teaching delayed gratification is the most and least effective. The question asks, "Are the progressive time-delay procedures more effective than the fixed time-delay procedure in teaching delayed gratification to children with ASD? Among the three conditions, which one does show the most clinically significant reduction of temper tantrum behavior?" The use of time delays across all conditions may be aversive, but one usage may be less aversive than others.

It is predicted that the progressive, the progressive time-delay condition with verbal praises and visual cues will be more effective than the fixed time-delay condition. It is also predicted that the progressive time-delay condition with visual cues will be the most effective condition that shows the clinically significant reduction of temper tantrum behavior across participants. The behavioral changes among the three delayed gratification conditions and the changes between baseline and the complete delayed gratification phases will be evaluated.

The Significance of the Study

Although the treatment efficacy of FCT has been well established over time (Harding et al., 2009; Tiger et al., 2008), investigating the clinical utility of FCT may lead to more socially valid treatments. Expanding the empirically supported treatment with added components may be beneficial for maximizing treatment efficacy (Reichle et al., 2010). Additionally, understanding the concept of delayed gratification is an important function that promotes self-regulating negative emotions (Feldman et al., 2011; Reichle et al., 2010).

The proposed study will hopefully result in an early behavioral intervention that can be used to teach children with ASD the concept of delayed gratification through the use of FCT with added components. This is an important concept for developmental psychologists to further understand how children learn to decline the temper tantrum behavior. The proposed research designs will allow the researcher to investigate whether both FCT and teaching delayed gratification show treatment effects on more than one participant. The designs will also allow the researcher to make the multiple treatment comparison of delayed gratification conditions feasible. Learning this concept may help improve children's self-control on their temper tantrum behavior. The use of the intervention should provide long-term benefits to children with ASD in terms of regulating their emotions and their learning of self-control.

CHAPTER 2: REVIEW OF THE LITERATURE

"Educating children with autism is a challenge for both parents and teachers. Each child with autism has unique abilities and challenges, and if taught properly by trained professionals using evidence-based practices, can develop to his or her full academic potential." –Autism Advocate, 2007 (adapted from Jones and Palko, 2010)

The category of ASD is one of the largest diagnostic categories within the population of developmental disabilities in the United States (Matson et al., 2011; Matson & Sturmey, 2011; Wilkinson, 2012). On March 27, 2014, the Centers for Disease Control and Prevention (CDC) updated the estimate of autism prevalence in the United States to 1 in 68 children. Challenging behaviors (e.g., SIB) can have harmful effects on the lives of children with ASD and their families and may threaten physical and mental health, resulting in negative social consequences (Hardin et al., 2009; Matson & Sturmey, 2011; Patterson, 2002; Reichle et al., 2010). All mental-health and educational professionals working with children with ASD, are, thus, responsible for the course of behavioral treatment and setting the agenda based on the needs of the children's and primary caregivers. Additionally, the professional should attend to the child's motivation to stay in and work hard in treatment, address anything interfering with treatment, and work to establish a strong therapeutic alliance. Within the specific context of treatment, it is the professional's goal to focus on the cause of the dysfunctional behavior (i.e., the target behavior), teach and reinforce the use of appropriate behavioral skills, and build connectedness to parents or caregivers.

Therefore, this chapter provides a comprehensive literature review of the relevant body of autism research. In identifying the nature of ASD and the likelihood of problem behaviors, the purpose of the chapter is to evaluate empirical studies of ASD in the context of behavioral science and education. This chapter also addresses investigatory strategies for determining

problem behaviors among children with ASD, verifying findings from relevant behavioral treatments, and use of evidence-based behavioral treatments to promote social competence among children with ASD. Finally, the chapter reports limitations and implications of the current findings and the suggestion for future research.

Overview of Autism Spectrum Disorders

The Disorders

In the *DSM-V,* ASD covers a broad range of developmental disabilities identified by abnormal development in socialization, communication, and behavior (APA, 2000; Rice, 2009). However, according to the *DSM-IV-TR,* ASD was classified as a pervasive developmental disorder (PDD), consisting of five subcategories: autistic disorder (i.e., autism), Rett's disorder, childhood disintegrative disorder, Asperger's disorder (i.e., Asperger's syndrome), and PDD-NOS (APA, 2000). In the *DSM-IV-TR*, a PDD was categorized by severe developmental impairment in various areas: reciprocal communication and social skills and/or the presence of restricted behavior or activities (APA, 2000). Even in the *DSM-V*, autism is still considered the most severe developmental disorder among other developmental disorders, and the rest of them are characterized as ASD (Matson et al., 2011; Matson & Sturmey, 2011).

Social and communication deficits associated with ASD, in general, appear around the age of two (ASA, 2007), and they affect multiple functions of a child's development. Because studies have noted there is no biological indicator that exists for ASD (Matson et al., 2011; Rice, 2009), mental-health professionals have tried to identify the presence of abnormal behaviors caused by ASD (Mancil, 2006; Matson et al., 2011; Reichle et al., 2010; Rogers, 2008; Wilkinson, 2012; Wing et al., 2011).

Autism. In 1943, Dr. Leo Kanner, a child psychiatrist and physician at Johns Hopkins Hospital, was the first person to identify the core symptoms of autism (e.g., non-interaction with others, uncoordinated motor movement, repetitive behavioral patterns, high levels of frequent temper tantrum behavior) and listed them as autistic disturbances of affective contact. He chose the word *autistic*, which means *self* in the Greek language, because those core symptoms led the children to be self-oriented. He found that the symptoms pervaded most parts of his 11 young patients' social, communication, and behavioral functioning. It is important to note that Kanner's observations of autistic disorder are still aligned with the current understanding of ASD (Matson & Neal, 2009; Matson & Sturmey, 2011). However, his findings did not attract public attention because autism was rare in the 1940s and 50s (Rice, 2009). When the first edition of the *DSM* was published in 1952, autism was listed under the category *childhood schizophrenia*.

In 1971, Kanner reported a follow-up study on the children he observed in the 1940s. The findings showed that 3 out of 11 children had significant long-term disabilities. In the end, Kanner (1971) concluded that autism seems to be an inborn developmental disability, which severely impairs the social and emotional functioning of a child. Similar to Kanner, Lotter (1978) conducted a longitudinal study to examine whether autistic symptoms are lifelong disabilities. In his study, between 61% and 74% of the children exhibited SIB. Only 5% to 17% of them lived close to a "normal" life, and their poor social skills and delays in developing communication skills made the acquisition of life skills difficult (Lotter, 1978). Overall, both studies confirmed that the symptoms caused by the disorder need special attention, and continuing the study of its diagnosis and possible treatments was unavoidable.

As the number of children with autism grows, more clinical studies have identified the problem behaviors caused by autism. When the second edition of the *DSM* was drafted in the

early 1970s, the term *autism* stood on its own. The core symptoms associated with autism have continuously been evaluated by different researchers, especially those in the field of applied behavior analysis (ABA; Matson et al., 2011; Matson & Neal, 2009; Matson & Sturmey, 2011; Wilkinson, 2012).

Asperger's syndrome. Although the *DSM-IV-TR* lists the disorder as *Asperger's disorder*, *Asperger's syndrome* is the term used across fields (Attwood, 2006; Cohan & Rémillard, 2006; Matson & Neal, 2009). There has been debate on whether Asperger's syndrome should be separated from autism (Attwood, 2006; Cohan & Rémillard, 2006), but until now it has been recognized as a mild form of autism (Matson et al., 2011; Matson & Neal, 2009). The disorder has been a heavily researched topic since the early 1980s, but early on, it was not recognized as a disorder like autism (Matson & Neal, 2009). Based on the *DSM-V*, the disorder is categorized as ASD.

Dr. Hans Asperger, an Austrian pediatrician, first described Asperger's syndrome in 1944. When he observed four children in his practice, he found that their IQ appeared to be normal and they seemed to be experts in their personal interests (Asperger, 1944/1991). However, he found that they had difficulties in social engagement, motor skills, and repetitive behaviors. Because the deficits he discovered were aligned with the ones found in autism, he used the term *autistic psychopath* in the clinical diagnosis (Asperger, 1944/1991). His finding was not spotlighted when it first came out, because the diagnosis coincided with Kanner's findings on autism and was written in German (Matson & Neal, 2009).

Some studies categorized Asperger's syndrome as high-functioning autism, because the core symptoms (e.g., restricted or stereotyped behaviors, limited communication skills) of Asperger's syndrome and autism overlap (APA, 2000; Matson et al., 2011; Matson & Neal,

2009). However, a recent trend in ASD research suggests that Asperger's syndrome should be separated from autism because the social and communication impairments of children and youth with Asperger's syndrome are less severe than those of children and youth with autism (Attwood, 2006; Bolick, 2011; Cohan & Rémillard, 2006; Matson & Neal, 2009; Matson & Sturmey, 2011; National Institute of Neurological Disorders and Stroke [NINDS], 2012; Wilkinson, 2012). The deficits caused by Asperger's syndrome worsen in the absence of intervention, although the symptoms are mild compared to classic autism (Attwood, 2006; Matson et al., 2011; Matson & Neal, 2009). The NINDS (2012) stated that the symptoms associated with Asperger's syndrome are typically detected around the age of three, and approximately 2 out of every 10,000 children are diagnosed with this condition.

Rett's disorder (RD), childhood disintegrative disorder (CDD), and pervasive developmental disorders not otherwise specified (PDD-NOS). Based on the *DSM-IV-TR*'s definition, the term *PDD* covers a range of disorders characterized by delays in social and communicative functioning. Autism and Asperger's syndrome are frequently diagnosed by mental health professionals (Attwood, 2006; Matson et al., 2011; Matson & Neal, 2009; Wilkinson, 2012), but not all developmental disorders are characterized as autism or Asperger's syndrome. In such cases, the disorders may be identified as Rett's disorder or syndrome, childhood disintegrative disorder or PDD-NOS. These disorders are often grouped as *atypical autism* (Matson & Neal, 2009). In the *DSM-V*, those disorders are grouped as ASD.

Children with one of these three disorders show normal development until the age of two, but after that age, abnormal development of communication skills (e.g., impairment in expressive and receptive language), social interaction (e.g., lack of empathy for others), motor skills, or behavior patterns can be observed. In the case of Rett's disorder, the deceleration of healthy

growth and presence of stereotyped hand movements (e.g., ritualistic hand-washing behaviors) are prominent features (Matson & Neal, 2009). The neurologist Andrea Rett was the discoverer of Rett's disorder in 1966, but the disorder was not classified as a PDD until 1999 (Matson et al., 2011; Matson & Neal, 2009). Considering that the *DSM-IV-TR* was published in 2000, the recognition of Rett's disorder is fairly recent. Children with childhood disintegrative disorder and PDD-NOS exhibit autism-like symptoms but are not characterized with the same severity of symptoms as children with autism or Asperger's syndrome.

Overall, delays in understanding language, difficulties with social interaction, and repetitive behaviors are all considered symptoms reflective of a PDD. Among the various PDDs, autism is the most studied because its symptoms are quite severe at an early age (Matson et al., 2011; NINDS, 2012; Wilkinson, 2012). Research related to Asperger's syndrome and the other related disorders has continuously grown; more children are diagnosed with one of these disorders rather than with autism (Attwood, 2006; Matson et al., 2011; Matson & Neal, 2009).

Behavioral Problems Caused by ASD

In the past decade, a number of studies have reported core deficits for children with ASD (Ingvarsson & Hollobaugh, 2010; Leaf et al., 2010; Mancil, 2006; Matson et al., 2011; Reichle et al., 2010; Rogers & Vismara, 2008; Sigafoos, 2000; Vollmer et al., 1999). The identified deficits in the literature are self-impulse control deficits (Harding et al., 2009; Mancil, 2006; Vollmer et al., 1999), failures to develop peer relationships (Ingvarsson & Hollobaugh, 2010; Leaf et al., 2010), stereotyped patterns of behaviors (Attwood, 2006; Matson & Neal, 2009), and delays in the development of language, communication, and high-order thinking (Dominick et al., 2007; Mancil, 2006; Reichle et al., 2010; Sigafoos, 2000). These are considered lifelong problems

(Matson et al., 2009; Matson et al., 2011; Poppes, van der Putten, & Vlaskamp, 2010), and research has been conducted investigating behavioral treatments for symptoms associated with ASD (Horner et al., 2002; Mancil, 2006; Matson et al., 2011; Rogers, 2008).

Because of their cognitive, language, and social deficits, children with ASD are especially at risk for developing problem behaviors (Attwood, 2006; Dominick et al., 2007; Harding et al., 2009; Hartley, Sikora, & McCoy, 2008; Horner et al., 2002; Matson et al., 2011), which is a major societal concern. Research has found the following typical problem behaviors for children with ASD: temper tantrums (e.g., severe, emotional expressions of anger, frustration, and/or vulnerability), SIB (e.g., head banging), property destruction (e.g., throwing a toy), physical aggression (e.g., screaming, hitting), and disruption (e.g., making a loud noise when a class is in session; Horner et al., 2002; Reichle, 1990). Because problem behaviors are pervasive (Horner et al., 2002; Matson et al., 2009), children with ASD who engage in problem behaviors are likely to be isolated from schools, peer relationships, and others. Horner et al. (2002) argued that problem behaviors are not likely to decrease without behavioral treatment.

In summary, the existing research has shown that (a) children with ASD have severe impairments of social, communicative, and behavioral functioning; (b) they are particularly at risk for the development of problem behaviors because of the associated impairments; and (c) the impact of problem behaviors on their educational and social learning might be lifelong in the absence of behavioral intervention. Considering these points, early interventions for children with ASD are necessary to prevent the entrenchment of problem behaviors, and to do so, a diagnosis of ASD by a qualified professional and a thorough analysis of the problem behaviors and the procedures of mental-health professionals should be performed in an approved setting (Mancil & Boman, 2010; Matson et al., 2011; Rice, 2009; Tiger et al., 2008).

The Need for Behavior Supports for Children with ASD

Previous studies have noted that the severe impairments caused by ASD are lifelong problems (Dominick et al., 2007; Horner et al., 2002; Mancil, 2006; Matson et al., 2011; Mancil & Neal, 2009; Reichle et al., 2010; Wilkinson, 2012), and that early interventions (including clinical diagnosis by qualified professionals, planning appropriate and individualized behavioral training, and creating specialized educational programs) are crucial for improving the behavioral outcomes of children with ASD (Individuals with Disabilities Education Act [IDEA], 1997; NINDS, 2012). The 1997 Amendments to the IDEA Act put great emphasis on the importance of assessment, early intervention, and early childhood special education for children with developmental disabilities (National Association for the Education of Young Children, 1997). The subsequent regulation of the IDEA Act (1997) ensures access for children with disabilities to general education through both in-state and district wide assessment systems (McLean, Wolery, & Bailey, 2004). Since the amendments to the IDEA Act (1997) were passed, each state department of education has received requests for assistance from educational staff in district special education programs (Bolick, 2011). The major issue expressed by those staff is the extent to which they can meet with mental-health professionals and determine their responsibilities for developing FBAs and possible intervention plans for children with ASD and other developmental disabilities (McLean et al., 2004; Wilkinson, 2012). Mental-health professionals have expressed the same concern due to the new expected description of autism in the *DSM-V* (published in May 2013), as well as the recent changes in the way mental-health professionals diagnose the basic triad of problems that identify ASD (Matson et al., 2011; Wilkinson, 2012; Wing et al., 2011). Considering the drastic increase in the number of children diagnosed with

ASD, clinical diagnosis as the first step of identifying behavioral problems is crucial (Carey, 2012; Matson et al., 2011; Wilkinson, 2012),

Concerns in the ASD diagnostic criteria. The main goal of the *DSM-V* is to promote objective diagnosis of mental and behavioral conditions of individuals. However, some of the proposed changes are rising concerns in parents and mental-health professionals (Wing et al., 2011). The diagnostic criteria influence the options for possible clinical treatments along with insurance coverage and eligibility for special education services (Carey, 2012; Wing et al., 2011). The proposed revisions seem to capture the essential elements of the current ASD definition, but Wing et al. (2011) suggested that the simplification of certain autistic features (i.e., combining social and communication problems into a single problem) may overlook some individuals with high-functioning autism who need health treatments and educational services. Wing et al. (2011) were the first to suggest that social and communication problems should be considered separately, because the inability to communicate verbally or nonverbally with others and the inability to predict cause-effect relationships are not related (Wing et al., 2011; Wing & Gould, 1979).

Myles and Simpson (2003) noted that the main difference between children with autism and those with Asperger's syndrome is that children with Asperger's syndrome do not exhibit severe delays in language and cognitive development. Mostly, their developmental abilities are close to the normal range (i.e., IQ scores between 90 and 100), so the underlying problems caused by Asperger's syndrome may not be easily detectable (Attwood, 2006; Myles & Simpson, 2003).

Despite growing awareness of possible complications, the *DSM-V* committee announced that the proposed changes will not be discriminatory against any individual with ASD who needs

assistance (Carey, 2012). The newly added recognition of genetic causes for ASD and the inclusion of social communication disorder may be a selective safeguard against diagnosing children with high-functioning autism, nevertheless, broadening the clinical terminology should be helpful for producing effective psychosocial interventions for children with ASD. Substantial interventions or strategies that produce therapeutic change in clinical settings for all autistic conditions and the triad of impairments are still needed (Matson et al., 2011; Wing et al., 2011).

Thus, the criteria for ASD diagnosis are intended to support clinical interventions for any individual based on the extent to which those treatments are empirically supported. However, the changed criteria in the *DSM-V* appear less defined than the current ones (Carey, 2012; Volkmar, 2010; Wilkinson, 2012; Wing et al., 2011). Even experienced mental-health professionals have difficulties recognizing the early markers of autistic symptoms (Myers & Johnson, 2007; Wing, 2005; Wing et al., 2011), so a thorough examination is necessary. In order to provide qualified professionals with clear guidelines for determining patient eligibility for services the new DSM will need to provide a clear and accurate roadmap for identifying the various ASD conditions.

Developmental measures. Together with the criteria outlined in the *DSM-IV-TR*, mental-health professionals utilize several psychological assessment tools to detect symptoms of ASD and to evaluate the development of language skills and behavioral patterns. The goal of these assessments is to determine whether the child has a particular developmental delay that meets the given criteria identified by the state for receiving health and special education services (McLean et al., 2004). In addition, the diagnosis helps primary caregivers and educational staffs identify possible behavioral assessments and intervention plans to serve the needs of the child (Florida Department of Education, 1999).

Among the existing assessment tools, the Autism Diagnostic Observation Schedule (ADOS), the Autism Diagnostic Interview-Revisited (ADI-R), and the Childhood Autism Rating Scale (CARS) are measurements that trained professionals have used with validated results (Matson et al., 2011). Qualified professionals (i.e., psychiatrists, licensed clinical psychologists, or physicians) are able to conduct these assessments. Subsequently, a clinical research team directed by the professionals can determine the diagnosis based on the results.

All three development measures are used to ensure consistent diagnostic procedures and detect the presence of common characteristics of ASD that impact the everyday life of a child with the disorder. The diagnostic process for evaluating children with ASD using these tools is that a trained professional interviews the child's primary caregivers, reviews relevant resources, and closely observes the child while asking him or her to perform specific tasks.

The ADOS. The ADOS is a standardized measure for diagnosing ASD and its related disorders (Lord, Rutter, DiLavore, & Risi, 1999). The approximate length of administration is 30 to 45 minutes, and the trained professional records and scores the observation. By evaluating behavior, communication, social interaction, and cognitive functions, the tool allows clinicians to diagnose ASD at any age. Most of all, the ADOS is play-based and fun for toddlers and preschoolers, who comprise the target age group of this study. Lord et al. (2000) tested all items of the ADOS to measure its validity and reliability. Their results showed that discriminative validity of the ADOS survey was 95% for autism and 92% for autism spectrum disorders. The interrater reliability of each of the three domains was shown to be 0.93 for social, 0.84 for communication, and 0.82 for repetitive behavior, respectively. The test-retest reliability for each of the three domains was shown to be 0.78 for social, 0.73 for communication, and 0.79 for repetitive behavior. Gray, Tonge, and Sweeny (2008) also measured discriminative validity of

the observational tool and found that Cohen's kappa for two observers was 0.73. In the given studies, every item was tested across and between different age groups to justify the tool's accuracy and reliability. Based on the results, the ADOS was found to be a fairly reliable and valid diagnostic tool to use for ASD diagnoses (Gray et al., 2008; Lord et al., 2000).

The ADI-R. The ADI-R (Le Couteur, Lord, & Rutter, 2007) is a widely used, standardized assessment tool for diagnosing ASD. Whereas the ADOS is used to evaluate the child through direct observation, the ADI-R is used to evaluate the child's developmental and behavioral history based on a primary caregiver interview. The ADI-R contains 93 questions that address a series of symptoms related to ASD: (a) language and communication skills, (b) reciprocal social interactions, and (c) repetitive, restricted, and stereotyped behaviors (Le Couteur et al., 2007). The developers of the ADI-R tested its validity and reliability after revisions were made to it. The reliability of each category was fairly good with kappa coefficients ranging from 0.62 to 0.89. The internal consistency of all items ranged from 0.45 to 0.70 with a Cronbach's alpha of 0.84. Overall, the results indicated that the ADI-R was valid and reliable (Lord, Rutter, & Le Conteur, 1994).

The CARS. The staff of the Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH) program in North Carolina formalized their observations of children with ASD and developed the CARS (Schopler, Reichler, DeVellis, & Daly, 1988; Schopler, Reichler, & Renner, 1986). The 15-item behavior rating scales identify whether the child has autistic tendencies and differentiates him or her from children who belong to other categories of developmental disabilities. The CARS can be used by any child who is at least two years of age. Since 1986, the CARS has been widely used by clinicians and educators to recognize and classify children with ASD. Each item in the CARS covers a particular

characteristic, ability, or behavior. After directly observing the child and analyzing relevant information from the primary caregiver's reports, the examiner rates the child on each item. Using a seven-point scale, he or she indicates the degree to which the child's behavior deviates from that of a normal child of the same age. A total score is computed by summing the individual ratings on each of the 15 items. Children who score above a given point are categorized as autistic. In addition, scores falling within the autistic range can be divided into two categories: mild-to-moderate and severe. Schopler et al. (1988) reported the test/retest reliability, internal consistency, and inter-rater reliability based on their 280 participants at TEACCH. The test/retest reliability of the CARS, which was assessed a year apart, was 0.88. The internal consistency (i.e., Cronbach's coefficient alpha) was 0.94. The inter-rater reliability for Schopler's two raters of the 280 participants was 0.71.

Temper tantrums as a Dependent Measure

Defining Temper tantrums

Temper tantrums are generally considered to be evidenced by the demonstration of a child's anger or frustration by aggressive physical movement. *Segen's Medical Dictionary* (2011), which has been recognized as the premier dictionary for health-care professionals, defines *temper tantrums* as follows: "A prolonged anger reaction in an infant or child, characterized by screaming, kicking, noisy, and noisome behavior throwing himself or herself on the ground to get his or her way from a parent/caregiver/warden." Typical examples of temper tantrum behavior evaluated by different research teams are being grumpy, crying, screaming, yelling, whining, throwing things, head banging, biting nails, et cetera (Belden et al., 2008; Giesbrecht et al., 2010; Green et al., 2011; Horner et al., 2002; Mancil, 2006; Potegal, Kosorok, & Davidson, 2003).

Temper tantrums as an Early Predictor for Future Problem Behaviors

Studies have noted that children with ASD exhibit a range of problem behaviors, such as temper tantrums, SIB, pica (i.e., eating something inappropriate), and/or stereotypy (i.e., repetitive physical movement by self-stimulation; Ahearn, Clark, MacDonald, & Chung, 2007; Dominick et al., 2007; Fisher et al., 2000; Harding et al., 2009; Horner et al., 2002; Iwata et al., 1982/1994; Mancil, 2006; Matson et al., 2011; Piazza, Roane, Keeney, Boney, & Abt, 2002; Reichle et al., 2010). According to Lecavalier (2006), the prevalence of such problem behaviors among children with ASD is approximately 50%. A recent study conducted by Matson et al. (2011) concluded that the frequency of problem behaviors experienced by children with ASD was rising and placed them at serious risk. Among the listed problem behaviors, Mancil (2006) found that temper tantrums were the most frequently reported (64%) challenging behavior by primary caregivers.

This study, therefore, focuses on temper tantrums as an important dependent variable to measure for the following reasons: (a) the behaviors are considered early indicators for future violent behaviors and interfere with other positive developments such as being engaged with school or forming healthy peer relationships (Green et al., 2011; Hartley et al., 2008; Matson et al., 2011; Potegal & Davidson, 2003), (b) temper tantrums among children with ASD often cause serious management problems for their primary caregivers and educators (Belden et al., 2008; Dominick et al., 2007; Horner et al., 2002; Mancil et al., 2006), and (c) recent studies have indicated that long, frequent, violent, and self-destructive temper tantrums not only indicate the presence of a developmental disorder (Belden et al., 2008), but are also connected to the actual occurrence of aggression and future antisocial behavior (Giesbrecht, Miller, and Müller, 2010; Green et al., 2011; Hartley et al., 2008). In child development, temper tantrums between the ages

of 18 months and 4 years are considered normative (Belden et al., 2008; Harrington, 2004), but a high frequency of temper tantrums and their continuation into later ages are closely associated with future maladjustment, especially among children with ASD (Belden et al., 2008; Dominick et al., 2007; Potegal & Davidson, 2003).

Other studies have concluded that children between the ages of 18 months and 3 years old normally exhibits temper tantrum behavior for the following two reasons: (a) the child has not learned how to respond to the undesired situation in appropriate ways (e.g., has undeveloped verbal and nonverbal communication) and (b) the child is unable to regulate negative emotions (e.g., lacks self-control or is hyperactive; Belden et al., 2008; Giesbrecht et al., 2010; Green et al., 2011; Mancil, 2006; Potegal & Davidson, 2003). Thus, the presence of temper tantrums is consistent with normative development in early childhood, but once the behaviors become a habit, they may strain future learning.

Especially for children with ASD, temper tantrums may provide a window into unregulated, strong, negative emotions if not properly treated (Dominick et al., 2007; Green et al., 2011; Matson et al., 2011; Potegal & Davidson, 2003). Based on primary caregivers' reports, Dominick et al. (2007) showed that the prevalence of temper tantrums was significantly higher in children with ASD (70%) as compared to children with normal developing disabilities. In addition, the authors found that the prevalence of temper tantrums was significantly higher in children with ASD as compared to children with mental retardation and language impairment. The findings also revealed that temper tantrums in children with ASD remained problematic and the behaviors rapidly escalated as the children aged. Among the ASD group, 20% of the children had frequently showed temper tantrums by the age of one, 40% by the age of two, and 50% by the age of three. The higher prevalence of temper tantrums in children with ASD was highly

correlated with the presence of aggression or self-injurious behaviors as the occurrence of temper tantrums was gradually increased by age (Dominick et al., 2007). The authors thus concluded that the temper tantrums of children with ASD be considered highly problematic. Aligned with their study, there has been a recent trend in developmental psychology and medical science for conducting scientific studies that evaluate the relationship between temper tantrums and future antisocial behaviors (Belden et al., 2008; Giesbrecht et al., 2010; Green et al., 2011).

Measuring Temper tantrums. Studies have utilized both qualitative and quantitative components (i.e., mixed methods) to measure temper tantrum behavior (Belden et al., 2008; Giesbrecht et al., 2010; Green et al., 2011). Belden et al. (2008) used primary caregiver interviews consisting of the temper tantrums section of the Preschool Age Psychiatric Assessment (PAPA) to measure the intensity, frequency, and duration of the participants' (three- to six-year old) temper tantrums. The chosen instrument, whose validity and test/re-test reliability had previously been well established in the literature (Egger et al., 2006), was designed to measure both qualitative and quantitative components of the target behavior. The qualitative component was to first evaluate the participants' tantrum behaviors based on the primary caregiver interview. All interviews were videotaped for better quality control. Next, the quantitative component (i.e., another interview of the caregivers) was conducted. The trained interviewers obtained all the necessary information in the presence of the caregivers and systematically measured the intensity, frequency, and duration levels of the temper tantrums following the 3-rating scales of the PAPA.

Considering that the research study was primarily designed as a group study (i.e., for a one-way, univariate analysis of variance), the use of the empirically validated assessment and the evaluation of the mixed methods were strengths of Belden et al.'s (2008) study. The major

drawback, however, was that both the diagnostic and temper tantrums data came from primary caregivers. Primary caregivers' responses are often considered reliable (Belden et al., 2008; Potegal & Davidson, 2003), especially when the children are young (i.e., under five years old) and/or have a delay in language and communication (Matson et al., 2011). However, their results might have been more convincing if the authors had measured the participants' temper tantrums through direct observation in an approved setting.

For a clinical experiment, the topography of temper tantrum behavior must be individually defined in order to measure the frequency, intensity, and/or duration of each child's behavioral pattern (Green et al., 2011; Potegal & Davidson, 2003; Vollmer et al., 1996). The extent to which researchers classify common temper tantrum behavior is subjective and depends on their primary goals. For example, Potegal and Davidson's study (2003) evaluated 335 children between the ages of 18 months and 5 years to determine the most frequent temper tantrum behavior. The findings revealed that crying was the most frequent (86%), screaming and shouting was second (40%), and whining was third (13%).

In the case of Green et al. (2011), the intensity of each behavior was measured based on a 3-point (i.e., low, intermediate, and high) temper tantrums intensity scale created by the researchers. They classified vocal behavior as follows: whining as a low level of anger, yelling as an intermediate or moderate level of anger, and screaming as a high or severe level of anger. The rating system also defined how the children's temper tantrum behavior escalated from low to high. In most cases, children who rated high scores were in the stage of meltdown, so they needed to be safeguarded to prevent potential danger (e.g., engaging in SIB, damaging others' belongings, etc.) (Green et al., 2011). Overall, the studies showed that temper tantrum behavior

are scientifically measureable, but creating the behavioral measure is subjective; it depends on how the researcher defines the behavioral hierarchy.

Factors Contributing to Temper tantrums

Developmental stage, temperament, and behavioral or health condition (e.g., having ASD) are considered major contributors to temper tantrums creation (Belden et al., 2008; Giesbrecht et al., 2010; Matson & Sturmey, 2011; Potegal & Davidson, 2003). The intensity and frequency of each child's temper tantrums vary, but there are developmental stages children typically go through (Belden et al., 2008; Harrington, 2004; Potegal & Davidson, 2003). In infancy, children use temper tantrum behavior as their primary communication mode for emotional expression (Giesbrecht et al., 2010; Green et al., 2011; Harrington, 2004; Potegal & Davidson, 2003). Between the ages of 1 1/2 and 3, children throw temper tantrums as a means of gaining independence and power (i.e., to get what they want immediately), so their temper tantrums often tend to be violent. Around the age of 3, temper tantrums still serve as a means of communication, but the violence of the previous stage fades away, because children at 3 years of age and older develop their perception and thinking skills (Green et al., 2011; Harrington, 2004). By the age of 4, temper tantrums do not occur in most cases, but if they do, they can be interpreted as social anxiety or frustration (Harrington, 2004; Potegal & Davidson, 2003). Some children throw more temper tantrums than others, if they are temperamentally more impulsive than others (Potegal & Davidson, 2003). Research has indicated that children with ASD or attention deficit and hyperactivity disorder are more likely to have high rates of temper tantrum behavior than other children because of their lack of self-control skills (Belden et al., 2008; Dominick et al., 2007). Overall, temperament, parenting, and environmental variables (e.g., setting, family conditions, etc.) can contribute to a child's tendency toward temper tantrums (Giesbrecht et al., 2010).

Temper tantrums as Predictors of Challenging Behavior for Children with ASD

Studies have found that temper tantrums were more common in children with ASD than in those without ASD (Dominick et al., 2007; Mancil, 2006; Matson et al., 2011; Reichle et al., 2010). Previous findings from laboratory studies of children's temper tantrums have implied that primary caregivers have difficulties in preventing or controlling temper tantrum behavior in children with autism (Dominick et al., 2007). There are multiple reasons for the difficulties managing them: (a) the occurrence of temper tantrums for children with ASD is more frequent than for other children due to their greater sensory sensitivity (Belden et al., 2008; Dominick et al., 2007), so it is difficult for the primary caregivers to predict what triggers them (Gardner, 2007; Mancil, 2006), (b) the duration of temper tantrums in children with ASD are greater than for children with neurotypical development or other developmental disabilities (Dominick et al., 2007), (c) the temper tantrums of children with ASD are more violent and aggressive than those of other children (Belden et al., 2008), and (d) the behaviors tend to escalate beyond the point where the children fully control them and the parents inadvertently reinforce them (Dominick et al., 2007; Gardner, 2007).

For children with ASD, it is important to intervene in temper tantrum behavior as early as possible so they do not lead the children to engage in self-injury or aggressive behavior (Belden et al., 2008; Giesbrecht et al., 2010; Matson et al., 2011; Potegal & Davidson, 2003). Once temper tantrums become a part of the daily routine, they are no longer considered normal development. Rather, they present a serious behavioral problem that can persist into later childhood (Green et al., 2011; Harding et al., 2009). In that case, temper tantrums can be a strong predictor of future antisocial behaviors (Potegal & Davidson, 2003), which is a compelling

reason for behavioral treatment studies on them (Belden et al., 2008; Giesbrecht et al., 2010; Green et al., 2011; Matson et al., 2011).

Several applied behavioral studies have examined clinical interventions that avert problem behaviors in children with ASD, and they have presented a number of possible behavioral preventions based on their final outcomes (Matson et al., 2011; Reichle et al., 2010; Vollmer et al., 1999). However, few studies have examined temper tantrums specifically among children with ASD because the causes of their temper tantrums are often uncertain (Kuhn et al., 2009; Dominick et al., 2007). For future research, Belden et al. (2008) suggested that the evaluation of relations between children's temper tantrums, their developmental and cognitive abilities, and parenting styles might be important for identifying the function of the problem behavior.

With respect to Belden's viewpoint, Kuhn et al. (2009) argued that the language and communication deficits caused by ASD make it difficult to understand what the children want from their temper tantrums. However, primary caregivers often use *coercion* (e.g., spanking the child when they do not follow what the parents ask) as their primary method for controlling the child's temper tantrums because they consider temper tantrums as rebellion. This parent-child coercion (also known as the *Patterson Coercion Model*) negatively reinforces problem behaviors and leads the children to later maladjustment, which escalates negative family and social climates. Gerald Patterson's *Coercion Model* of aggression (2002) shows that lack of parenting or discipline strategies gradually train children to be aggressive and antisocial. In the end, children who fail to control impulsive anger and aggression may feel distanced from their social network and the continuous perceptual distortions of social intervention will result in negative consequences (Patterson, 2002).

How parents teach their children can also be a strong predictor of the temper tantrums's behavioral outcome, given that children with ASD typically exhibit temper tantrum behavior more often than children developing normally and that their temper tantrums are strongly correlated with problem behaviors in later life (Dunlap, Koegel, Johnson, & O'Neil, 1987; Green et al., 2011; Matson et al., 2011; Reichle et al., 2010). Thus, it is crucial to examine temper tantrums functions in children with ASD so that alternative behaviors that have the same consequences as temper tantrums can be taught (Tiger, Fisher, Toussaint et al., 2009).

Function-Based Interventions for the Problem Behaviors of Children with ASD

As discussed, previous studies have indicated that temper tantrums and the presence of aggression for children with ASD are closely related to each other (Belden et al., 2008; Dominick et al., 2007), which makes temper tantrums important predictors of future maladjustment. In addition, research has provided evidence that temper tantrums of children with ASD caused by a lack of emotional regulation are major concerns for primary caregivers because those behaviors inhibit the lifelong learning of children with ASD (Fisher et al., 2000; Harding et al., 2009; Mancil, 2006; Matson et al., 2011, Potegal & Davison, 2003; Reichle et al., 2010; Vollmer et al., 1996). These problem behaviors have detrimental effects on the lives of children with ASD, resulting in potential health risks (Zachor & Ben Itzchak, 2010), the continuous use of intrusive actions and restricted behaviors (Sigafoos, 2000), and increased caregiver stress (Dominick et al., 2007; Lecavalier, Leone, & Wiltz, 2006).

The rising prevalence of problem behaviors caused by ASD has been mentioned by mental-health and related professionals (Hartley et al., 2008; Matson et al., 2011; Matson & Sturmey, 2011; Ringdahl, Kopelman, & Falcomata, 2009; Wilkinson, 2012). Thus, performing additional studies of the problem behaviors and the development of effective strategies to treat

them have gained importance (Horner et al., 2002; Granpeesheh et al., 2010; Matson et al., 2011; McGee, Morrier, & Daly, 1999; Peters-Scheffer et al., 2011; Ringdahl et al., 2009; Virués-Ortega, 2010; Zachor & Ben Itzchak, 2010). To design behavioral interventions with high treatment efficacy, clinical psychologists and related professionals gather comprehensive information on the environmental variables that scientifically identify the occurrence of the problem behavior and the conditions that maintain the behavior to determine why the behavior happens (Harding et al., 2009; Iwata & Dozier, 2008; Peter-Scheffer, Didden, Korzillius, & Sturmey, 2011; Tiger, Fisher, Toussaint et al., 2009; Virués-Ortega, 2010). In ABA, this process is known as FBA, whose development was described in Chapter 1.

Among the behavioral treatments in autism research, FBA and its treatment procedures (i.e., FCT) have been empirically validated and well established in the literature for years (Matson et al., 2011; Matson & Sturmey, 2011). Because the methodology of the proposed study is derived from FBA and FCT, the conceptual basis and foundation of FBA and FCT will be introduced. Then, the current findings that support the use FBA and FCT in the existing literature will be discussed in depth. The popularity of behavioral interventions has continuously grown over time (Matson et al., 2007; Matson et al., 2009; Matson et al., 2011), and they are currently utilized to treat common symptoms of ASD.

Learning the Main Purpose of Problem Behavior

The ABA field rests on the premise that the purposes for behavior will be most clearly defined if the behavior is directly observed and reported quantitatively (e.g., determining the frequency, duration, and intensity of temper tantrums; Skinner, 1953). As discussed, children's temper tantrum behavior have been directly observed by primary caregivers (Belden et al., 2008) or experimenters (Green et al., 2011) in past research. Both Belden et al. (2008) and Green et al.

(2011) specifically defined temper tantrums as screaming, whining, crying, et cetera so that any person unfamiliar with the behavior could recognize its topography. Based on behavioral observations and the given definition, the frequency and duration of the temper tantrums were measured in experimental settings (Belden et al., 2008; Green et al., 2011).

When a behavior is considered problematic (e.g., frequently occurring, posing self-risk, limiting future learning), identifying the cause of the problem behavior is the first step in ABA. As explained by the ABA literature (Cooper, Heron, & Heword, 2007; Matson & Neal, 2009; Matson & Strumey, 2011), this type of scientific study carries the implicit assumption that (a) the behavior occurs under certain environmental or biological conditions (i.e., antecedents), and that (b) the behavior is then followed by a consequence, which later determines the likelihood of the reoccurring behavior. If the consequence is either a positive or a negative reinforcer that occurs immediately following the behavior, it is likely that the occurrence of the behavior will increase. If the consequence is a punishment, the occurrence of the behavior is likely to decrease.

All behaviors serve a function or purpose (Carr, 1977). That is to say, behavior is a means of (a) gaining social attention (i.e., the attention condition), (b) gaining access to a desired item or an activity (i.e., the tangible condition), (c) avoiding an undesirable event (i.e., the demand or escape condition), or (d) sensory stimulation (i.e., the alone condition; Carr, 1977; Carr & Durand, 1985; Iwata & Dozier, 2008; Iwata et al., 1982/1994; Matson & Neal, 2009; Vollmer et al., 1996).

Functional behavioral assessment (FBA). A significant body of ABA research supports the use of behavioral interventions such as FBA for children with ASD (Hanley, Iwata, & McCord, 2003; Matson et al., 2011; Matson & Neal, 2009). An FBA is an initial step for understanding the way in which the target behavior relates to the environment (Furniss, 2009;

Horner, 1994). Data from the FBA aids mental-health professionals in planning behavioral strategies. The goals of a well-conducted FBA are to provide information on (a) the specific contingencies that maintain the problem behavior, (b) the antecedent conditions that need to be implemented for preventing the reoccurrence of the problem behavior, and (c) a possible replacement behavior that serves the same function as the problem behavior. Altogether, the intent of an FBA is to discover the cause and effect relationship between the problem behavior and possible consequences (Iwata & Dozier, 2008). The results of the FBA also help experiments build hypotheses between specific environmental stimuli and the occurrence of the problem behaviors. In general, three different methods are used to conduct an FBA: indirect assessment, descriptive assessment, and functional analysis.

Indirect assessment. Often referred to as *anecdotal assessment*, indirect assessments gather background information about the problem behavior. Informant measures (e.g., interviews, surveys, checklists) that rely on either the primary caregivers or others related to the children are used in the assessment; those methods are considered straightforward and time efficient for conducting an FBA (Iwata & Dozier, 2008). The primary caregiver interviews used by Belden et al. (2008) are an example of indirect assessment, because the parental responses were used to measure the children's temper tantrums without direct observation. The strengths of Belden et al.'s (2008) method were as follows: (a) their assessment was structured to get relevant information from parents and (b) there was no risk to the participants caused by direct observation. Some children with severe temper tantrum behavior may pose a risk to themselves or others (Matson et al., 2011), so if Belden et al. (2008) had conducted a direct observation, there would have been some potential risk involved in the study. Because their primary purpose was to provide a preliminary guideline to parents and health-care professionals on how temper

tantrum behavior might indicate a psychiatric disorder, their use of indirect assessment was appropriate.

However, when the ultimate goal of a study is to find behavioral strategies that decrease temper tantrum behavior, the findings from indirect assessment are not reliable enough (Iwata & Dozier, 2008). The results of an indirect assessment are not useful as a sole assessment procedure when attempting to determine the function of a problem behavior, but its findings can be used as a preliminary guide for further investigation of the target behavior. Researchers frequently rely on primary caregiver reports to determine various factors about problem behaviors, such as the types of attention delivered in the children's typical environments (Harding et al., 2009) and the types of demands the children find aversive (Reichle et al., 2010).

Measures of indirect assessment. Over the past few years, researchers in ABA have examined the utility of FBA questionnaires (Herzinger & Campbell, 2007; Horner, 1994; Iwata & DeLeon, 1996; Iwata & Dozier, 2008; Matson et al., 2011), such as the Motivational Assessment Scale (MAS; Durand & Crimmins, 1988, 1992) and the Functional Analysis Screening Tool (FAST; Iwata & DeLeon, 1996). The MAS had frequently been utilized prior to the FAST's development, but research has provided evidence that the tool is not reliable (Sigafoos, Kerr, Roberts, & Couzens, 1993; Zarcone, Rodgers, Iwata, Rourke, & Dorsey, 1991). Zarcone et al. (1991) reexamined the reliability of the MAS and found a poor interrater reliability of 20% for the tool. Similar to Zarcone et al.'s (1991) study, Sigafoos et al. (1993) found that the lowest percentage of interrater agreement, an overall mean of 43% across participants and questions, was on questions that were most indicative of behavioral function.

The FAST (Iwata, 2002) has become the most widely utilized questionnaire for determining the function of target behaviors since the late 1990s (Iwata & Dozier, 2008). Iwata

and DeLeon (1996) found a test-retest reliability of 67% when examining the tool, but the reliability is still unpublished by the authors and has little empirical support for its use (Ellingson et al., 1999). Furthermore, there have been no published studies examining the use of the FAST for people with ASD although new measures for use in an FBA (e.g., the GB Motivating Screening Tools) are continuously developed (Barrera & Graver, 2009; Singh et al., 2009).

More evidence supporting the use of the FAST is needed, but current researchers still rely on the results from the FAST as their preliminary guide (Iwata & Dozier, 2008; Tiger, Fisher, Toussaint et al., 2009). The reasons for its use in this study are that (a) it requires minimal time (i.e., 10 to 15 minutes) to conduct the assessment in clinics (Iwata, 2002; Iwata & Dozier, 2008); (b) it is primarily designed for initial assessment; which helps the experimenter develop hypotheses prior to the direct observation, and (c) it is a structured method that helps the experimenter gather information on what to include in the direct observation (i.e., the FA; Fisher et al., 2000; Hanley et al., 2003; Iwata, 2002; Iwata & DeLeon, 1996; Iwata & Dozier, 2008; Vollmer et al., 1996).

Descriptive assessment. Also known as *naturalistic assessment*, this method has been used as a supplementary measure to gather information that is not obtained from indirect assessment (Iwata & Dozier, 2008). Descriptive measurement requires direct observation of the circumstances surrounding the problem behavior. Its primary goal is to identify the correlational relationship between the problem behavior and its surroundings. To do so, the experimenter observes the participant in the setting under which the behavior is most likely to occur. During the direct observation of relevant activities and contexts, the experimenter measures and analyzes the sequence of antecedent-behavior-consequences (i.e., an ABC analysis). Bijou, Peterson, and Ault (1968)'s ABC chart has been well-known in the literature, which allows researchers to

compile and analyze data to isolate the environmental events that are strongly correlated with the occurrence of the target behavior. However, since the assessment is individually tailored to meet the researcher's needs (Harding et al., 2009; Iwata & Dozier, 2008), researchers have implemented various methods to collect their data. Generally, there are two ways of ABC recording: Continuous and narrative data recording. Continuous data recording is to collect data on the preceding event, the occurrence of the problem behavior, and the consequences (Neef & Paterson, 2007). Narrative data recording is to collect events in which the problem behavior occur (Neef & Paterson, 2007). Recent studies used both methods, but some note that continuous data recording allow researchers to find out strong possibilities on the likelihood of the occurrence of the problem behavior under a specific environmental event (Harding et al., 2009; Iwata & Dozier, 2008).

In summary, ABC data collection is extremely helpful in that the findings allow the researcher to collect objective data in the natural environment, revealing the natural contingencies that maintain the problem behavior (Neef & Peterson, 2007). However, the findings based on the ABC data does not identify cause and effect relationship between the target behavior and the environmental event—which requires a direct assessment (Iwata & Dozier, 2008).

Direct assessment. The direct assessment often used to establish a baseline for a procedure is the functional analysis (FA) established by Iwata et al. (1982/1994). The purpose of the FA is to identify sources of positive reinforcer for a problem behavior while conducting direct and quantifiable observation of the problem behavior in the most controlled setting. A significant body of ABA research has empirically supported the validity and reliability of FA (Fisher et al., 1996; Fisher et al., 2000; Fisher, Kuhn, & Thompson, 1998; Hanley et al., 2003;

Harding et al., 2009; Horner, 1994; Iwata & Dozier, 2008; Tiger, Fisher, Toussaint et al., 2009; Vollmer et al., 1996), and its methodology is often used as baseline measure in clinical research (Matson et al., 2011).

This experimental analysis involves exposing participants to four or five different environmental conditions likely to evoke the target problem behavior. The logic behind its use is that the experimenter can identify casual relationships between the behavior and the environmental conditions, providing specific consequences in response to the behavior (Harding et al., 2009; Iwata et al., 1982/1994; Vollmer et al., 1996). The most standardized way of conducting an FA is the rapid alteration in a random order of the experiment conditions (i.e., attention, demand, tangible, and alone) and the control condition (i.e., play) while all other variables are controlled (Iwata et al., 1982/1994). Then the behavior changes in each condition are plotted on a graph to determine the function of the behavior. For example, if the rate of the behavior was elevated in the escape condition, it is concluded that the behavior is caused by negative reinforcer (Reichle et al., 2010).

In their 1982 study, Iwata et al. used an FA to identify the function of SIB. Nine children and adolescents with intellectual disabilities who displayed various topographies of SIB were introduced to the four experiment conditions. Some notable findings were revealed based on their data. At first, each participant's response to the first condition was different, which showed that SIB was maintained by different conditions (Iwata et al., 1982/1994). Next, two thirds of the participants exhibited high levels of SIB associated with attention conditions, so the researchers concluded that the cause of the SIB was the result of certain environmental conditions (Iwata et al., 1982/1994). Based on the findings, the authors concluded that an effective behavioral intervention can be developed and implemented to fulfill each participant's needs. The major

drawback of the study, however, was that the authors did not describe how the results of the FA could promote effective behavioral treatment for problem behavior.

Several studies have highlighted some potential limitations of FA. Sturmey (1995) was critical that a low rate of displayed behaviors may not yield a sufficient amount of data for identifying the function. Sturmey (1995) also pointed out that rapid changes between the conditions can cause multiple problems, such as participants discriminating between alternating conditions and the problem behavior being caused by the changes. Horner (1994) suggested that the conditions used in FA are too broad to identify the specific causes of a problem behavior. Hall (2005) pointed out that the social validity of FA is limited, because the method is primarily designed for a controlled setting in which the participant is exposed to arranged conditions not identical to those produced from the natural environment. That is to say, the casual relationship identified by an FA may not be generalizable to other settings.

Despite its limitations, FA is still recognized as the most time-efficient way of identifying target behavior functions in ABA research (Hanley et al., 2003; Iwata & Dozier, 2008). The most attractive quality of FA is that it gives the experimenter rigid control over the environment, which makes the identification of a causal relationship between environmental events and the target behavior easy (Neef & Paterson, 2007). Since 1982, numerous studies have used an FA to identify the functions of various behaviors in individuals with ASD and other developmental disabilities including aggression (Fisher et al., 2000; Fyffe, Kahng, Fittro, & Russell, 2004; Harding et al., 2009; Reichle et al., 2010; Thompson & Iwata, 2007; Vollmer et al., 1996; Vollmer et al., 1999), stereotypy (Ahearn et al., 2007), pica (Piazza et al., 2002), and SIB (Dominick et al., 2007; Iwata et al., 1984/1992). Those researchers implemented behavioral treatments based on the results of the FA and a significant reduction in problem behaviors was

found. Their findings have substantially demonstrated the validity and reliability of the methodology over time (Hanley et al., 2003; Iwata & Dozier, 2008; Matson et al., 2011).

Data collection in direct assessment. In terms of data collection, there are several ways in which researchers measure the target behavior objectively. If the problem behavior is discrete (i.e., fairly short in duration with a definite beginning and ending point) such as seat-leaving, the experimenter uses a frequency measure (e.g., noting that the participant yelled three times in a session), collects all the frequency data, and plots a graph to identify the source of the problem behavior. If the behavior is continuous (i.e., an ongoing behavior) such as talking with friends or temper tantrums, the experimenter uses *partial-interval* measures (e.g., noting that the participant screamed during a given interval) and collects the data (Fisher et al., 2000; Hanley et al., 1994; Harding et al., 2009; Iwata et al., 1982/1994). For partial-interval recording, an estimate of the actual number of times the behavior occurs is derived (e.g., the screaming occurred during 4 of 30 intervals). Thus, the number of intervals in which the behavior occurs is divided by the total number of intervals and converted to the percentage of actual occurrences (Gast, 2010). Partial-interval data recording has gained popularity over time because most problem behaviors are ongoing and the data showing the overall performance of behavioral changes is given on a graph (Gast, 2010; Harding et al., 2009; Reichle et al. 2010).

Functional Communication Training (FCT)

Since 2000, a growing body of research has situated FCT as the most prominent functional behavioral technique, especially for use with children and adolescents with ASD (Braithwaite & Richdale, 2000; Casey & Merical, 2006; Danov, Hartman, McComas, & Symons, 2010; Falcomata, Roane, Feeney, & Stephenson, 2010; Gibson, Pennington, Stenhoff, & Hopper, 2010; Harding et al., 2009; Mancil, 2006; Mancil & Boman, 2010; Matson et al., 2011). That

trend is likely to continue. The vast majority of children with ASD experience difficulties with social and communication learning, and they feel challenged in emotional regulation (Feldman et al., 2011; Mancil, 2006; Mancil & Boman, 2010). The difficulties they face require effective behavioral intervention to overcome.

The FCT treatment has been recognized as a systematic practice for decreasing inappropriate behaviors and replacing them with socially acceptable behaviors (Tiger et al., 2008). It has demonstrated the effectiveness of positive behavioral support for individuals with ASD and other developmental disabilities (Fisher et al., 1993; Fisher et al., 2000; Harding et al., 2009; Lalli et al., 1995; Mancil, 2006; Mancil & Boman, 2010). The use of FCT is a well-established practice in ABA (Tiger et al., 2008). It is a systematic method of replacing problem behaviors with effective social or communication behaviors (Franzone, 2009). Several aspects of the FCT treatment process have been evaluated and examined by different research teams with the purpose of maximizing its treatment efficacy for young children with ASD.

Once the researcher identifies the function of the problem behavior through the FA, a behavioral strategy is implemented. The goal is to decrease the participant's motivation to engage in the problem behavior and replace an alternative behavior, which is accomplished through the differential reinforcer of alternative behavior. Derived from these procedures, FCT is based on the hypothesis that problem behavior like temper tantrums may serve a communicative function (Mancil & Boman, 2010; Tiger et al., 2008). The purpose of FCT is to identify the function of each disruptive behavior and then teach an alternative behavior that uses appropriate forms of communication (i.e., alternative response). For instance, if the function of a temper tantrum behavior has been identified as a way to gain a desired item (i.e., a tangibly motivated behavior) through the FA, the child is taught how to request the item by speaking, gesturing, or

pointing to a picture card that shows the item, which is a technique known as *picture exchange communication system (PECS),* rather than throwing a temper tantrums.

Stages of FCT. There are three stages to FCT. First, an FA is conducted to identify under what conditions the problem behavior is invoked and maintained. Next, the researcher must evaluate whether (a) the problem behavior has communicative intent (Carr & Durand, 1985) and whether (b) the alternative behavior serves the same communicative function as the problem behavior, which is the underlying assumption behind differentially reinforcing alternative behaviors. Finally, the alternative behavior, a socially appropriate communicative response, is taught through the use of positive reinforcers. When the training has reduced the problem behavior and increased the use of alternative behavior, the researcher can reasonably conclude that the intervention was effective (Mancil, 2006).

To maximize the treatment efficacy of FCT, the results of the FA must be reliable so the researcher can ensure that the problem behavior is appropriately targeted for replacement. Michael (1982) stated that procedures used to establish the problem behavior's purpose are likely to increase the value of the reinforcer chosen; thus, identifying the conditions that evoke the problem behavior is crucial prior to implementing possible interventions.

Identifying functions of problem behaviors. In the FCT research done between 1990 and 2010, a range of problem behaviors exhibited by individuals with ASD and other developmental disabilities were examined: SIB (Braithwaite & Richdale, 2000; Casey & Merical, 2006; Danov et al., 2010; Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998; Harding et al., 2009; Lalli et al., 1995; Vollmer et al., 1998), physical aggression and property destruction (Braithwaite & Richdale, 2000; Fisher et al., 2000; Hagopian et al., 1998; Hagopian et al., 2005; Vollmer et al., 1996; Wacker et al., 2005), pica (Ahearn et al., 2007; Hagopian et al., 1998),

stereotypy (Piazza et al., 2002; Wacker et al., 1990), elopement (i.e., running away from what is being required) (Falcomata, Roane, Feeney, & Stephenson, 2010; Gibson et al., 2010), and inappropriate sexual behavior (Fyffe et al., 2004). Aggression and SIB were the most prominent challenging behaviors in the research. In 2006, Mancil's meta-analysis found that 64% of FCT studies reported SIB and aggression as the most frequently found problem behaviors.

The reasons why problem behaviors were displayed, based on the results of the FAs conducted in these studies, are shown on Table 3 and include the demand condition (9 cases), the tangible condition (6 cases), and the attention condition (4 cases). Both Mancil's (2006) and Tiger et al.'s (2008) meta-analyses of FCT literature between 1985 and 2006 noted that the demand condition was the most frequently identified reason for the display of problem behaviors in children with ASD (55% of the cases in Mancil's study and 43% of the cases in Tiger et al.'s study). In the literature, attention condition was defined as the condition in which the participants' problem behavior was maintained by a person's attention. Demand condition was defined as the condition in which the participants' problem behavior was maintained by escaping from the given task. Tangible condition was defined as the condition in which the participant's problem behavior was maintained to obtain their preferred items.

Table 3

The Identified Functions of Problem Behaviors in the Existing Functional Communication Training (FCT) Literature

FCT Study	Problem Behavior Cause
Braithwaite & Richdale (2000)	Demand and tangible conditions
Casey & Merical (2006)	Demand condition
Danov et al. (2010)	Tangible condition
Farcomata et al. (2010)	Demand condition
Fisher et al. (2000)	Attention and tangible conditions
Fyffe et al. (2004)	Attention condition
Gibson et al. (2010)	Demand condition
Hagopian et al. (1998)	Demand condition
Hagopian et al. (2005)	Attention and tangible conditions
Harding et al. (2009)	Demand and tangible conditions
Vollmer et al. (1998)	Demand condition
Wacker et al. (1990)	Attention, demand, and tangible conditions
Wacker et al. (2005)	Attention and demand conditions

Target population. In the current FCT literature, the majority of study participants, about 80%, were individuals with autism and PDD (Mancil, 2006). Two thirds of the participants were males (Mancil, 2006; Mancil & Boman, 2010; Tiger et al., 2008; Wacker et al., 2005). The age range of the participants was from 2.7 to 14 years, with a mean of 8 years (Mancil, 2006; Wacker et al., 2005). The age group between 3 and 7 years old have been frequently selected and examined by different researchers, because studies provided that children with ASD's problem behaviors were significantly decreased when behavioral interventions were implemented in early childhood (Mancil, 2006; Mancil & Bowman, 2010; Matson et al., 2011).

Characteristics of settings. Because FCT was first developed as a clinical intervention (Carr & Durand, 1985), most FCT research has been conducted in clinical settings (Fisher et al., 2000; Hagopian et al., 1998; Tiger et al., 2008). There is a growing awareness that conducting FCT in highly controlled settings results in a lack of social validity for the treatment (Tiger et al., 2008). Wacker et al. (2005) argued that treatment efficacy of FCT in the clinical environment would not be the same as for the natural environment, so more studies are needed. In 2009, Harding et al. conducted FCT in a home environment to reduce a 2-year-old boy's problem behavior caused by the escape condition. The participant's problem behavior decreased to near zero rates while the use of appropriate behavior increased. To increase the social validity of the FCT, the researchers concluded that the extent to which the treatment is implemented as planned must be ensured in the natural setting.

Implementing FCT with additional procedures. Once the function of the problem behavior and the alternative behavior are identified, FCT can be implemented. How experimenters teach the communicative responses to participants varies. Depending on the children's receptive language abilities, either verbal or nonverbal alternative behaviors can be taught. For teaching nonverbal responses, several studies have utilized the strategy called the *picture exchange communication system (PECS),* which allows the child to use a picture card as a communicative response (Harding et al., 2009; Vollmer et al., 1999). The *prompting* technique, which involves giving a cue or hint that helps the participants remember to use the alternative behavior, is often used to accelerate learning the alternative behavior (Matson et al., 2011).

While implementing FCT, different conditions have been manipulated to evaluate its treatment efficacy in the research studies (Fisher et al., 1993; Fisher et al., 2000; Hagopian et al., 1998; Hagopian, 2005; Lalli et al., 1995). A number of studies indicated that FCT alone often

fails to sufficiently reduce problem behaviors (Fisher et al., 1993; Hagopian et al., 1998; Peterson et al., 2005). Instead, components added to FCT have been shown to be more effective than using FCT alone including extinction procedures (i.e., giving no attention to the problem behavior) and punishment procedures (i.e., removing the reinforcer if the problem behavior is maintained.

In 1993, Fisher, Piazza, Cataldo, Harrell, Jefferson et al. examined three variations of FCT procedures—FCT alone, FCT with extinction, and FCT with punishment—to determine which condition resulted in the most significant reductions of problem behavior. Four children with developmental disabilities participated in the study. Two of them engaged in problem behaviors to escape demands, and the other two engaged in problem behaviors to gain access to their preferred items. First, the FCT alone condition was implemented. The participants were allowed to either escape from demands or receive the item they wanted when they used the replacement behavior. Then, FCT with extinction was implemented. This time, the participants were positively reinforced only when the problem behavior was not used and the replacement behavior was. The third condition was FCT with punishment, and participants were unable to obtain positive reinforcer if the problem behavior was used at all. The FCT alone condition did not produce clinically significant reductions of the problem behavior; the FCT with extinction and FCT with punishment conditions significantly reduced the problem behaviors to nearly zero.

Hagopian et al. (1998) conducted a meta-analysis of the FCT literature to evaluate which variations of FCT procedures used in previous studies were effective. In 27 case studies, FCT with extinction resulted in an approximate 90% reduction of problem behaviors. By contrast, FCT alone resulted in an approximate 60% to 80% reduction. Based on these results, the authors did not highly recommend the use of FCT alone for reducing problem behaviors.

Delayed Gratification Training as a Part of FCT Procedures

Need. The past 27 years of ABA research have provided a substantial amount of support for the empirical validity of FCT (Mancil & Boman, 2010; Tiger et al., 2008). As discussed previously, the main goal of FCT is to identify the function of one disruptive behavior through an FA and teach an alternative one for the target behavior by showing the child how to use an appropriate form of communication instead. In general, children with ASD have difficulty regulating their emotions (Belden et al., 2008; Potegal & Davidson, 2003). High levels of aggressive behavior make it hard for these children to communicate functionally, so finding an effective psychological treatment to decrease those misbehaviors and increase more functional forms of communication is critical to both educators and clinical psychologists (Casey & Merical, 2006; Mancil & Boman, 2010; Tiger et al., 2008).

A major challenge of using FCT as a treatment, however, is that positive reinforcers for using alternative behaviors in the natural environment may not always be immediately available (Fisher et al., 2000). If such is the case, the child may first use his or her communicative response but if the reinforcer is not immediately given, he or she is likely to escalate problem behaviors (i.e., called *extinction burst* in ABA). Because of the non-immediate response, the child's communicative response is likely to be decreased. *Extinction burst* has been recognized as the major drawback of FCT.

Thus, teaching delayed gratification (or time-delay procedure) along with FCT has drawn significant attention from both developmental and behavioral scholars (Kelley et al., 2011; Matson et al., 2011; Reichle et al., 2010; Vollmer et al., 1999). Some studies have suggested that using FCT with additional procedures that teach delayed gratification through delaying reinforcers in various ways might help children with ASD to self-manage their aggressive

behaviors (Fisher et al., 1993; Fisher et al., 2000; Fisher et al., 2005; Hagopian et al., 2005; Lalli et al., 1995; Taylor & Harris, 1995; Tiger et al., 2008; Vollmer et al., 1999). Nevertheless, in ABA research, few studies to date have systematically evaluated effects of delays on children with ASD when learning to communicate, because it is difficult to teach children with ASD to wait before communication requests can be granted due to their underdeveloped receptive communication skills (Fisher et al., 2000; Kelley et al., 2011; Reichle et al., 2010; Vollmer et al., 1999).

Researchers in both clinical and developmental psychology have recently argued that evaluations of impulsivity and the ability to delay gratification may help children with ASD avoid future problem behaviors (Feldman et al., 2011; Lee et al., 2008; Matson et al., 2011; Orman, 2009; Reichle et al., 2010). Impulsive behavior occurs when an individual favors immediate reinforcer over delayed reinforcer (Fisher et al., 2000; Lee et al., 2008; Mischel, 1961 Vollmer et al., 1999). These findings have revealed that learning to delay gratification can promote self-control, which can be a predictor of positive social behavior in later life (Fisher et al., 2000; Mischel et al., 1989; Reichle et al., 2010).

Manipulating time-delay conditions during FCT. Fisher et al. (2000) conducted extensive research on the relationship between FCT and delayed reinforcer. In their first experiment, a 3-year-old boy received two treatments: FCT alone and FCT with extinction. During the baseline measure, the participant's problem behavior was maintained by adults' attention. In the first treatment session, the experimenter provided FCT to the participant, and the rate of the problem behavior slightly decreased. Then, FCT with extinction was implemented. The participant's problem behavior was reduced to near zero. The third experiment was also FCT with extinction, but a delay between the alternative behavior occurrence and the delivery of

reinforcer was gradually increased to 30 seconds. The participant's problem behavior was decreased to zero after the third experiment. The results indicated that teaching the participant to wait for reinforcer made FCT more effective. The authors concluded that a delayed reinforcer may give long-term benefits to children with developmental disabilities in terms of regulating self-emotions, because the problem behavior was not evoked after the delayed condition was introduced (Fisher et al., 2000).

The delayed condition Fisher et al. (2000) implemented is known as *schedule thinning*, and several studies have used this technique during the implementation of FCT (Hagopian et al., 2004; Lalli et al., 1995; Vollmer et al., 1999). To expand on Fisher et al.'s (2000) study, Hagopian et al. (2005) examined FCT alone, FCT with extinction, and FCT with extinction and competing stimuli. Three children with developmental disabilities had problem behaviors with attention, tangible, and escape conditions identified as the causes. In the first phase, FCT was introduced alone and all participants obtained their reinforcer when they used the alternative behavior. In the second phase, all participants were placed on extinction if the alternative behavior was not used within 30 seconds of showing a problem behavior. In the third phase, the procedure was the same, but the schedule of reinforcer was thinned, meaning that the delay between the replacement behavior use and the reinforcer delivery was increased. In other words, all participants learned to wait without engaging in the problem behaviors after they provided the alternative behavior. The findings revealed that FCT with extinction was the most effective in reducing the problem behavior, but introducing delays may have increased the treatment efficacy of FCT.

Time-delay methods have been more meaningfully used in educational settings than in clinical settings. Hagopian et al. (2005) showed the way in which time delays could be used as a

means of increasing on-task behavior. Two types of time-delayed procedures were introduced by the authors, which were progressive and constant (or fixed) time delays. *Progressive* time delay procedures are intended to teach the ability to wait with gradual increase of wait time, while directly manipulating either verbal or visual cues within the given time (e.g., saying "Good waiting!" in every 30 second within 5 minutes). In this procedure, the child learns how to delay gratification when given verbal help and also, he or she is likely to tolerate more wait time without any recognition. *Constant (or fixed)* time delay procedures specify certain lengths of time for delays between the giving of instructions to children so they can use their new skill (Hagopian et al., 2005). Constant time delay has often been used in clinical settings, whereas progressive time delay has more regularly been applied to the natural environment (Reichle et al., 2010).

Lerman, Addison, and Kodak (2006) made a preliminary study of self-control during aversive events to investigate the ways in which children with autism tolerated task delays. The purpose of this study was to examine children with autism's behavioral sensitivity in the amount and delay of tasks as part of testing their self-control. Two children with autism whose problem behaviors are maintained by escape participated in the study. The children's behavioral sensitivity was evaluated in three different conditions: Magnitude analysis, delayed analysis, and self-control analysis. In the magnitude analysis, each child was asked to choose one task between small and large. Then, during the delayed analysis, if the child preferred the immediate task to the large one, the child was prompted to make another choice 1 minute after completing the task. If the child chose the large task, the child was prompted to make another choice 10 seconds after completing the task. In the self-control analysis, the child was again asked to choose one between small and large task, but if the child successfully completed the chosen task on his own

(i.e., showing self-control), the amount of the chosen task was increased (i.e., 10 seconds) to determine whether the amount of the task might influence on the child's self-control. The results of this preliminary study showed that the choice-making of the two children were sensitive to differences in the amount and delay of aversive tasks. The children constantly preferred the small task to large task during the magnitude analysis. However, when they realized the amount of delay was longer after choosing the small task, the children preferred the large task. During the self-control analysis, when the amount of time for task completion was gradually increased, the children failed to show self-control (i.e., they were more likely to fail to complete the chosen task when the amount of time was increased to 20 second, 30 second, and etc.), which made the authors concluded that the amount of work and the length of time delay seemed to influence on self-control. The results might be more convincing if the children's behavioral sensitivity was compared to that of children with normal development, but still, the research provided evidence that children with autism seemed to have a lack of self-control in regards to make a choice between two aversive events.

Three studies demonstrated how time delay procedures effectively worked for children with autism when social skills were promoted. Charlop et al. (1985) conducted a study on the promotion of verbal skills. With a progressive time delay, all the participants gradually mastered how to communicate with others and made progress on their problem-solving strategies. Thus, after they had learned to request something from others, they applied the communication strategy in similar situations. Taylor and Harris (1995) also used the progressive time-delay method in an educational setting. When the delay was gradually increased, children with ASD showed more communicative response and sought information. Liber et al. (2008) conducted a study to evaluate how children with autism demonstrated their social skills with time-delay procedures.

The constant time delay was used, and the results indicated that participants were able to demonstrate their new skills through the intervention. Considering that learning social skills is related to the goal of FCT, those studies proved that FCT with time-delay procedures are beneficial for early interventions in autism research.

Reichle et al. (2010) recently conducted a study to examine the effects of various ways to communicate a delay (i.e., a *delay cue*) while implementing procedures to teach delayed gratification to children with ASD. The reinforcer delivery was used to increase task engagement and minimize escape condition problem behaviors in children with ASD. The authors investigated how delayed gratification sufficiently helped participants self-regulate impulsiveness and increase learning abilities. *General* delay cues do not give the exact length of task conditions (e.g., saying, "You're almost there! Hang on!"). *Explicit* delay cues make clear the precise amounts of the time the participants need to continue with a task (e.g., saying, "After two minutes, this task will be done."). By using general and explicit delay cues, the researchers found out that the participants demonstrated increased task engagement with concurrent decreases in the problem behaviors for both delayed conditions, but the rate of academic engagement during the explicit delay cue condition was higher than that for the general delay cue condition. Thus, learning delayed gratification made the participants more goal oriented, and they sought opportunities to further their progress.

Wait times can be triggering events for problem behavior of children with ASD (Lerman et al., 2006). A major challenge for them is learning how to understand time as an abstract term (Grindle & Remington, 1995). Counting time can help children with normal development skills understand the concepts of time and delayed gratification, but there is a strong possibility that children with ASD do not get clear, visual stimulus that signal how long a wait will be. Thus,

visual prompts have widely been used in teaching children with ASD to self-regulate emotion (Athens & Vollmer, 2010). These visual enhancements may potentially be paired with time-delay procedures that teach delayed gratification, but doing so would require systematic training with a procedure with proven treatment efficacy. Further research in this area is needed.

Implications and future research needed on teaching FCT and Delayed Gratification

Applied behavioral analysts and mental health professionals have examined clinical interventions that reduce problem behaviors in children with ASD, and they have presented a number of possible behavioral prevention strategies based on their final outcomes (Matson et al., 2011; Reichle et al., 2010; Vollmer et al., 1999). However, few studies have examined temper tantrums specifically among children with ASD because the causes of their temper tantrums are often uncertain (Belden et al., 2008; Dominick et al., 2007; Green et al., 2011; Kuhn et al., 2009). What those studies have concluded is that the language and communication deficits caused by ASD make it difficult to understand what the children want from their temper tantrums.

Studies have found that temper tantrums are significantly more common in children with ASD than in those without ASD (Dominick et al., 2007; Matson et al., 2011; Reichle et al., 2010; Vollmer et al., 1996). Dominick et al.'s (2007) study showed that temper tantrums were highly correlated with the presence of aggression and SIB for children with ASD. Given that children with ASD typically exhibit temper tantrum behavior more often than children developing normally, it has been predicted that their temper tantrums are strongly correlated with problem behaviors in later life (Belden et al., 2008; Dominick et al., 2007; Dunlap et al., 1987; Green et al., 2011; Potegal & Davidson, 2003). Thus primary caregivers need behavioral interventions to reduce temper tantrum behavior (Green et al., 2011; Harding et al., 2009; Potegal & Davidson,

2003). Examinations of the reasons why children with ASD throw temper tantrums, and the teaching of alternative behaviors that have the same function as temper tantrums are needed.

As a behavioral intervention, FCT identifies the function of one disruptive behavior and teaches a replacement for the target behavior by showing the child how to use an appropriate form of communication instead. The validity of FCT is well established; however, research has indicated that teaching delayed gratification during the implementation of FCT will maximize its treatment efficacy (Tiger et al., 2008). Once children with ASD learn the basics of how to communicate with others, teaching them to tolerate delayed gratification should proceed.

Research has indicated that teaching children to wait for a larger reward makes FCT more effective and acceptable in a clinical setting (Fisher et al., 2000; Tiger, Fisher, Toussaint et al., 2009). Findings have shown that using delayed reinforcers provide a long-term benefit to children in terms of regulating their emotions because of how closely related delayed gratification is to self-control, which helps children with developmental disabilities significantly decrease misbehaviors in the long run (Felden et al., 2011). Children with ASD need to be trained to have better self-control in order to regulate their temper tantrums. Particularly for children with ASD, the most effective FCT procedures should produce ways to improve their social learning because of their deficits in this area (Matson et al., 2011).

The ability to delay immediate gratification has played a central role in child development, because there is a strong correlation between delayed gratification and self-regulation (Athens & Vollmer, 2010). For example, when primary caregivers prevent the toddler from engaging in socially inappropriate behaviors (e.g., messing up the room), the child's immediate gratification is deferred. At that moment, the child may choose one of the following two options: either pursuing his or her immediate satisfaction or accepting the caregiver's

request. If the child decides to meet the caregiver's needs, his or her ability of delayed gratification is social competency that can lead the child to the later acceptance of social expectations. Theoretically, a child's ability to delay gratification is interpreted as a sign of maturity (Mischel et al., 1961).

When children with ASD face difficult demands, it is common for them to display a variety of inappropriate behaviors such as aggression and noncompliance. In addition, they typically demonstrate higher levels of violent behavior than children with normal development (Potegal & Davidson, 2003). In most cases, these behaviors stem from a desire to escape the burden of expectations placed on them, that is, the demand (or escape) condition (Reichle et al., 2010). The disruptive behaviors are difficult for caregivers to handle because children with ASD have developmental delays. Thus, it is challenging for them to understand the concept of patience and DG (Fisher et al., 2000). Teaching children with ASD how to manage time delays requires a substantial amount of training for the child (Fisher et al., 2000; Fisher et al., 2005; Reichle et al., 2010), but fostering their prosocial behaviors that depend on delayed gratification can significantly encourage the development of a conscience as requested by better social interactional behaviors (Felden et al., 2011; Hoerger, Quirk, & Weed, 2011; Reichle et al., 2010).

In a concrete way, the use of constant and progressive time delay procedures in the given studies can be referred as parents' strategic use of *forced exposure* to channel the child's preference. In terms of behavioral management, *forced exposure* means primary caregiver's creating a situation which places the child in the presence of socially appropriate conditions (or behavior) to help the child gradually learn the new skill (Kremer-Sedlik, & Kim, 2007). The child may show a negative response because his or her primary choice is removed (or not immediate available), but gradually the child will work on regaining the option by behaving in a

way opposite to what he or she immediately desires (Edwards, Li, & Lee, 2002). The intensity of the child's reactance is likely to be differentiated based on the magnitude of the threat (e.g., constant time delay versus progressive time delay) upon the child's primary choice. The concept has been evaluated in the general education domain, but it has not been applied as much in the field of special education. Furthermore, the way in which the delayed gratification procedures can combine with socialization strategies to guide children with ASD's behavior has not been fully examined, although much attention has been paid to the extent to which children with ASD learn to classify words and sentences for task engagement (Harding et al., 2009; Reichle et al., 2010).

The ways in which young children effectively regulate their emotions can strongly impact their future learning and positively promote socially acceptable behaviors. Teaching children with ASD how to control emotion to wait for a desired goal is an important behavioral skill that can decrease challenging behaviors such as aggression and SIB. In addition, once they learn to delay gratification, behavioral treatments may work more effectively. Early initiation of the behavioral intervention proposed by this study—if found to be effective—will help parents and related professionals develop tailored behavioral interventions for children with ASD. Overall, the research has exposed the need to understand the developmental dynamics of children's cognition and emotional regulation, which represent the broader spectrum of self-control. Future studies are needed to find relevant, developmentally based strategies associated with delayed gratification that will help children with ASD become socially competent both within and potentially outside of the clinical setting. The proposed study hopes to contribute to that goal of understanding how FCT can contribute to delayed gratification strategies in a controlled clinical setting.

CHAPTER 3: METHOD

The Proposed Study

The rationale behind this study was twofold. Through a direct systematic replication of previous ABA research, the first goal was to validate the treatment efficacy of FCT for reducing children with ASD's temper tantrum behavior and increasing their alternative communicative response. The next goal was to examine the consequences of using the three time-delay conditions on each child's temper tantrum behavior, alternative communicative behaviors, and emotional regulation (i.e., their compliance with waiting). In the context of delayed gratification, the study evaluated the extent to which the fixed time delay, the progressive time delay with verbal praise, and the progressive time delay with a visual display of progress in waiting reduced the temper tantrums and increased the three participants' ability to wait.

The first part of the study sought to replicate the effect of FCT plus extinction (FCT+ext) to determine the relative efficacy of that procedure for teaching the participants alternative, communicative behaviors (Fisher et al., 1993; Hagopian et al., 2005; Kelley et al., 2011). The second part of the study, which was an extension of the existing FCT literature, added the component of positive behavioral support for self-control. It was to (a) establish conditions under which three types of delayed gratification procedures may support positive behaviors and compare them with the FCT+ext condition and (b) compare the final outcomes to similar findings existing in ABA research.

A pilot study was previously conducted (see chapter 4) to test the feasibility of conducting the proposed study. A multiple-baseline-across-settings and an alternating-treatments approach was used to make the multiple treatment comparison feasible. The preliminary results indicated that the manipulation of teaching delayed gratification predicted the participant's

behavior changes from baseline to intervention (see figures in chapter 4). Among the three conditions of being told to wait, the participant's problem behavior was significantly decreased during the progressive time delayed condition with a visual display, but temper tantrums was gradually increased when the fixed time delay condition was first introduced. The proposed study sought to extend this finding by examining the effectiveness of delayed gratification procedures across participants.

Experimental Design

The research designs were selected based on the research questions of interest. Two types of research design were utilized in the study. During the initial FCT+ext treatment phase, a multiple-baseline-across-participants approach was utilized to verify the relative efficacy of the FCT procedure. During the three delayed gratification conditions, a multi-element design (i.e., alternating treatment design) was used with each participant. This research design is a method in which two or three treatment conditions are rapidly alternated to examine differential effects (Gast, 2010; Reichle et al., 2010). The research method is based on response differentiation among the given three conditions to establish a functional relation (Gast, 2010). Both research designs were selected to evaluate the treatment efficacy of the independent variables.

The research questions were intended to determine associations between participants' behavioral changes. The dependent variables include observational measures of temper tantrum behavior, alternative communicative behaviors, and the ability to wait. The independent variables include multiple treatment conditions, which are FCT+ext and the three delayed gratification procedures. The same baseline measure (i.e., the findings from the FA procedures) was applied prior to both the FCT and delayed gratification phases.

Participants

Participant Recruitment

Three children (one boy and two girls) with autism spectrum disorders (ASD) and a history of temper tantrum behavior participated in the study. All participants were clinically diagnosed with autism (see Table 4) as consistent with the criteria for autistic disorders in the *DSM-IV-TR* and ASD in the *DSM-V*. Both the researcher and the licensed psychologist (who was also the primary clinician of the study) at the Center for Child Health and Development (CCHD), the University of Kansas, Medical Center (KUMC) confirmed that the diagnostic results are from standardized autism measures (i.e., the ADOS and the CARS-2) during the screening phase of recruitment. The research team ensured that the diagnoses were made within the past 2 years (see Table 4 again). The reason for this criterion was to have a current diagnosis for each participant and to ensure that ASD symptoms still impact the participants.

All participants were healthy aside from their ASD diagnoses. Recruitment flyers were posted throughout the Center for Child Health and Development (CCHD) at the University of Kansas, Medical Center. Recruitment flyers were also sent to CCHD service providers and one of the participating clinic sites, Children's Therapeutic Learning Center (CTLC). CTLC was the place at which the study was conducted. To avoid a mortality threat to internal validity, the researcher asked service providers and the director at CTLC to consider the potential participants' previous records of appointment attendance, interest in behavioral intervention, and proximity to the study location before referring families to the current study.

Inclusion and exclusion criteria. Participants were selected on the basis of the following criteria: (a) being between the ages of 3 and 5 years, 11 months old, (b) having a legal guardian

who provided written consent for the child to participate in the study, (c) having mental-health professionals (e.g., behavioral therapists) who also consented to study participation, and (d) having problem behaviors that were maintained by the tangible condition, based on the parental interview. If the result showed that the problem behavior was maintained by the tangible and one of the other three conditions, functional analysis was conducted to determine which condition was most likely the cause of the problem behavior. The exclusionary criteria for children included (a) children who were previously engaged in competing behavioral treatments and activities that would prevent the implementation of the FCT intervention, (b) children who were using certain medication such as Adderall or Ritalin, and (c) children whose problem behaviors were maintained by the sensory simulation condition. The results of psychological screening testing conducted by a licensed psychological evaluator and related mental-health professionals were summarized after the completion of the study.

Screening phase. The researcher conducted a brief review of medical and educational records to obtain the participants' diagnoses used to describe them; thus, those diagnoses were given by sources independent of the researcher and associated clinic team members. For the informal record review, the researcher reviewed each participant's file and wrote down information that pertained to the participants' levels of problem behaviors and any relevant medical issues (e.g., allergy). The phase 1, called Functional Behavior Assessment (FBA), provides relevant information about the conditions under which each participant's displayed temper tantrum behavior (e.g., the topography of each behavior, the intensity, etc.). Clinic team members who performed the ASD diagnosis have passed an in-house training course at the Center for Child Health and Development (CCHD), the University of Kansas, Medical Center (KUMC) and held a minimum of a doctoral degree in a related field (e.g., clinical psychology

and applied behavior analysis). The researcher was the primary data observer who oversaw the whole study. The director at CCHD is a licensed psychologist who holds a doctoral degree in clinical psychology and applied behavior science and has over 30 years of experience working with children with ASD. He was also the primary experimenter of the study. The other mental-health professional is a Board Certified Behavior Analyst (BCBA) who has more than 5 year of experience with children with ASD. She was the secondary data observer (i.e., the reliability person) of the study and also served as the secondary experimenter of the study when the primary experimenter was not available.

Based on their diagnostic results, the researcher consulted with them to determine the participants' eligibilities. The researcher also consulted with the team members about this research because they (a) had expertise in the treatment of challenging behaviors and communication training for children with ASD and (b) attended every session to ensure the participants' safety and the researcher's supervision in the study. Table 4 on the next page summarizes the results of psychological testing conducted by three different licensed psychological evaluators independent of this research.

Table 4

Participant External Assessment Results

Child	Age at Assessment	Diagnosis	Diagnostic Manual	Assessments Used	Date of Evaluation
Sonya	3 Years, 7 Months	ASD	DSM-V	ADOS-2, CAR-2, and medical evaluation	September 24, 2013
Lily	3 Years, 5 Months	ASD	DSM-V	ADOS-2, CARS-2, and medical evaluation	November 26, 2013
Uno	3 Years, 6 Months	Autism	DSM-IV-TR	ADOS-2, CARS-2, and medical evaluation	March 18, 2013

*Note: Those names are fictitious names used to identify all collected data throughout the study.

Participants' characteristics (prior to the FBA). ***Sonya (fictitious name).*** Sonya was 3 years, 7 months old female with ASD and global developmental delay (GDD) at the time of this study. The results of the ADOS-2, CARS-2, and medical evaluation indicated that she did not have age appropriate social skills nor had age appropriate communication skills. The results also indicated that her temper tantrums (e.g., peeling, crying, yelling, screaming, pinching, biting, and saying "Goodbye!" and "no no") impeded her learning. Sonya has been receiving educational programming in a preschool classroom at the Children's Therapeutic Learning Center (CTLC) since May 2013. She was enrolled full-time, Monday through Friday, at the time of this study. Her daily school activities included mealtimes (breakfast and lunch), independent leisure activities at the gym, class activities, and special activities (e.g., speech therapy).

Lily (fictitious name). Lily was 3 years, 5 months old female with ASD and GDD at the time of the study. The results of her diagnostic tests showed that she engaged in certain activities she liked, but she did not have age appropriate communication skills. The results also indicated

that she frequently showed frequent temper tantrum behavior, such as disruptive muttering, crying, yelling, striping her clothes, and falling on the floor. Lily's clinic team noted that she would need occupational therapy for once a week, as well as speech therapy. The medical record indicated that Lily was eligible to receive her Individualized Education Program (IEP), so her parents enrolled her at CTLC as a full-time, preschool child. Her daily school activities included mealtimes, independent leisure activities, speech therapy, and classroom activities.

Uno (fictitious name). Uno was 3 years, 6 months old male with autism (based on the *DSM-IV-TR*) at the time of the study. His pediatrician and related health professionals noted that Uno had excessive speech delay due to his sensory difficulties, so it was recommended that he would need 60 minutes of occupational therapy twice a week, as well as speech therapy. The results of the diagnostic tests indicated that he frequently engaged in repetitive behaviors (e.g., playing his toy guitar), did not use language functionally, did not imitate any daily activities. The results also noted that Uno frequently engaged in temper tantrums, such a falling out, running, yelling, hitting, and throwing things out if he was not allowed to do his favorite activities. In June 2013, he began to receive his IEP program in his school district, between 8:00 and 12:00, from Monday through Friday. Then, he came to CTLC in the afternoon preschool program. His daily school activities included lunchtime, independent leisure activities, special education programs, physical therapy, and classroom activities.

Protection of human subjects. The protocol for the study was reviewed and approved by the Institution Review Board (IRB) at KUMC on June 20, 2013. However, the research team had a hard time finding enough participants at CCHD, so they decided to add CTLC and submitted the modified version for the IRB approval on October 30, 2013. The modified protocol was approved by the IRB on November 21, 2013 (see Appendix A for a copy of the consent

form and a copy of the letter of support from CTLC). The researcher did not proceed with the study prior to the human subject committee's approval.

Confidentiality. To fulfill ethical standards for the protection of human subjects, informed consent from each participant's legal guardian was obtained. Once verbal consent was given by the guardians, the researcher described the study to them as the first step. Then, the researcher provided them with a copy of the written consent form to review, allowed them to discuss the study with their child, and answered any questions or concerns they have. Then, the guardians signed two copies of the written consent form and were asked to keep one copy for them. After consent was obtained, the researcher assigned a fictitious name to each participant. The fictitious names were used to identify all collected data throughout the study. Those names were also used to de-identify protected health information based on the HIPAA Privacy Rule (i.e., section 164.514 (a)). All forms were identified by the fictitious names within the research team, not by the actual names of participants. All data for the study remained confidential. Both hard and electronic copies of the data were kept in the researcher's locked cabinet in the office. The clinic professionals were involved with data collection, but they were never given access to the filed data.

Setting and Materials

Setting

The study took place at Children's Therapeutic Learning Center (CTLC) in Kansas City, Missouri. The Center provides educational programming for infants, toddlers, and preschool children who have developmental disabilities. The settings for experimental sessions were three different therapy rooms (i.e., speech-therapy room, occupational therapy room, and parent

resource room). The researcher and the clinic team were at both locations when every session occurred. All sessions were conducted in the given three clinic rooms. Each of them contain a child-sized table, toys, storage cabinets, and several chairs in addition to the session materials. Some rooms are also equipped with a one-way observation window, one camcorder, and sound monitoring for research staff supervision. The researcher and supervising staff conducted all sessions in the session room. Each session, including those for baseline and intervention phases, was 5 minutes in length.

Materials

The research team used a variety of experimental and instructional materials during the study. This section shows a sample of session materials, preference items, and data collection materials used during all experimental sessions. A closet or other organizational structure in one room of the center stored potential reinforcers, stimuli, and data collection equipment. The session and stimulus materials were placed in a bin, and the data collection materials were stored in a secured cabinet. All materials were brought out as needed during the sessions.

Session materials. In each session, age-appropriate toys (e.g., playdoh, toy computer, Lego blocks, or doll), edible items (e.g., fruit snacks and potato chips), and academic materials (e.g., picture cards) were presented to each participant. The materials were used to determine which items each participant most preferred during the stimulus assessment. The chosen items by the participant were used as the reinforcer during the treatment sessions. They were used to reinforce the target responses (i.e., the use of appropriate communication response and the compliance with waiting) during each intervention phase.

Preference items. Preferred items varied for each participant. First, each participant identified seven preferred items during a stimulus preference assessment. During the assessment, the researcher recorded the participants' most-to-least preferred items. The most desirable item (i.e., the most frequently chosen item) was used as the reinforcer in both the FCT and delayed gratification phases. However, when the child picked up a different item to play with, that particular item became the reinforcer for that session. Stickers and a visual schedule poster board were used during the progressive time-delay with a visual display condition.

Data collection materials. One camcorder was set up in each therapy room, and every session was videotaped for subsequent data collection. A digital timer was used to measure 10-second intervals for partial interval data recording. Data sheets for the study were used to record the occurrence of every target behavior.

Instruments

Table 5 on the next page shows the list of instruments used in the study. Each instrument was described in detail. The list of research team members expected to complete each measure is also shown in Table 6, page 83.

Table 5

Instruments Used to Measure Variables in the Study

Variables	**Instruments**
Autism spectrum disorder (ASD)	Childhood Autism Rating Scale, 2nd edition (CARS-2) and Autism Diagnostic Observation Schedule, 2nd edition (ADOS-2) (*used by medical professionals)
Receptive vocabulary	Peabody Picture Vocabulary Test, fourth edition (PPVT-IV)
Temper tantrum behavior	Functional Analysis Screening Tool (FAST), Functional Assessment Inventory (FAI), the antecedent-behavior-consequences chart, and partial-interval data sheets for the baseline measure
Reinforcers	Stimulus Preference Assessment Sheet
Alternative, communicative behavior and the ability to wait	Partial-interval data sheet for the both FCT and DG phases
Procedural fidelity	Procedural fidelity form for the FBA, baseline measure, and FCT and DG phases
Social validity	Treatment Acceptable Rating Form, short version for the FCT and DG phases

Note. DG = delayed gratification, FCT = functional communication training.

Table 6

Parties Responsible for Instrument Responses

Instruments	**Completed By**
The Peabody Picture Vocabulary Test, Fourth Edition	The participants, but the licensed psychologist (i.e., the experimenter) conducted the assessment
Functional Analysis Screening Tool	The primary caregiver, but the researcher recorded the primary caregiver's response
Functional Behavior Assessment Inventory	The primary caregiver, but the researcher recorded the primary caregiver's response
Antecedent-Behavior-Consequence chart	The primary caregiver
Partial-interval data	The researcher and the secondary observer
Procedural fidelity form	The researcher and the secondary observer
Treatment Acceptability Rating Form-Short Version (the item 1 through 6)	The experimenter and the secondary observer

ASD Diagnosis

The three participants' medical records showed that the CARS-2 and the ADOS-2 were used for the participants' ASD diagnosis. Both assessments are considered standardized measures in clinical practice (see Chapter 2) and have been frequently utilized by licensed clinical psychologists. The researcher used the diagnostic review as the determination for the ASD diagnostic criteria. The results were summarized in Table 4, page 77.

Developmental screening procedure. The vast majority of children with ASD have delays in language (Matson et al., 2011; Matson & Sturmey, 2011). Once the researcher reviewed the medical records, each participant was asked to complete the Peabody Picture

Vocabulary Test, Fourth Edition (PPVT-IV; Dunn & Dunn, 2007), the standardized assessment of receptive vocabulary skills. The goal of using the PPVT-IV was to ensure that each participant has adequate receptive vocabulary skills. Updated in 2007, the PPVT-IV is a norm-referenced assessment that an examiner administers to individuals. According to the PPVT-IV publication summary (Dunn & Dunn, 2007), the tool demonstrated substantial evidence that it is reliable and valid. Its internal consistency for this scale is .94. The test-retest reliability is at 93%. The overall construct validity is $r = 0.82$.

The clinical psychologist from our research team was the examiner who administered the PPVT-IV. On each page of the test book, there were four pictures. The examiner said a word, number, or phrase that was depicted in one of the pictures. The participants were then asked to point to the picture of the word, number, or phrase. The examiner recorded each response on the answer sheet. After the assessment was completed, the examiner followed scoring procedures described in the manual. Each participant's raw vocabulary score was calculated using the protocol outlined by the PPVT-IV measures. The participant's raw receptive vocabulary scores from these measures were transformed into standardized scores based on the established, age-related norms. The average of the standardized scores were then be calculated to yield a total language score for each participant. Table 7 summarizes the results of the PPVT-IV conducted by the examiner.

Table 7

Participants' PPVT-IV Results

Child	Age at Assessment	Date of Assessment	PPVT-IV Age Equivalence	Standard Score (max: 100)	Percentile
Sonya	3 Years, 7 Months	12/6/2013	Below 2 years old	60	Below 1 percentile
Lily	3 Years, 5 Months	12/11/2013	Below 2 years old	43	Below 1 percentile
Uno	3 Years, 6 Months	12/6/2013	Below 2 years old	37	Below 1 percentile

This test is appropriate from the age of 3 and beyond and is frequently assessed with populations in which the use of verbal language is delayed or absent (Dunn & Dunn, 2007). To meet the receptive vocabulary skill criterion of this study, participants were expected score equivalent to or greater than a normally developed 2-year-old on the PPVT-IV. The determination of this cut-off score was that the participant needed to understand the experimenter's simple instruction (e.g., "Please draw a circle") during the FCT and delayed gratification phases. The results showed that all participants scored less than a normally developed 2-year-old on the PPVT-IV, however, they understood the experimenter's simple instruction such as "sit in" or "clean up the table." While taking the test, they were engaged in temper tantrum behavior, so the experimenter concluded that their behaviors impeded them.

Functional Behavioral Assessment (FBA)

Indirect assessment. The FAST is a standardized screening measure for FBA that asks questions to assist behavioral analysts and research teams in defining and understanding the

function of a target behavior (see Appendix B for a clean copy of the form). The researcher conducted this functional interview with the child's primary caregiver who knows the child and has observed the problem behavior. The interview took approximately 20 to 25 minutes for each participant. The FAST was used prior to conducting an FA to use the result as a preliminary guide for further assessment in the study.

As previously described in the literature review, the test-retest reliability of the FAST (67%) has been established by its authors. Although the current reliability score is low, the tool is still utilized and is the most commonly used assessment (Hanley et al., 2003; Iwata, 2002; Iwata & DeLeon, 1996; Iwata & Dozier, 2008). The FAST consists of both qualitative and quantitative methodology. The qualitative interview covers the informant-client relationship, brief information on the problem behavior, the frequency and severity of the behavior, situations in which the problem behavior is more and less likely to occur, and the ABC analysis. The quantitative screening follows with 16 yes or no questions that ask about the environmental event during which the problem behavior is likely to occur. Question 1 through 4 ask whether the problem behavior is maintained by both the tangible and attention conditions. Question 5 through 8 ask whether the problem behavior is maintained by the demand condition. Question 9 through 12 ask whether the problem behavior is maintained by sensory stimulation. Question 13 through 16 ask whether the problem behavior is maintained by pain attenuation. If the participant scored 3 on the first 4 questions and scored 1 on the remaining 12 questions, it was concluded that the participant's problem behavior was maintained by both the tangible and attention conditions. Once the interview was completed, the experimenter circled the number of each question answered yes and defined the function of the problem behavior based on the result. Table 8 on the next page summarizes the results of the FAST (only the quantitative part) conducted by the

researcher. The qualitative part (e.g., the topography, frequency, and history of the problem behavior) will be described in Chapter 5, Phase 1.

Table 8

A Brief Result based on Functional Analysis Screening Tool (FAST)

Child	Age at Assessment	Dates when the FAST was administered	Informant	The screening time for the FAST	The condition(s) of which the child maintains the problem behavior based on each score
Sonya	3 Years, 7 Months	12/6/2013	The primary caregiver (mother)	25 minutes	Tangible & Attention (scored 3 out of 4 items) Demand (scored 3 out of 4 items)
Lily	3 Years, 5 Months	12/9/2013	The primary caregivers (parents)	30 minutes	Tangible & Attention conditions (scored 3 out of 4 items)
Uno	3 Years, 6 Months	12/6/2013	The primary caregiver (mother)	20 minutes	Tangible & Attention conditions (scored 4 out of 4 items)

Descriptive assessment. The purpose of using the Functional Behavior Assessment Inventory (FBAI; O'Neill et al., 1997) was to provide the examiner with detailed information about the context in which the problem behavior occurs in a naturalistic environment (e.g., a home) through the parent interview (see Appendix C for a copy of the FBAI form). The form includes a series of questions about the child's everyday functioning and behavioral problems, including the situations in which the problem behavior is most or least likely to occur across settings, the estimated functions of the problem behaviors, possible alternative behaviors, the child's communication skills, and what the child might want as reinforcers. This measure took approximately 30 minutes. Table 9 on the next page summarizes the results of the FBI data

conducted by the researcher. More details on the primary caregivers' interview response will be shown in Chapter 5, Phase 1.

Table 9

Functional Behavior Assessment Inventory (FBAI) Results

Child	Dates when the FBAI was administered	Informant(s)	Problem Behaviors	When are the problem behaviors occurred?	How do the parent(s) try to resolve the problem?
Sonya	12/6/2013	Mother	Yelling good-bye & no-no, hitting her older brothers, & labeling	When she tries to escape from the given tasks or her favorite toys are taken away	Spanking (a few times), Time-out
Lily	12/9/2013	Parents	Throwing things, disruptive muttering, taking off her clothes, & being floored	When she is not getting what she wants	Calming her down or giving her a massage
Uno	12/6/2013	Mother	Hitting himself, falling out, & throwing anything	When the school bus does not come on time or his favorite snack is not available.	Trying to calm him down positively

The ABC charts. The researcher asked all primary caregivers to observe the participants a minimum of 2 or 3 days at home so that they were able to document antecedents and consequences surrounding the occurrence of temper tantrum behavior. The researcher collected ABC data from each primary caregiver via email after they completed to fill out the form. The purpose of the data collection was to analyze the environmental events highly correlated with the

occurrence of the problem behavior. The purpose of this assessment was to (a) refine the operational definition of the temper tantrum behavior, (b) examine any patterns of antecedents and consequences that evoke or maintained the temper tantrum behavior, and (c) allow the primary caregivers to document specific consequences (e.g., type of attention) that followed the problem behavior within the natural setting.

The ABC chart created by Dozier and Iwata (1998) was used in the study, because (a) on the top of the data sheet, the researcher can define the target behavior (i.e., give the response definitions that will be explained in the next section) and (b) both quantitative and qualitative methods are used (see Figure 1 and Appendix D for a copy and written sample of the full length ABC assessment form). In Figure 1, there is the section that asks "Please fill in for each occurrence of targeted behavior," the primary caregiver recorded the date and time, the antecedent events, the problem behavior's description, the frequency of the problem behavior, and the consequences of the problem behavior sequentially. Both antecedent and consequence sections were coded by number based on the given code list.

Once all data were collected, the researcher looked at the frequency of each problem behavior and determined if the prolonged events were strongly correlated with the problem behavior. Figure 1 on the next page shows the abridged version of the ABC chart. Table 10 on the page 91 summarizes the results of the ABC data conducted by the primary caregivers. The actual form, along with a written sample, will be shown in the Appendix D.

Figure 1

The ABC Data Sheet

Antecedent Data Sheet (Short version)

Name _____

Targeted Behaviors _____

Please fill in for each occurrence of targeted behavior. Circle all antecedent codes that apply.

Date	**Time**	**Antecedent**	**Description of situation** (What happened right before the behavior occurred?)	**Frequency** (How many?)	**Consequence** (What did you do?)
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**

Antecedent Codes

1 – presented with instructions or tasks
2 – wants something and can't have it
3 – an object/food item is taken away
4 – during/after attention for other behaviors
5 – change of activities (explain)
6 – awakened from night sleep/nap
7 – other (explain)

Consequence Codes

1 – ignore
2 – verbal attention (e.g.,say something)
3 – time out/other punishment (explain)
4 – escape (e.g., stop making him do a task or work)
5 – physical attention (e.g., massage)
6 – other (explain)

Table 10

The ABC Data Results (Brief Summary)

Child	Dates when the ABC data was collected	Informant(s)	Antecedent	Behavior	Consequence
Sonya	1/4/2014	Mother	Her older brother took a water bottle from her because she removed labels.	She started to hit her brother.	She got 5 minutes of "time-out".
Lily	12/9/2013	Mother	She wanted a balloon from a store. Her dad said "no."	She started to grunt.	Her dad verbally calmed her down.
Uno	12/15/2013	Mother	He wanted to go to see his grandmother at night. His mother said "no."	He started to yell and fall out.	The mom first ignored him, then tried to calm him down.

Protocols and Data Sheets for Both Baseline and Treatment Phases

Protocols for FA, FCT, and DG phases were used for every session (See Appendix E). Ten-second partial interval coding was used for data collection (see Appendix F for a copy of the data form). Each session of the baseline and treatment phases was 5 minutes long (i.e., 300 seconds). Divided by 10 seconds, the total of 30 intervals were shown in a row. The participant's identification number and the session date and time were shown on top of the sheet. Then, for the baseline measure, response definitions for temper tantrum behavior and alternative communicative behaviors were shown in each column. For the FCT measure, response definitions of temper tantrum behavior and alternative communicative behaviors were shown in each column. For the delayed gratification measure, response definitions of temper tantrum

behavior, alternative communicative behaviors, and the ability to wait were shown in each column.

Procedural fidelity form. To avoid threats to treatment integrity, the trained observer recorded data on procedural fidelity (see Appendix G for a copy of the form). More details on how to collect data will be given in the Validity section, but it was to ensure that the researcher implements the independent variables as originally planned. The results of this part will be shown in Chapter 5.

Stimulus Preference Assessment Data Sheet

After completing the baseline measure, stimulus preference assessment was conducted to define each participant's reinforcer for both FCT and DG. The identification of most-to-least items were based on the initial preferences assessments conducted prior to conduct the FA, prior to start the FCT, and prior to the Delayed Gratification Conditions. Most-to-least items were also recorded on the data sheet (see Appendix H for both a clean copy and written sample of the form). The results of this assessment will be shown in Chapter 5.

Survey on Follow-Up Phase

At the end of all children's participation in the study, the *Treatment Acceptability Rating Form-Short version* (TARF-S; Reimers & Wacker, 1988/1992, see Appendix I) was used. The TARF-S consists of 10 items, but the researcher only used the first 6 items because the last 10 items intended to ask the primary caregiver's opinion about the study. All of the primary caregivers said they were unable to observe any session due to their job obligation. Thus, the researcher asked both the experimenter and the secondary observer questions regarding treatment

acceptability and effectiveness. They answered those questions by selecting a rating on a seven-point Likert-type scale. Their results will be described in Chapter 5, Phase 6.

Variables and Response Definitions

The Dependent Variables

Both the researcher and the secondary observer measured three dependent variables in this study. The primary dependent variable of the study is the percentage of 10-second intervals of temper tantrums occurrences across all phases. The second dependent variable of the study is the percentage of 10-second intervals of alternative communicative behavior occurrences across all phases. The third dependent variable of the study is the percentage of 10-second intervals in waiting without temper tantrums (i.e., the amount of wait time tolerated) during the baseline and the delayed gratification treatment phase. All given behavioral changes will be shown as line graphs for baseline and treatment conditions in the Chapter 5.

The Independent Variables

The independent variables of the study are the treatment procedures: (a) FCT with extinction, (b) the fixed 50-second time delay condition, (c) the progressive time delay with verbal praise condition, and (d) the progressive time delay with visual cues condition. The implementation of those variables was recorded by the two data observers.

Response Definitions on the Dependent Variables

Temper tantrum behavior. The behaviors caused by temper tantrums will be topographically different for each participant, so individualized response definitions for problem

behaviors will be developed for each participant (see Table 9 for the topography of each participant's temper tantrums). Based on the chapter 2, *Temper tantrums* are defined as a wide range of emotional outbursts or feelings of frustration that may lead to a child engaging in yelling, throwing things, self-biting, harming others, or any other type of inappropriate vocal sounds or negative verbal statements made or exhibited that are noncompliant with behavioral requests. *Noncompliance* is defined as a strong rejection or resistance of demands, defined as "no" reactions to or strong rejections of the researcher's request within 5 seconds of it being asked. All such behaviors will be categorized as temper tantrum behavior. See Table 11 on the next page for examples of these responses, which reflect a wide range of disruptiveness.

Table 11

Operational Examples of Temper tantrum behavior

Behavior Type	**Example**
Emotional Outburst/Distress	Whining, flailing arms and legs, disruptive muttering, inappropriate mouth closing, fainting, and/or crying.
Physical Aggression	Slapping, scratching, kicking, pinching, pushing, pulling other person's hairs, rolling over, and/or throwing objects at someone.
Verbal Aggression	Yelling, screaming, verbal complaints, etc.
Property Destruction	Throwing objects to damage property, ripping, knocking, banging, and/or attempting to dislodge instruments.
Self-Injurious Behavior	Scratching, body hitting, nail biting, eating non-food items (i.e., pica), and head banging.
Noncompliance With Behavioral Requests	Strongly rejecting commands such as refusing to open mouth after pica, maintaining a rigid posture, ignoring verbal requests to terminate an action, refusing to sit back, and/or nonstop temper tantrum behavior.

Alternative communicative response. *Alternative communicative response* is the socially appropriate form(s) of communication that the participants learn to use to respond to requests or express their desires. Those behaviors include using a picture card, also called picture exchange, or using both of verbal and non-verbal statements taught to them to either orally or hand-gesture to request a desired toy or activity. *Ability to wait* is successful waiting without exhibiting problem behavior after a request by the researcher has been made to wait. See Table 12 for examples of the exhibition of replacement behaviors.

Table 12

Operational Examples of Replacement Behaviors

Behavior Type	**Example**
Picture exchange	Handing over a picture card with a preferred item or activity pictured on it to the researcher to request the reinforcer.
Verbal or non-verbal communication	Making an appropriate verbal or non-verbal request to obtain the reinforcer (e.g., "My turn" or "More, [please].").
Ability to wait	The participant's waiting after asking for their reinforcer without displaying temper tantrums.

Instructor response techniques. Three behavioral techniques will be used by the primary experimenter during the treatment sessions. *Praise* is a positive statement given in response to the participants using a replacement behavior. *Prompting* is an instructional signal that encourages the participants to use a replacement behavior. *Extinction* is ignoring the exhibition of a problem behavior entirely. Each of these techniques is used to reinforce socially positive behaviors while decreasing the frequency of negative behaviors in ABA (Fisher et al., 2000; Harding et al., 2009; Mancil, 2006). See Table 13 on the next page for examples of applied behavioral techniques.

Table 13

Operational Examples for Instructor Response Techniques

Technique	**Example**
Praise	Saying "Good waiting!" when the participant appropriately follows an instruction.
Modeling	Demonstrating a described action.
Prompting	Providing a hint to the participant either verbally or nonverbally if needed to encase in appropriate behavior.
Extinction	Ignoring the problem behavior and continuously reinforcing the replacement behavior.

Data Collection and Measurement

Throughout the study, both indirect assessments and direct observations were conducted and data on the dependent variables were collected. The validity and reliability of the data collection were measured for all sessions.

Indirect Assessment

In the first phase, the researcher gathered information about each participant's behavior without conducting any observations. The FAST (Iwata & DeLeon, 1996) was used to collect information on the participants' past exhibitions of the problem behavior. Then, the FAI (O'Neil et al., 1997) and the ABC analysis were used to gather more in-depth information on the problem behavior. Two observers independently scored procedural fidelity forms (see Appendix G) during each data collection session to ensure the researcher interviews the primary caregiver as planned.

Direct Observation

After the indirect assessment was completed, direct observations were made during the baseline and treatment phases. All sessions were videotaped. The researcher was the primary observer and the other observer was hired as a secondary observer for reliability check (i.e., IOA). Both of them collected data from both in vivo and the videotaped sessions. Each interval was measured using a sports timer with a beeping sound.

Training. Prior to data collection, the researcher provided the secondary observer with a total of 60-minute pre-data collection video training session (see Appendix E for a copy of video training manual). All training workshops and training procedures have been established by Dr. Claudia Dozier and her trainees at the University of Kansas. First, the researcher reserved a room for observer training and provided the secondary observer both written examples for each dependent variable. The training manual included each target behavior and its response definition, each replacement behavior and its response definition, and treatment conditions. After the observer was trained to identify what was to be measured, the researcher randomly selected sample video clips (i.e., using a number lottery), turned on each video clip on a laptop computer, and measured intraobserver reliability and interobserver agreement (IOA). Intraobserver reliability is to check the validity, which was to see whether the observers are measuring what the researcher intends to measure.

The two observers scored all given responses simultaneously but independently. The researcher obtained each answer key for the six observation sessions and checked the observers' answers after they completed each session. To ensure the observers' reliability in the proposed study, they needed to demonstrate both intraobserver reliability and IOA scores of 90% or higher for the completion of the training. The scores of 80% or higher were needed for the actual study.

No study data were collected until the observers successfully completed the training. Table 14 below shows the mean agreement on each training video session.

Interobserver Agreement (IOA). The purpose of assessing IOA was to see whether the two independent observers record the same events. Training agreement for all dependent variables using the 10-second partial interval recording system was calculated by counting the number of intervals in which both observers agreed on an occurrence of a target behavior divided by the sum of agreements and disagreements and multiplying by 100 to yield percent of occurrence agreement (Gast, 2010). Agreement scores were computed using a paper and pencil agreement data sheet (see Appendix F for a copy of data sheet) and calculator or within MS Excel spread sheet designed to automatically calculate IOA scores. Figure 2 on the next page shows the example data for calculating IOA.

Table 14

Mean Interobserver Agreement (IOA) during the Video Training Sessions

Session	Video
Video 1	98.33% (range 98.33-100%)
Video 2	95.55% (range 95-96.67%)
Video 3	93.44% (range 88.33-100%)
Video 4	97.77% (range 93.33-100%)
Video 5	92.77% (range 90-98.33%)
Video 6	94.99% (range 93.33-98.33%)

Figure 2

The Example Data for Calculating IOA (adapted from http://sped.jppss.k12.la.us)

▪Observer 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
OT	X	X			X		X	X	X				X	X		X		X	X	X

▪Observer 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
OT	X		X		X			X	X	X			X	X		X	X	X	X	

▪This is an observation of off-task behavior (OT) that two observers conducted at the same time. The "x" indicates that the behavior occurred and a blank indicates that off task did not occur. Calculate percentage of off-task behavior for each observer. Then, calculate IOA for these two observers.

Based on the given data, there were 14 instances of agreement and 6 instances of disagreement. Thus, the IOA is calculated as follows: IOA = (Number of agreements/ Total # of intervals) X 100 → IOA = 14/20 X 100 = 70%

Partial-interval recording: Baseline and treatment measure. This is a recording strategy for behavior observations whether or not a behavior occurs in each session. Each 5-minute session with the participants was broken down into 10-second intervals for recording data purposes. The occurrences of both the problem and replacement behaviors were recorded if they occurred at any point during the 10-second interval. For example, if a participant screamed three times during one 10-second interval, the check mark was coded for that problem behavior during that interval. The results of the partial-interval data collection were presented in terms of the percentage of intervals in which each behavior occurred. For the compliance percentages, the ability to wait was measured by determining how much of the wait time the participants successfully endured as described on page 96.

Reliability and Validity of the Study

Reliability of the Study

Once the observers completed the required training, the primary and the secondary observers played the videotaped sessions of the study used to collect all the data. The primary observer continuously compared reliability data with the other observer and compared her data collection to hers to ensure reliability throughout the study. This was done approximately for every one-third of the sessions for both in vivo and videotaped data. Agreement on at least 80% of the observation was considered acceptable. During the videotape data collection, the researcher monitored each observer's performance to combat observer drift. Mean IOA for the baseline, FCT, and Delayed Gratification Procedures will be shown in the Chapter 5.

The Integrity of the Procedures

Acceptability of the Procedures

The integrity of the independent variables implemented in the study was evaluated by completing procedural integrity checklists. The purpose of this procedure was to determine whether each experimental procedure (i.e., the independent variables) was conducted as planned. Thus, a procedural fidelity checklist was given to the secondary data observer to assess three aspects of the study: (a) the FBA phase, (b) the FA phase, and (c) the FCT and delayed gratification procedure sessions. On each procedural fidelity checklist, the steps of each phase were identified and described. The researcher gave the procedural fidelity form to the observer after each data collection session was complete. The observer filled out checklists at every session. The reason for evaluating procedural fidelity was to control for PI bias (e.g., tracking if the researcher forgets a procedure that should be conducted during a specific condition of the

FCT phases). If each step was properly performed, the observers checked the "yes" box. If not, the "no" box was checked. Procedural integrity was analyzed for at least 25% of the sessions for each phase. All data were collected subsequently to ensure treatment integrity (i.e., the extent to which the IVs were implemented as planned). The implementation fidelity rating was calculated. The percentage was calculated by dividing the items checked "yes" by the total number of the questions, then multiplying by 100. The results of procedural fidelity data will be shown in the Chapter 5.

Procedures

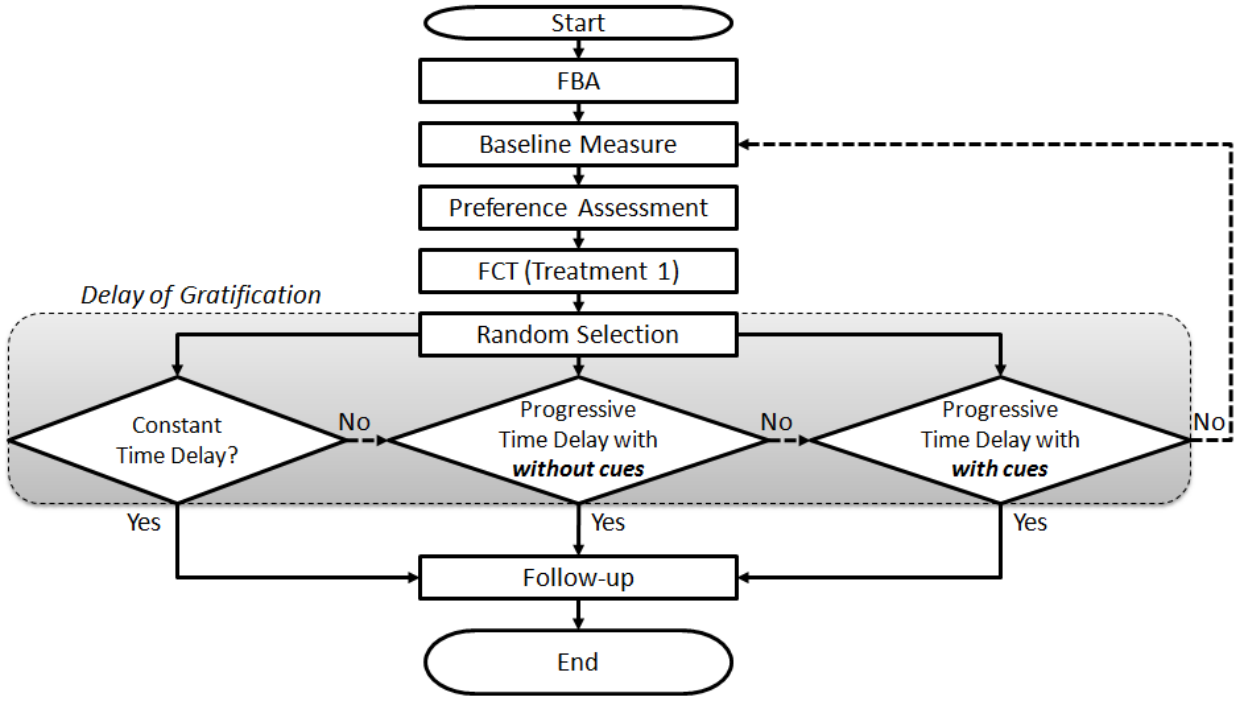
This experiment was conducted in six phases: 1) the FBA phase, 2) the FA as a baseline measure phase, 3) the stimulus assessment phase, 4) the initial FCT phase, 5) the multiple comparison of delayed gratification phase, and 6) the follow-up phase (see Figure 3 on the next page). The results of the FBA are shown in Table 7, 8, and 9. The results of the stimulus assessment phase will be shown in the Chapter 5. The results of the FA, FCT, and delayed gratification phases will also be shown in the Chapter 5.

The FBA Phase (Pre-Baseline)

In the FBA phase, the researcher used both interview questionnaires (i.e., the FAST and the FAI) and direct observation analysis (i.e., the ABC analysis) to identify the purpose for each participant's temper tantrum behavior. Based on the results (see Table 7, 8, 9), the researcher developed a hypothesis on why the temper tantrums occurred.

Figure 3

Flow of Participants in the Proposed Clinical Study



The FA Phase

The procedure for the FA phase has been established by Iwata et al. (1982/1994) to examine the functional relationships between experimentally arranged environmental conditions and the participant's display of problem behavior. It was conducted within a single-subject multielement experimental design (Iwata et al., 1982/1994).

Four conditions (i.e., three experimental conditions and one control condition) were manipulated for all participants, and the researcher investigated each session. Each condition was 5 minutes long and was conducted at least three separate times to ensure the stability of the data.

Data collection for the FA phase ended when differential effects across experimental conditions were observed. See Table 15 below for a description of the experimental conditions and the consequences for problem behavior for all participants during the functional analysis. The results of the FA phase will be shown in the Chapter 5.

Table 15

Consequences for the Participants' Behaviors during the FA

Participants' Behaviors	Contingent Tangible (5 minutes each)	Contingent Demand (5 minutes each)	Contingent Attention (5 minutes each)	Free Play (Control) (5 minutes each)
Problem Behavior	The reinforcer was returned	No demand	3 to 5 seconds attention, mild reprimand*	Continued play
Appropriate Behavior	The reinforcer was out of reach for 15 seconds	Continued task demand with neutral tone	Ignored	Continued Play

*Note: mild reprimand= "Don't do that!"

The contingent tangible condition. This condition is designed to test the occurrence of problem behavior under conditions in which the highly preferred item was within view, but access to be restricted. The experimenter determined two or three of the participants' most highly preferred items as identified by direct observation. The participant was given brief, 30-second access to the preferred items, then the experimenter said, "My turn," and removed the items from the participant. If problem behavior was evoked (i.e., Contingent upon the problem behavior), the researcher returned the items, saying, "Here, it is your turn to play." If the participant did not display problem behavior, the preferred item remained within view for 15 seconds.

The contingent demand condition. This condition is designed to be analogous to situations in which a child wants to escape or avoid completing certain tasks. The purpose of the condition was to test for the participants' reactions to negative reinforcer in the form of making demands. The experimenter requested that the participant performed a task such as stacking blocks, et cetera. Instructions on how to perform the task were given once every 30 seconds (step 1). If the participant refused to complete the task, the researcher modeled it (step 2). If the participant still refused to complete the task, the researcher provided hands-on guidance for the participants (step 3). This three-step graduated guidance procedure has been used in other studies to establish a baseline condition and is considered an evidence-based practice (Vollmer et al., 1996). If the participant did not complete the task after the three-step guidance was complete, the researcher stopped giving instruction for 15 seconds.

The contingent attention condition. This condition is designed to be analogous to situations in which a child's problem behaviors are caused by not receiving someone's attention. The researcher began to read a book for himself and ask the participant to play quietly in the clinic room. If the participant exhibited problem behaviors, the researcher provided them with attention for 30 seconds, saying, "Don't do that!" (i.e., a mild, verbal reprimand). Then, the experimenter returned to reading. If the participant did not engage in problem behavior, he or she was ignored.

Free play condition. The participant was given free access to play with anything without any restriction. The experimenter played with the participants if they want him to. The play condition is a control condition, and it lasts as long as the three experimental conditions.

The Paired Stimulus Preference Assessment Phase

The paired-stimulus preference assessment (Fisher et al., 1992) was conducted to identify a hierarchy of the preferred items. First, five to six different items were placed on the table. The items were placed within the participants' view but out of reach. Next, the experimenter randomly picked two items, place them close to the participants, and say, "Pick one that you like." The chosen item was handed to the participant, and the participant was allowed to play with the item for 30 seconds. Then, the item were removed. The researcher again randomly picked up two items and asked the participant to pick the one they like, and allowed another 30 seconds of play. Each item was presented in different pairings, and the researcher was recorded the number of times each item was picked and convert that to a percentage of selection. The item with the highest selection percentages was used as reinforcer during the two treatment conditions. The results of the stimulus preference assessment phase will be shown in Chapter 5.

Treatment Phase 1: FCT with extinction

The goal of this first treatment phase was to test whether FCT effectively decreases the frequency of the participants' temper tantrum behavior. After the experimenter identified the causes of each participant's problem behavior, communication training technique (either handing over the picture card by using Picture Exchange Communication System (PECS) or saying the verbal request) was individually determined for each participant. The experimenter taught an appropriate communication skill that could be used to replace the function of the temper tantrum behavior. Once the child learns and uses the appropriate communication skill, the reinforcer was delivered immediately. The FCT were divided into three distinct, sequential conditions. Figure 4 on the next page shows examples of FCT and FCT with ext.

Figure 4

Examples of FCT (top) and FCT with extinction (bottom)

Step 1: Identify communicative opportunities. During the targeted routine, the experimenter arranged the environment to provide opportunities to teach replacement behaviors. For instance, the experimenter identified snack time as an opportunity to teach each participant to request food. The experimenter placed food in sight but out of reach of the participant and created an opportunity (e.g., "Say 'more'!") for the participant to request the preferred food.

Step 2: Model the desired behavior. The experimenter modeled the desired behavior to the participant. For example, the researcher modeled using the picture cards to request desired items or asked the participant, "Say (the name of the item)."

Step 3: Provide consequences. The experimenter provided consequences for the participant's behavior when the replacement behavior takes place. For example, the experimenter immediately provided the participant with his or her reinforcer upon the participant's successful use of a replacement behavior. The participant's problem behavior was ignored (i.e., placed on extinction) while the replacement behavior was reinforced.

All participants obtained the reinforcer when one of two conditions was met: (a) the problem behavior ceases and/or (b) an appropriate replacement behavior occurred. Whether the problem behavior persists during each condition of the FCT procedure was also be recorded for each participant. The participants used replacement behaviors instead of temper tantrums to gain their most preferred reinforcer items as identified in the stimulus preference assessment phase.

Alternative communicative response. As discussed in the previous section on response definitions, there were two ways the participants displayed an alternative behavior.

Picture exchange communication system (PECS). This action is considered a picture exchange response as described by Hagopian et al. (1998). Three steps were taught to the participants for expressing their desires through a replacement behavior that used picture cards: (a) moving their hand toward the card that pictures their desired reinforcer, (b) picking up the card, and (c) giving the card to the researcher. The experimenter verbally instructed the participants in the process, let the participants knew what the final goal is, and asked the participants to model the replacement behavior. The experimenter used hand-over-hand guidance three or four times to prompt the participants through all the steps (i.e., mass trials). When the participants correctly used the cards to communicate their desires, the reinforcer was delivered. The researcher then asked the participants to complete the process independently.

Verbal/Non-verbal communication. In this condition, the first three steps were identical to the picture exchange condition, but one more step was be added: saying the phrase (i.e., "my turn" or "more") or provide a gesture for the desired item. The procedure was same as the picture exchange, but the participants were expected to give that either verbal or non-verbal response to obtain the reinforcer as the last step of the process. The experimenter modeled each step to the participants three or four times (i.e., mass trials), and the reinforcer was delivered when the participants verbally said "my turn" or "more." Then the experimenter asked the participants to do the entire four-step sequence independently. If the participants forget the final step, the researcher gave a prompting response; however, the reinforcer was only be delivered when the participants successfully completed the entire sequence. The results of the FCT will be shown in the Chapter 5.

Treatment Phase 2: The Multiple Comparison of the Delayed Gratification Procedures

After completing the FCT in Treatment Phase 1, the participants moved on to Treatment Phase 2 in which three different conditions of delayed gratification were introduced as a means to demonstrate experimental control. In the three conditions being analyzed, the participants' responses on delayed gratification procedures were observed at their different levels. Each participant was observed to identify which condition best improved their self-regulation (i.e., the toleration of delay). Using these three different procedures allowed the researcher to do the evaluation of which one best decreased the exhibition of temper tantrum behavior and increased the wait time across participants. During each condition, the participants did not receive the reinforcer for responding to an instruction until the required wait time (i.e., 50 seconds for the

fixed delay condition and 5 seconds of gradual wait time increase during the two progressive time delay conditions) have passed.

Fixed time-delay condition (FD). The goal of this condition was to test whether the participants were able to tolerate the 50 seconds of wait time on each trial. Also, the purpose of the implementation was to evaluate the extent to which loss of freedom introduced to the participants affected levels of temper tantrum behavior.

The experimenter allowed the participant to play with the reinforcer for 30 seconds first, which was the contingent tangible condition in the FA. The experimenter then said, "My turn!" and removed the item from the participant. When the participant immediately used his or her communicative response to request the reinforcer, the experimenter said, "You need to wait." When the participant exhibited temper tantrum behavior during the wait time, extinction was used and the participant was told to wait without immediate delivery of the reinforcer. If the participant appropriately used a replacement behavior again but still within the wait time period (i.e., 50 seconds), the researcher said, "You still need to wait." The reinforer was not delivered if the experimenter met one of the following criteria: a) the participant exhibited and escalated the problem behavior or b) until the wait time (i.e., 50 seconds) was over. Once the participant stops showing problem behavior or the wait time was passed, the experimenter said, "Now it is your turn," which is the *release cue,* and handed the participant the reinforcer.

The participant's wait time was measured and recorded based on the following criteria: a) if he or she accepted and showed no problem behavior during a trial, the trial time (i.e., 50 seconds) was the wait time, b) if he or she immediately displayed problem behavior right after a trial begins and escalated the behavior until the trial was over, no wait time was recorded, and/or c) if the participant waited for any point of time within a trial, the time was considered as the

wait time. 2 to 3 trials of fixed time-delay were given in each session. The maximum wait time among the given trials was recorded as the wait time per session. The percentage of 10-second partial intervals of temper tantrum behavior was also recorded as well as the wait time. The results will be shown in Chapter 5.

Progressive time-delay with verbal praises (PDVP). The goal of this condition was to test whether the participants were able to tolerate when *delay cues* (i.e., "Good waiting!") were verbally delivered before the onset of temper tantrum behavior. The purpose of this condition was also to see whether each participant tolerated the gradual increase of the wait time with verbal praises. It was also to find out the maximum wait time the participant was able to tolerate in each session. 3 to 4 trials of progressive delay with verbal praises were given per session.

The experimenter allowed the participant to play with the reinforcer for 30 seconds first, which was the contingent tangible condition in the FA. The experimenter then said, "My turn!" and removed the item from the participant. When the participant immediately used his or her communicative response to request the reinforcer, the experimenter said, "Good asking, but you need to wait." In the first trial, the experimenter then waited for 5 seconds. When the participant tolerated the 5 seconds of wait time, the experimenter said, "Good waiting! Now it is your turn!" and then delivered the reinforcer. The participant were allowed to play with the reinforcer for another 30 seconds and then the experimenter removed the item away. In the second trial, the experimenter increased the wait time to 10 seconds. When the participant waited for 5 seconds, the experimenter said, "Good waiting!" When the participant waited for another 5 seconds, the experimenter said, "Good waiting! Now it is your turn!" and then delivered the reinforcer.

The verbal praise (i.e., "Good waiting!") was made every 5 seconds all the way up to 50 seconds. When the participant successfully completed the given trial, 5 seconds were added to

the next trial (i.e., the successful completion of 5 seconds waiting led the participant to move on the next trial, 10 seconds waiting). When the participant successfully completed the given trial but the session time was over, the wait time of the trial was considered as the maximum wait time in that session. When the participant's problem behavior was maintained during the given trial, the experimenter first stopped and waited until the problem behavior was ceased. Then, the experimenter tried another trial with the same wait time interval and observed whether the participant was able to tolerate the wait time. If successful, the experimenter moved to the next trial with 5 more seconds.

When the participant exhibited temper tantrum behavior during the wait time, extinction was used and the participant was told to wait until the wait time was over. Then, the participant was allowed to have the reinforcer for 30 seconds, but the same wait time was given for the next trial. If the participant appropriately used a replacement behavior again but still within the wait time period, the researcher said, "Good asking! But you still need to wait." The reinforcer was not delivered if the experimenter met one of the following criteria: 1) the participant exhibited and escalated the problem behavior or 2) until the wait time during the trial was over. Once the wait time was passed, the experimenter said, "Good waiting. Now it is your turn," which is the *release cue,* and handed the participants the reinforcer. The minimum wait time per trial was 5 seconds and the maximum wait time per trial was 50 seconds. The maximum wait time per session was recorded. The percentage of 10-second partial intervals of temper tantrum behavior was recorded as well. The results will be shown in Chapter 5.

Progressive time-delay with visual cues (PDVC). The goal of this condition was to determine if a visual schedule (i.e., a token economy) helped the participant increase the waiting time. Treatment efficacy of this intervention has not been systematically examined in ABA

research, especially compared to both the fixed and progressive delay with verbal praises conditions. Thus, the procedure was newly developed by the researcher, although the mechanism of cue delivery is adapted from Reichle et al.'s study (2010).

As in the previous two delayed gratification conditions, the reinforcer was first shown to the participant but placed out of reach. A visual schedule board was placed in front of the participant. Same as the condition with verbal praises, the participant was told to wait for 5 seconds. However, instead of listening to the verbal praise, the participant was asked to put a star sticker on the board after they have successfully completed 5 seconds of waiting. Then, the experimenter removed the sticker. After 30 seconds, the experimenter said, "My turn!" then removed the reinforcer, and asked the participant to wait. If the 10 seconds of waiting was successful, two star stickers were given to put on the board. In that fashion, the experimenter gradually increased the amount of time between each sticker (i.e., 5 seconds).

The participant was allowed to put the maximum of 10 star stickers (i.e., 50 seconds of wait time) on the board. In other words, if the participant successfully tolerated 50 seconds of wait time in this condition, then the experimenter considered it as the completion of the study. Then, the participant needed to go through this condition across the two other settings (i.e., the progressive delay with visual cues both in the fixed condition setting and in the progressive with verbal praises setting) so that he or she was able to tolerate the 50 seconds of waiting with the given visual schedule. In each session, 3 or 4 trials were given.

If the participant exhibited the problem behavior during the wait time, extinction was used and the reinforcer was not be delivered. The participant was also asked to wait for the same amount of time that was required in the previous trial. Once the participant completed the series of tasks without exhibiting the problem behavior, he or she received the reinforcer. As described

in the previous sections, the percentage of 10-second partial intervals of problem behavior was recorded and the wait time was also calculated.

Follow-up Session: Social Validity Measures

The follow-up session intended to obtain the opinions of potential consumers (e.g., BCBAs, therapists, and behavior support staffs from the clinic setting) in order to evaluate the social validity of the effects of the intervention procedures and the results of the study. Social validity was evaluated using the first six survey questions of Treatment Acceptability Rating Form-Short Version (TARF-S), which was adapted from Wacker et al (1990)'s study (See Appendix I for a copy of the TARF-S). The TARF-S highlighted the procedures and accessed interviewee's opinions on the impact of the proposed intervention. The main goal of this survey was to evaluate the experimenter's treatment acceptability.

The same form was also given to the trained observer to evaluate her rating of treatment acceptability. Information was collected regarding advantages and disadvantages of using the three delayed gratification conditions in the clinical setting. The survey consists of 10 items that measure three factors, which are treatment acceptability (item 1, 2, and item 4), effectiveness of the given treatment (item 6), and time and cost effectiveness of the given treatment (item 3 and item 5) about the treatment. These items utilize a 7-point Likert scale, indicating 1 as "unacceptable" and 6 as "very acceptable." After the completion, both the researcher and the experimenter debriefed the primary caregivers. During that time period, the researcher took any question or concern from them. At the conclusion of the interview, the researcher thanked the respondents for their participation and gave a gift card as a token of appreciation.

Data Analysis Procedures

FBA. After the primary caregivers completed both the FAST and the FBAI, the researcher typewrote their responses on both surveys. Then, the typewritten responses were saved as a word file (see both Appendix B and C for a copy of the response). The FAST consists of both qualitative and quantitative components. The qualitative portion of the FAST was typewritten after the interview. The 16 items that utilize 3-point Likert scale (e.g., *Yes*, *No*, and *N/A*) will be scored based on scoring summary. Item 1 through 4 are to measure whether problem behavior is maintained by a person's attention and tangible conditions. Item 5 through 8 are to measure whether problem behavior is caused by escaping from demands. Item 9 through 12 are to measure whether problem behavior is maintained by sensory simulation. The last 4 remaining items are to measure whether problem behavior is caused by medical complication. The final score revealed which function of problem behavior was likely to occur in the naturalized environment (e.g., home).

ABC data. After filling out each occurrence of problem behavior, the researcher evaluated the events before the problem behavior occurred, the frequency of problem behavior, and the events after the problem behavior occurred, based on the primary caregivers' ABC data records. The researcher looked at each category and determine whether a certain event was strongly correlated with the frequency of problem behavior. The result provided detailed information on the function of behavior before conducting a functional analysis.

FA. The direct manipulation of the environmental variables (i.e., the IVs) for identifying the function of problem behavior was the baseline condition. The occurrences of temper tantrums, were recorded based on the manipulation of each IV. Then, the data were converted to (a) the percentage of temper tantrums occurrences per session. All percentages of the dependent

variable occurrences during the 10-second intervals were recorded. The behavioral measures were shown as line graphs (see the Chapter 5) to identify the function of temper tantrums occurrences. The highest percentages of problem behavior under certain condition provided the information that the behavior was likely to be maintained by the given condition. The data were used as baseline measure for treatment sessions. Interobserver agreement (IOA) on the occurrence of temper tantrums was accessed by having two observers independently but simultaneously collect data during 30% of all FA sessions.

Paired Stimulus Preference Assessment. After each participant's seven preferred item is identified, each item will be presented six times in different pairings, and the researcher will record the number of times each item is picked. Then, the frequency of the participant's selection on each item will be converted to a percentage of selection. Based on the result, the researcher will rank them from 1 to 7.

FCT and delayed gratification procedures. In order to analyze the effect of FCT and delayed gratification procedures on the occurrence of the dependent variables, a multiple baseline across participants and a multi-element design were implemented. The occurrences of temper tantrums, alternative communicative response, and compliance on waiting were recorded and converted to the percentages. Then, all percentages of the dependent variable occurrences during the 10-second intervals were recorded. The data were converted to (a) the percentage of 10-second partial intervals of temper tantrum behavior per session (both in the FCT and three delayed gratification conditions), (b) the percentage of 10-second partial intervals of alternative communicative response per session (in the FCT condition), and (c) the maximum wait time per session (in the three delayed gratification conditions). All behavioral measures were shown as line graphs comparing the baseline and treatment conditions. IOA on the occurrence of the

dependent variables was accessed by two observers independently but simultaneously collect data during 30% of all FCT and delayed gratification sessions.

Social validity. First, the researcher asked both the primary experimenter and secondary data observer to respond to a 6-question interview. The TARF-S accessed the interviewee's opinions on the acceptability of the proposed intervention procedures on the following dimensions: (a) willingness to implement the proposed intervention procedures, (b) acceptability and reasonability of the proposed intervention procedures, and (c) the effectiveness of the proposed intervention procedures. After all data collection were made from both the experimenter and the trained observer, the researcher scored each item and measured the followings: the overall willingness rating, the overall acceptability rating, and the overall effectiveness rating.

CHAPTER 4: A PILOT STUDY

Teaching Delayed Gratification to Reduce a Tangible-Maintained Behavior across Settings

The Purpose of the Study

Although extensive research has been conducted on FCT with delayed conditions, few studies have utilized various conditions for teaching delayed gratification as separate treatment conditions. As previously mentioned in chapter 3, the purpose of this pilot study was to assess (1) the feasibility of conducting the proposed study and (2) whether learning delayed gratification decreases temper tantrum behavior and increases self-regulatory skills. Two research methods were used: a multiple-baseline-across-settings and an alternating-treatments design. It should be noted, however, that the pilot study was not intended to be a comprehensive assessment of the treatment conditions. Rather it was intended to identify feasibility of this ABA research design and any challenges in implementation of the actual study.

The study was designed to answer the following three questions: (a) What target behavior is identified during the FBA and baseline measure? (b) Is teaching delayed gratification effective for reducing the target behavior? (c) Which intervention is the most effective among the given three delayed gratification conditions?

Participant

The participant had to meet the following criteria: (a) be aged between 3 and 5 years old, (b) have limited language abilities based on a norm-referenced assessment, and (c) be referred by the primary caregiver and/or a clinic professional for severe temper tantrum behavior. A 42-month-old boy who was diagnosed with language delay participated in the pilot study. The

primary caregiver of the potential participant was asked to complete the consent form for the child to participate in the study.

When the participant was 2 years old, his pediatrician suspected the child had language delay, as he had difficulty following the pediatrician's instruction and did not say a word. Also, he displayed temper tantrum behavior, which included yelling, pinching, and crying. After careful observation during his well-being checkups, the pediatrician made a referral to the tiny-k Early Intervention center in Lawrence, Kansas, for further evaluation. Then, a speech therapist and a licensed psychologist from tiny-k made a home visit and reevaluated the boy. First, the speech therapist conducted a hearing screening and the results showed that the boy had normal hearing. The psychologist used *the Battelle Developmental Inventory, second edition* (BDI-2, published in 2004), a norm-referenced standardized assessment designated for children from birth through age 8. The purpose of the BDI-2 is to diagnose and evaluate the early development of the child with tests in five different developmental domains: cognitive, motor, adaptive, personal-social, and communication. Based on the assessment, the participant obtained a total age equivalent score of 12 months and the following domain scores: adaptive, 14 months; personal-social, 9 months; motor, 11 months; communication, 8 months; and cognitive, 10 months. After the completion of his developmental screening, the participant had received in-home communication training until the age of 33 months and had begun attending a private preschool program at a local daycare twice a week.

Prior to the pilot study, the participant was diagnosed by the licensed psychologist at CCHD according the criteria set by the PPVT-IV. His PPVT-IV score was the 2-year age equivalent. The participant relied primarily on either pointing or leading as a means of communication (see Table 16). His primary caregiver informed the research team that the

participant engaged in temper tantrums when his preferred item or activity was not immediately accessible or a task demand was delivered.

Table 16

Participant Developmental Screening Results

Participant Age	Battelle Developmental Inventory (BDI)	Peabody Picture Vocabulary Test, Fourth Edition
42 months	12 months*	25 months

Note: * The BDI was conducted when the child was 2 years old.

Settings

During the course of the child's participation in the pilot study, all sessions took place in an outpatient clinic at the CCHC and at the participant's home. The family made weekly three-hour visits to the clinic and the researcher and the research team made weekly three-hour visits to the family's apartment over a three month period. The primary caregiver conducted all treatment procedures with coaching from the researcher.

Clinic. The licensed psychologist, the researcher, and primary caregiver attended every clinic session to ensure the participant's safety, behavioral observation for data collection, and the researcher's supervision. Also, the researcher set up a camcorder to ensure the presence of all three people in clinic. The clinic has three rooms. All rooms are utilized for counterbalancing experimental conditions. Each room contains a rectangular table, several child-sized chairs, and storage cabinets that hold children's toys and books. Two rooms are equipped with one-way observation windows, camcorders, and sound monitoring. The room that is not equipped with

one-way observation windows was set up with additional camcorder as a backup. During all sessions, the participant was seated across from the researcher at a table in a clinic room. Directly outside the three rooms, there was a waiting area provided for a short break.

Home. All procedures were conducted in the participant's bedroom, which contained toys, books, a small desk and chair, and a bed. The researcher, primary caregiver, two data observers, and a cameraperson attended every home session to ensure the participant's safety, behavioral observation for data collection, and the researcher's supervision. Also, the researcher asked the cameraperson to set up a camcorder in the participant's room to ensure the presence of all four people at home and all data collection.

Response Definition

The dependent variables measured in the pilot study were the occurrence of temper tantrum behavior and replacement behavior (i.e., tolerance on 5 minute waiting). Temper tantrum behavior included yelling, screaming, throwing items, and crying. The replacement behavior was how much time he was able to wait without leaving his room within 5 minutes.

Response Measurement and IOA

All sessions were videotaped both in clinic and at home. Prior to the baseline phase, the researcher recorded and collected all the data during the FBA. For both baseline and treatment phases in clinic, the researcher and the clinic supervisor recorded data in vivo. After the data collection was made, the two trained observers looked at the videotaped clinic sessions and recorded all data. For both baseline and treatment phases at home, the researcher and the observers recorded data in vivo and from video recording. The observers also assessed

procedural fidelity on the videotaped sessions. Table 17 on the next page displays procedural fidelity data for baseline and treatment conditions.

The two independent observers scored the target responses simultaneously but independently for determining the IOA. The IOA was conducted for 30% of all sessions. Mean IOA for the dependent variables was calculated by dividing each session into consecutive 10-second intervals and comparing the number of responses recorded during each interval by each observer. For both in vivo and videotaped sessions, an exact agreement was reached because both observers recorded the same number of responses in a given 10-second interval. Agreement percentages were calculated by dividing the number of intervals with exact agreement by the total number of intervals in each session. Table 18 and 19 on the following first two pages show the mean agreement on the temper tantrum behavior (with the range as applicable) during baseline measure, both in clinic and at home.

Table 20 and 21 display the mean agreement both on the temper tantrums and the replacement behavior, with the range as applicable during the 5 minute, fixed delayed condition, both in clinic and at home.

Next, table 22 and 23 show the mean agreement on the target behaviors with applicable range during the progressive time delay without visual cues, both in clinic and at home. Last, table 24 and 25 display the mean agreement on the dependent measure during the progressive time delay with visual cues condition in both conditions.

Table 17

Procedural Fidelity Checks

Phase	Procedural fidelity data in clinic (video)	Procedural fidelity data at home (video)
Baseline	100%	100%
Fixed time delay	95%	100%
Progressive time delay without visual cues	100%	100%
Progressive time delay with visual cues	100%	100%

Table 18

Mean Interobserver Agreement on the Target Behavior during Baseline (Clinic)

Baseline	In vivo	Video
Tangible	88% (range 80-95%)	91% (range 83.3-97%)
Demand	91% (range 83.3-100%)	97% (range 88-100%)
Attention	83.3% (range 80-88%)	98% (range 94-100%)
Play	100%	100%

Table 19

Mean Interobserver Agreement on the Target Behavior during Baseline (Home)

Baseline	In vivo	Video
Tangible	94% (range 90-100%)	100%
Demand	88% (range 80-97%)	91% (range 80-95%)
Attention	98% (range 94-100%)	100%
Play	100%	100%

Table 20

Mean Interobserver Agreement on the Dependent Variables during the Fixed, 5-minute Condition (Clinic)

Target behaviors	In vivo	Video
Temper tantrums	83.3% (range 76-94%)	90% (range 83.3-97%)
Compliance	80% (range 73-95%)	97% (range 88-100%)

Table 21

Mean Interobserver Agreement on the Dependent Variables during the Fixed, 5-minute Condition (Home)

Target behaviors	In vivo	Video
Temper tantrums	90% (range 85-100%)	94% (range 88-100%)
Compliance	97% (range 90-100%)	100%

Table 22

Mean Interobserver Agreement on the Dependent Variables during the Progressive Time Delay without Visual Cues Condition (Clinic)

Target behaviors	In vivo	Video
Temper tantrums	78% (range 68-80%)	83.3% (range 76-97%)
Compliance	90% (range 85-97%)	94% (range 90-97%)

Table 23

Mean Interobserver Agreement on the Dependent Variables during the Progressive Time Delay without Visual Cues Condition (Home)

Target behaviors	In vivo	Video
Temper tantrums	88% (range 85-94%)	94% (range 88-100%)
Compliance	97% (range 94-100%)	100%

Table 24

Mean Interobserver Agreement on the Dependent Variables during the Progressive Time Delay with Visual Cues Condition (Clinic)

Target behaviors	In vivo	Video
Temper tantrums	83.3% (range 75-90%)	94% (range 90-97%)
Compliance	97% (range 95-100%)	100%

Table 25

Mean Interobserver Agreement on the Dependent Variables during the Progressive Time Delay with Visual Cues Condition (Home)

Target behaviors	In vivo	Video
Temper tantrums	90% (range 83.3-97%)	92% (range 86-97%)
Compliance	100%	100%

Experimental Design

An alternating-treatments design was used to make the three delayed gratification intervention comparison feasible. The proposed research method is to alternate among conditions as a means to establish a functional relation between independent variables and dependent variables. In the study, all three delayed gratification conditions were simultaneously introduced and counterbalanced to avoid sequential effect. The design was also used to examine which condition was highly effective using the described strategies.

As well as an alternating-treatments design, a multiple-baseline-across-settings design was implemented to evaluate the effects of the intervention strategies on teaching delayed gratification to the participant in two different settings (i.e., both in the clinic and at home). Visual analysis was used to analyze the intervention effect. Experimental control was demonstrated when a change occurred in the level and trend of the measured behavior on the staggered introduction of the intervention. This design is suitable in situations wherein behavior cannot be reversed (Kennedy, 2005). Baseline data was measured on the participant's targeted behavior prior to the introduction of treatment. All procedures began simultaneously. When the

proposed intervention effects were observed, all treatment conditions were then introduced. The procedure continued until the conditions were implemented across all phases.

Procedure

The pilot study had five phases: (a) FBA, (b) baseline, (c) stimulus preference assessment, (d) parent training on how to implement delayed gratification procedures, and (e) delayed gratification conditions.

Phase 1: FBA. The FBA consisted of three steps.

Step 1: Descriptive assessment. The researcher used the FAST to gather relevant background information about the participant's problem behavior. The researcher asked the primary caregiver to identify the challenging behavior that was a great concern when they were in clinic. Based on the results, the participant's problem behavior was maintained by both tangible and demand conditions.

Step 2: Identify the target problem behavior. After the completion of the FAST, an FBA as described by O'Neill et al. (1997) was conducted. The researcher arranged a half-day visit with the primary caregiver to conduct a direct observation. During the home visit, the primary caregiver was asked to participate in an interview using the FAI (O'Neill et al., 1997). Then, the researcher conducted the ABC analysis. The temper tantrum behavior were defined as (a) yelling, (b) screaming, (c) crying, and (d) throwing items.

Step 3: Analyze the results. Once all data were collected, the researcher analyzed the data and generated a hypothesis on the most likely function of the participant's challenging behavior. The findings revealed that the participant's challenging behaviors were maintained by both tangible and escape conditions. Based on the results, it was hypothesized that the participant

displayed the problem behavior in one of the following conditions: (a) to gain a preferred item or activity or (b) to avoid an instructional demand.

Phase 2: Baseline. After the FBA, direct observations across settings were conducted to objectively measure the function of the participant's problem behavior across settings. The procedure for the baseline phase has been established by Iwata et al. (1982/1994). Four conditions (i.e., tangible, demand, attention, and play) were manipulated for the sessions, and the researcher investigated each during a 5-minute session. Each condition was conducted a minimum of four separate times to ensure the stability of the data. A total of 15 sessions were conducted in the clinic (see Figure 5), and 24 sessions were conducted at home (see Figure 6).

Figure 5

Line Graphs of the Percentages of Problem Behavior Occurrences at Baseline for Each Condition (Clinic).

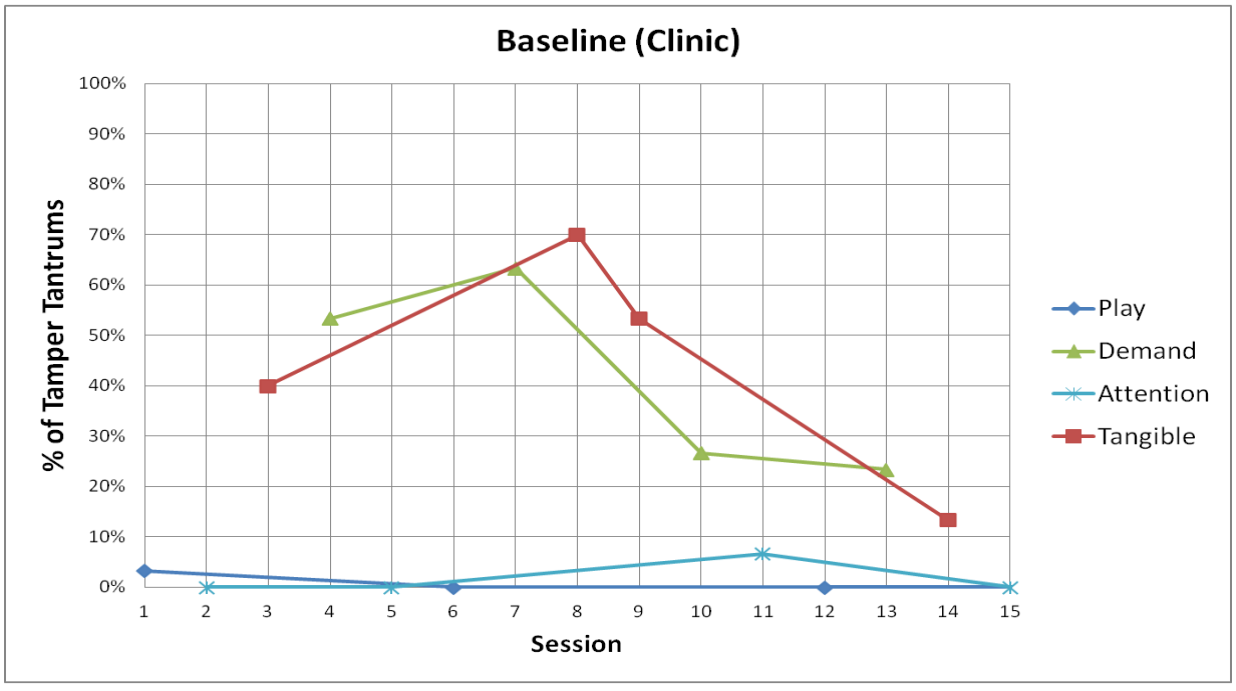
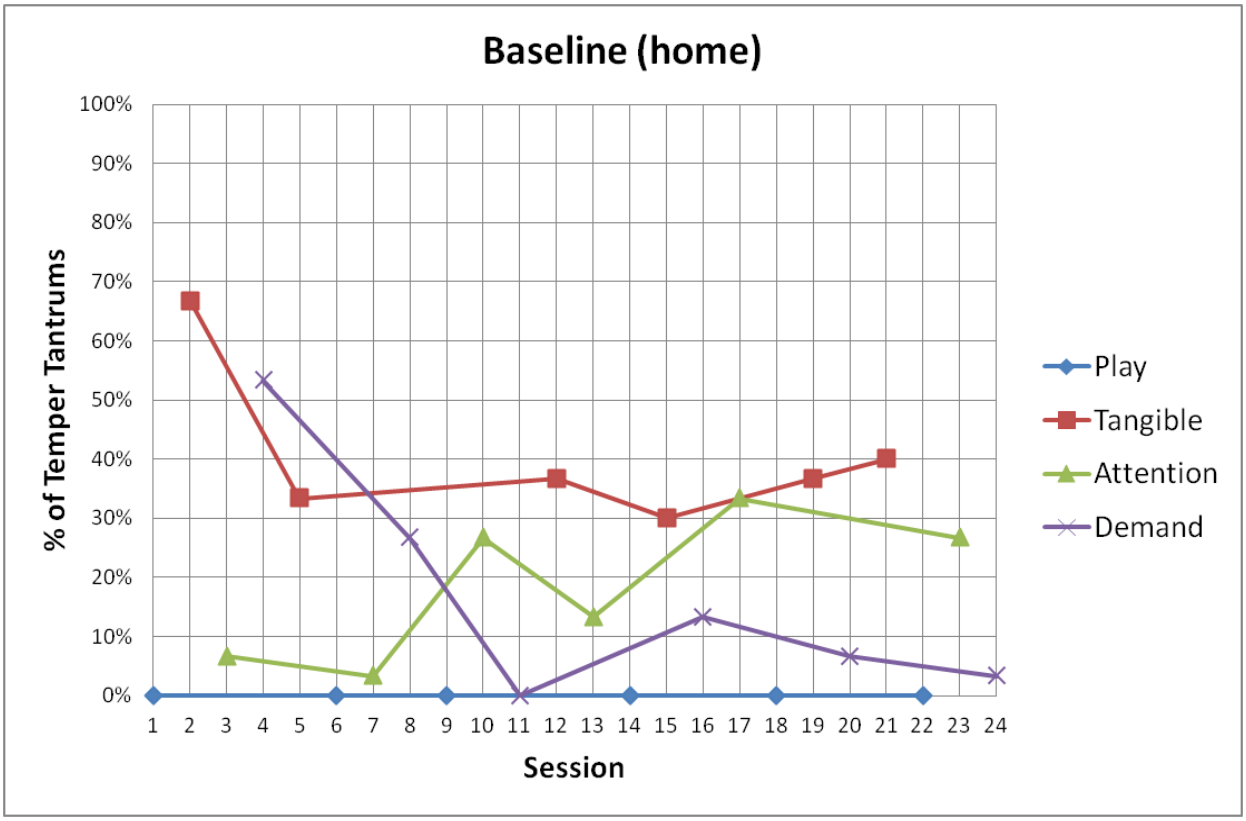


Figure 6

Line Graphs of the Percentages of Problem Behavior Occurrences at Baseline for Each Condition (Home).



The findings showed that the problem behavior was most evoked by the participant's desire for a preferred item, the tangible condition. The selection of replacement behavior was made based on that function.

Phase 3: Stimulus Preference Assessment. In clinic, the paired-stimulus preference assessment (Fisher et al., 1992) was conducted to identify a hierarchy of the preferred items. First, seven different items identified by the primary caregiver were placed on the table. The items were placed within the participant's view but out of reach. Then, the researcher randomly

picked two items, placed them close to the participant, and said, “Pick one.” The chosen item was handed to the participant, and he was allowed to play with it for 30 seconds. Then the item was removed, and the researcher again randomly picked up two items, excluding the first two items, and asked the participant to do the same. Each item was presented six times in different pairings, and the researcher recorded the number of times each item was picked and converted that to a percentage of selection. The item with the highest selection percentage was used as the reinforcer during the three delayed gratification conditions. Based on the results, the participant’s most highly preferred item was an iPad. Table 26 below summarizes the 7-item paired preference assessment.

Table 26

Results of the Stimulus Preference Assessment

Item	Number of selections	Percentage of selections	Rank
iPad	5	83.33%	1
Lego	4	66.67%	2
Train	4	66.67%	2
Cookie	3	50%	4
Blocks	2	33.33%	5
Book	2	33.33%	5
Crayon	1	16.67%	7

Phase 4. Parent training for teaching delayed gratification. The participant's primary caregiver reported that the participant had received FCT training from the tiny-k language specialist for a year. The participant understood most of the simple instructions given by clinical staff members, the primary caregiver, and the researcher. Based on the screening evaluation, the research team concluded that FCT training was not necessary for the pilot study. However, the replacement behavior was to say, "Please give me [the name of the preferred item]," when the problem behavior evoked.

Prior to implementing the three delayed gratification conditions, the researcher trained the primary caregiver on how to teach the participant tolerance for delayed reinforcer. Although this training component is not a part of the actual study, the researcher wanted to ensure that the treatment would be implemented as planned. The primary caregiver, therefore, was provided individualized instructions on the use of delay cues. After the training, the primary caregiver had opportunity to ask questions in regards to the implementation procedures. Then, both the primary caregiver and the researcher had a 30-minute practice session to familiarize themselves with the procedure.

Phase 5: Delayed Gratification. The delayed gratification phase consisted of manipulating three conditions.

5-minute, fixed time-delay. The primary caregiver placed the participant's most preferred item, the iPad, within view but out of reach. After the participant used a replacement behavior to request the item (i.e., "Dad, please give me the iPad."), the primary caregiver asked the participant to wait 5 minutes. If the participant exhibited temper tantrum behavior during the wait time, extinction was placed. The participant was told to wait, but the session was terminated if the participant had a meltdown or showed self-harming behaviors. If the participant

appropriately used a replacement behavior within the 5-minute period, the primary caregiver said, "I see. But you still need to wait." Once the participant successfully tolerated the entire 5 minutes of wait time, the researcher gave the release cue and said, "OK, here is your iPad. You may have one now." She handed the participant the iPad.

For the first few sessions, the participant displayed problem behaviors and did not want to wait for 5 minutes because the reinforcer was denied. Throughout the sessions, the participant learned how to tolerate the delay at home. However, the participant showed little changes in the levels of compliance when he was in the clinic.

5-minute, progressive time-delay without visual cues. In this condition, the entire 5-minute waiting time was divided into 9 trial periods: 10 seconds, 15 seconds, 20 seconds, 25 seconds, 30 seconds, 35 seconds, 40 seconds, 45 seconds, and a final 80 seconds. The last trial period was the longest to determine if the participant could tolerate more than a minute's delay if he had been trained to be wait for shorter durations of time.

The primary caregiver placed the participant's most preferred item within view but out of reach. After the participant used a replacement behavior to request the preferred item, the primary caregiver asked the participant to wait through the first trial period. If successful after 10 seconds, a delay cue was given before an additional 15 seconds passed, the second trial period. If this second delay was successful, a second cue was provided, and the participant was asked to wait an additional 20 seconds. When the participant successfully tolerated 4 minutes and 20 seconds of wait time, the primary caregiver provided him with another verbal cue for the last 80 seconds. Once the participant successfully tolerated the entire 5 minutes of wait time, the researcher gave the release cue and handed the participant the iPad.

During the wait time, if the participant exhibited the problem behavior, extinction was used and the participant was told to wait. If the participant used his replacement behavior during the wait time, the researcher provided a praise response but reminded the participant to wait. As described in the previous section, occurrences of problem and replacement behaviors were recorded and wait time compliance percentages were computed. The finding showed that the participant's temper tantrum behavior were gradually decreased across settings. In the beginning, the participant seemed to be more compliant when sessions were conducted at home. Nevertheless, the percentages for the last four sessions of the intervention in the clinic were decreased than those were at home.

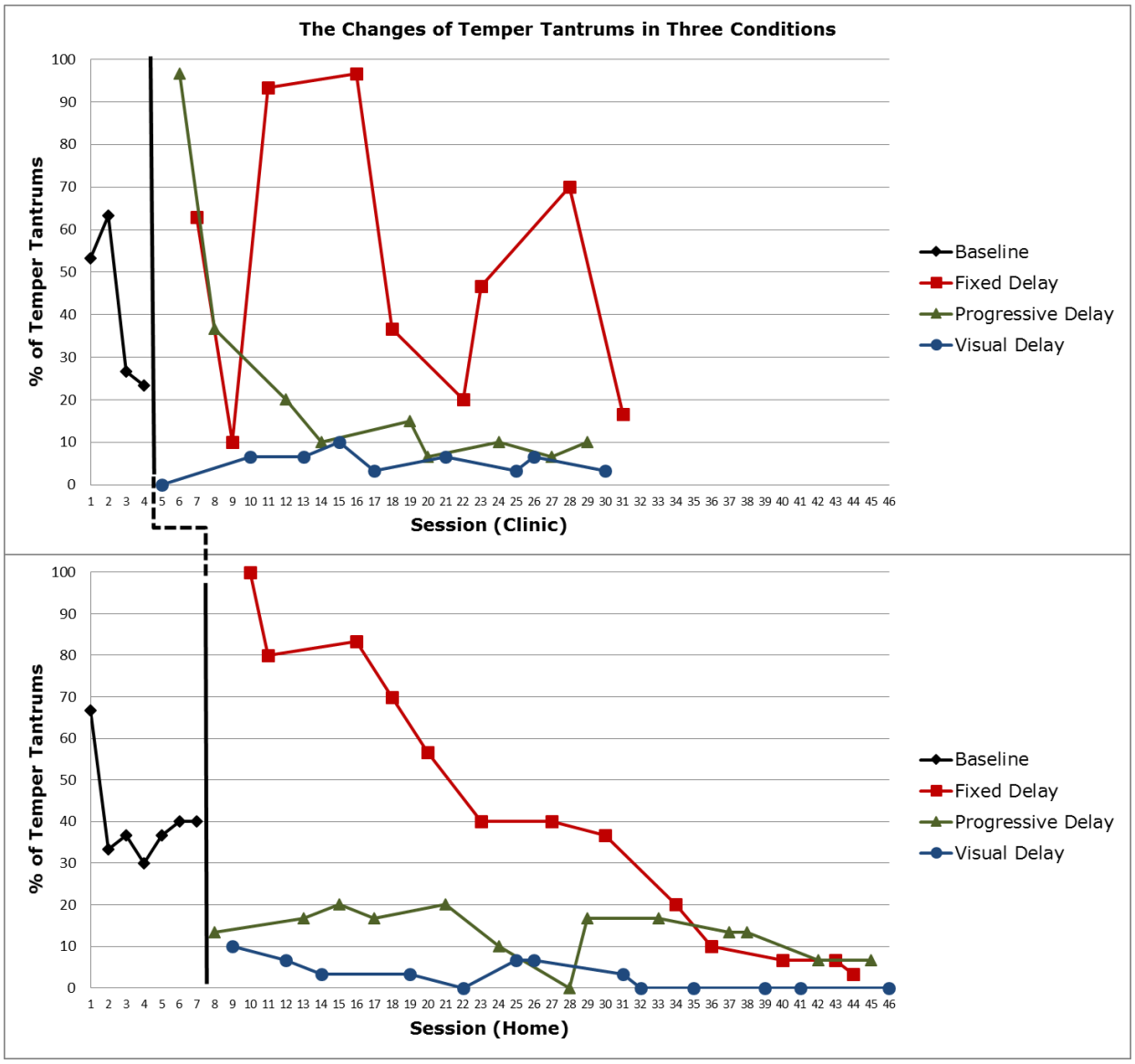
5-minute, progressive time-delay with visual cues. As in the previous two delayed gratification conditions, the most preferred item was shown to the participant but placed out of reach. A visual schedule board and nine stickers were placed in front of the participant. As during the progressive time-delay condition without visual cues, the entire 5-minute waiting time was divided into 9 trial periods. However, instead of giving verbal cues, the primary caregiver asked the participant to put a sticker on the board when each wait period was successfully completed. When the participant used his replacement behavior to request the preferred item, he was asked to wait for the first trial period. If he was successful after 10 seconds, the primary caregiver asked the participant to put one sticker on the board and used a delay cue (e.g., "You need eight more stickers") before the 7 trial period began. If this second delay was successful, another sticker was given to the participant, a second delay cue was provided (e.g., "7 more stickers"), and the participant waited an additional 20 seconds. If the participant successfully tolerated 4 minutes and 20 seconds of wait time, the primary caregiver delivered a final delay cue (e.g., "Keep waiting, one more sticker") for the last 80 seconds. Once the participant

successfully tolerated the entire 5 minutes of wait time, the primary caregiver gave the release cue and handed the participant the iPad.

During the wait time, if the participant exhibited the problem behavior, extinction was used and the participant was told to wait. If the participant used his replacement behavior during the wait time, the researcher provided a praise response but reminded the participant to wait. As described in the previous section, occurrences of problem and replacement behaviors were recorded and wait time compliance percentages were computed. The participant's temper tantrum behavior were significantly decreased to near zero during this intervention, both at home and in the clinic. However, between the clinic and home, the participant showed more compliance on waiting when sessions were conducted at home. Figure 7 on the next page shows the changes in the participant's temper tantrums within the three delayed conditions across settings.

Figure 7

The Percentages of Temper tantrums Changes during the Three Delayed Conditions across Settings



Discussion of Results and Future Concerns

The main goal of this pilot study was to test the feasibility of conducting the actual research. The findings indicated that the manipulation of teaching delayed gratification predicted the participant's behavior change from baseline to intervention. The results also provided partial support for the hypotheses (i.e., clinic only) the researcher proposed in the beginning, showing that the participant's problem behavior was dramatically decreased during the progressive time delayed condition with visual cues.

The studies discussed in the literature review evaluated the effects of delayed reinforcers for single-subject and group studies (Athens & Vollmer, 2010; Feldman et al., 2011; Fisher et al., 2000; Hagopian et al., 2005; Reichle et al., 2010; Vollmer et al., 1999). Those studies supported the contention that delayed gratification procedures were the most effective in decreasing problem behaviors and promoting the strengthening of self-control, but there are some potential limitations to its use. In the case of ABA research, no treatment evaluation of delayed gratification procedures has been conducted apart from using them with FCT, so the extent to which teaching the concept of delayed gratification contributes to delayed reinforcers' greater effectiveness is still unknown (Fisher et al., 2000; Hagopian et al., 2005; Vollmer et al., 1999). Another limitation is that few studies have evaluated how manipulating delayed gratification conditions affect impulsivity and self-control. Additionally, the way in which delayed gratification promotes academic task engagement has extensively been studied, but the extent to which teaching it is related to emotional regulation in autism research needs further examination.

Limitations of the pilot study based on the current findings. There were some limitations of the pilot study. First, the study was primarily designed for reducing problem behaviors motivated by a tangible consequence. Thus, even if the given interventions are

successful, it would still be uncertain that the treatment procedures would be effective for other causes of temper tantrums such as a desire to avoid demands or receive attention. Future investigations would be necessary for examining problem behaviors with those causes.

Possible limitations of the proposed study. Even if the proposed study seeks to extend the preliminary findings by investigating the effectiveness of the three delayed gratification conditions across participants, some limitations will be applied. First, children with ASD generally have sensory processing dysfunction, so the result of the fixed time delay condition may be aversive although the FCT will be taught beforehand. If those children continuously show high levels of temper tantrum behavior, sessions have to be terminated for their safety and the termination may result in some participants' dropout (i.e., *attrition*), which can be a threat to internal validity. Next, because of the nature of research designs, there can be another major threat to internal validity, which is *confounding effects*. A multiple-across-participants design requires all participants to receive the three delayed conditions in the same sequence, so previous experience may affect on the next treatment condition. In the case of multi-element design, the rapid alternation of two or more treatment conditions may result in potential interaction effects (i.e., the effects of each delayed gratification condition is not the same as when each condition is solely used). Last, the generalizability of the findings will be limited because of the limited number of participants (e.g., 3 or 4).

Future concerns. The FCT with delayed gratification phase may have an effect on the frequency of some participants' problem behaviors because the reinforcer is not immediately delivered to them. Although the primary investigator and the research team will ensure each participant's safety, some participants may feel vulnerable because of this denied access to the reinforcer. Those feelings of vulnerability might cause temper tantrums and lead them to engage

in aversive behaviors, especially in regards to the fixed time delayed gratification condition. Learning how to wait is an important skill for improving self-control, but the current finding may reveal that it may take a considerable time for the participants to understand the concept of delayed gratification. Future research will be needed to evaluate the generalizability and maintenance of multiple baseline treatment phase across behaviors or settings.

CHAPTER 5: RESULTS

The Results of the Study

As mentioned in the method section, the study had two rationales. The first rationale was to validate the treatment efficacy of FCT plus extinction (FCT+ext) for decreasing the three participants' temper tantrum behavior and increasing their alternative communicative response. The second rationale was to investigate the extent to which the three time-delay procedures made a profound impact on those participants. Through the randomized manipulation of the three time-delay conditions, the researcher tried to find out which condition seemed to be the most effective to teach the concept of waiting for the participants. Using a multiple baseline across three participants and an alternating treatment design, the researcher evaluated the effectiveness of both FCT+*ext* and the three time-delay conditions as a means to improve all participants' behavioral outcomes in clinic.

The three participants progressed through six phases: 1) FBA, 2) FA, 3) Paired Stimulus Preference Assessment, 4) FCT, 5) the three time-delay procedures, and 6) Follow-up. The method section (i.e., the Chapter 3) presented detailed descriptions of these phases. This chapter will show the process results of the study.

The Results: Functional Behavior Assessment (FBA)

The FBA was utilized as the first step to identify the purposes of all participants' temper tantrum behavior. By using both indirect and direct assessment methods, the main focus of the FBA was on identifying whether there was any social, developmental, cognitive, and/or environmental factors associated with the occurrence of temper tantrum behavior. This function-based assessment was helpful for the research team to understand each participant's temper

tantrum behavior and served as a stepping stone for planning how to implement behavior intervention plans (i.e., FCT and DG).

FAST. In Chapter 3, Table 7 summarized the results of the FAST interviews for each participant. The researcher conducted the interviews on two different dates (i.e., 12/6/2013 and 12/9/2013) based on each interview respondents' time availability. Interview respondents included Sonya's mother, Lily's parents, and Uno's mother. The topography/severity and frequency, situations in which the temper tantrum behavior was most likely occurred were identified by the respondents. Then, the antecedent and consequence of each participant's problem behavior were identified and recorded. Table 27 below summarizes the findings.

Table 27

The Findings of Functional Analysis Screening Tool (FAST)

Participant	Topography/severity	Frequency	Situation(s)	Antecedent	Consequence
Sonya	Peeling labels & stickers, crying, saying "Goodbye!" "No-no."/Mild	Daily (5-7 times per day)	When she is at home in the evening	Her eyes begin to blink so fast	3 minutes of time-out (i.e., sitting on her time-out chair)
Lily	Crying, yelling/screaming, taking off her clothes, and falling on the floor/Mild	Weekly (about 5 times once or twice a week)	Restaurants, toy store, or parks	Starts to become rigid and grunting	Either mom or dad tries to console her
Uno	Falling out, yelling, hitting self or others, taking off clothes, and throwing things out/Severe	Daily (5-6 times per day)	When his school bus does not come on time or he does not get what he wants	Begins to stamp his feet repeatedly	Try to calm him down

Lastly, the respondents answered either yes or no to the 15 questions, which allowed the researcher to find out the conditions of which the participant associated with the occurrence of the temper tantrum behavior (see Table 7 in Chapter 3). In the case of Sonya, the problem behavior was likely to be caused by attention, tangible, and demand conditions. In Lily's case, the problem behavior was likely to be caused by attention and tangible conditions. In the case of Uno, the problem behavior was most likely to be caused by attention and tangible conditions.

FBAI. The vast majority of the FAI's questions overlap with the ones in the FAST, so the researcher only covered the non-overlap portions to avoid redundancy. Table 28 below summarizes the results of the FBAI that were not previously covered in Table 8 (see Appendix C for a sample of one primary caregiver's full response).

Table 28

The Findings of Functional Behavior Assessment Inventory (FBAI)

Participant	Times when the problem behavior is most likely occurred.	Replacement behavior(s) when the problem behavior is occurring	Preference(s)	Primary form of communication	Previous interventions
Sonya	Between 6 and 9PM on every day	Sit quietly	Parents, elder sister, tablets, dolls, and crackers	Mixture of speech and gestures	None
Lily	Between 7 and 8PM on every day	Use gestures without temper tantrums	Mom and elder brother, and iPad	Mixture of speech and gestures	None
Uno	Between 7 and 8AM	Say out loud without temper tantrums	Mom, grandmother, swimming, and toy trucks	Mixture of speech and gestures	None

The benefit of conducting the FBAI was that the researcher was able to understand the cause of all participants' problem behaviors in a naturalistic environment. It was also helpful to know the types of the replacement behavior each primary caregiver tries to reinforce in a daily basis. Additionally, it was noteworthy that none of the participants had behavioral intervention prior to this study.

ABC Assessments.

The brief summary of the ABC data reports are shown in Table 10. This section shows the details of how the ABC assessments were made by our primary caregivers.

Sonya. Her primary caregiver observed Sonya on three different days (i.e., 12/7/2013, 12/8/2013, and 1/4/2014) at home. On December 7, 2013, the child tried to peel labels in the refrigerator and her mother said no. Sonya then screamed, yelled, and cried. As a consequence, her mother told her not to do it. On the following day, she screamed and cried for not allowing her to decorate her Christmas tree and her mom had 3 minutes of time-out. On January 4, 2014, Sonya tried to peel labels from her water bottle, so her elder brother took the bottle out from her. She cried and hit her brother, so her mom had 3 minutes of time-out again. Based on the primary caregiver's observation, it was hypothesized that Sonya's temper tantrum behavior were maintained by tangible condition (see Appendix D for a copy of the primary caregiver's report).

Lily. Her primary caregiver observed Lily on three, consecutive days (i.e., 12/9/2013, 12/10/2013, and 12/11/2013) while the child was at home. On December 9, 2013, the child refused to share her snack with her father, so she screamed once and the behavior was ignored. On the same day, she yelled and screamed to have her a balloon. Her parents calmed her down. On December 10, 2013, she refused not to take her vitamins and go to bed by crying, screaming,

and yelling. As a consequence, the parents held her and calmed her down. On the following day, she refused to brush her teeth in the morning, so the verbal attention (i.e., "you need to brush your teeth.") was given by the father. Based on the primary caregiver's observation, it was hypothesized that Lily's temper tantrum behavior were maintained by both tangible and demand conditions (see Appendix D for a copy of the primary caregiver's report).

Uno. His primary caregiver observed Uno on six, consecutive days (i.e., 12/6/2013, 12/7/2013, 12/8/2013, 12/10/2013, 12/11/2013, and 12/15/2013) at home. Between 12/6 and 12/8, the child yelled and screamed for not having his favorite snacks or activity, so the mother provided attention to him. Between 12/10 and 12/15, the child yelled and screamed again for refusing his sleep and desire to see his grandfather. As a consequence, the mother first ignored him but later she provided attention to him. Based on the report, it was hypothesized that Uno's temper tantrum behavior were maintained by both tangible and demand conditions (see Appendix D for a copy of the primary caregiver's report).

The Results: Functional Analysis (FA) as the Baseline Measure

After the ABC assessments were completed, the experimenter conducted four experimental functional analysis conditions (i.e., contingent attention, contingent demand, contingent tangible, and free play conditions) to all participants across sessions. The protocol for FA (see Appendix E) was given to the experimenter prior to the experiment. All of the four conditions were randomized by the experimenter.

Sonya. Table 29 shows the sequences of the four conditions were given to Sonya. Figure 8 displays the percent of 10 seconds intervals in which Sonya displayed temper tantrum behavior across sessions during four experimental functional analysis conditions. An increasing trend in

temper tantrum behavior was observed in the contingent tangible condition with a mean of 57.19% (range=30.76% to 81.82%) while low and stable trends were observed in the free play condition with a mean of 4.44% (range=0% to 13.33%), the contingent attention condition (0% across all sessions), and the contingent demand condition with a mean of 7.78% (range=3.33% to 16.67%). The results suggested Sonya's temper tantrum behavior was maintained by the contingent tangible condition.

Lily. Table 30 shows the sequences of the four conditions were given to Lily. Figure 9 displays the percent of 10 seconds intervals in which Lily displayed temper tantrum behavior across sessions during four experimental functional analysis conditions. Two highest trends in temper tantrum behavior were observed both in the contingent tangible condition with a mean of 77.27% (range=50.00% to 100.00%) and in the contingent demand condition with a mean of 76.66% (range=63.33% to 93.33%). Low and stable trends were observed in the free play condition with a mean of 1.11% (range=0% to 3.33%) and the contingent attention condition with a mean of 3.33% (range=0% to 3.33%). The results suggested both a positive and negative reinforcer function for Lily's temper tantrum behavior, although the trend in temper tantrum behavior in the contingent tangible condition show slightly higher than the trend in the contingent demand condition.

Table 29

The Sequences of the 4 FA Conditions (Sonya)

Days	Sequences of Sessions
Day 1	play-tangible-attention-demand
Day 2	attention-demand-play-tangible
Day 3	attention-demand-tangible-play

Figure 8

The Percentages of 10 seconds Intervals with Temper Tantrum Behavior Displayed by Sonya during the Functional Analysis

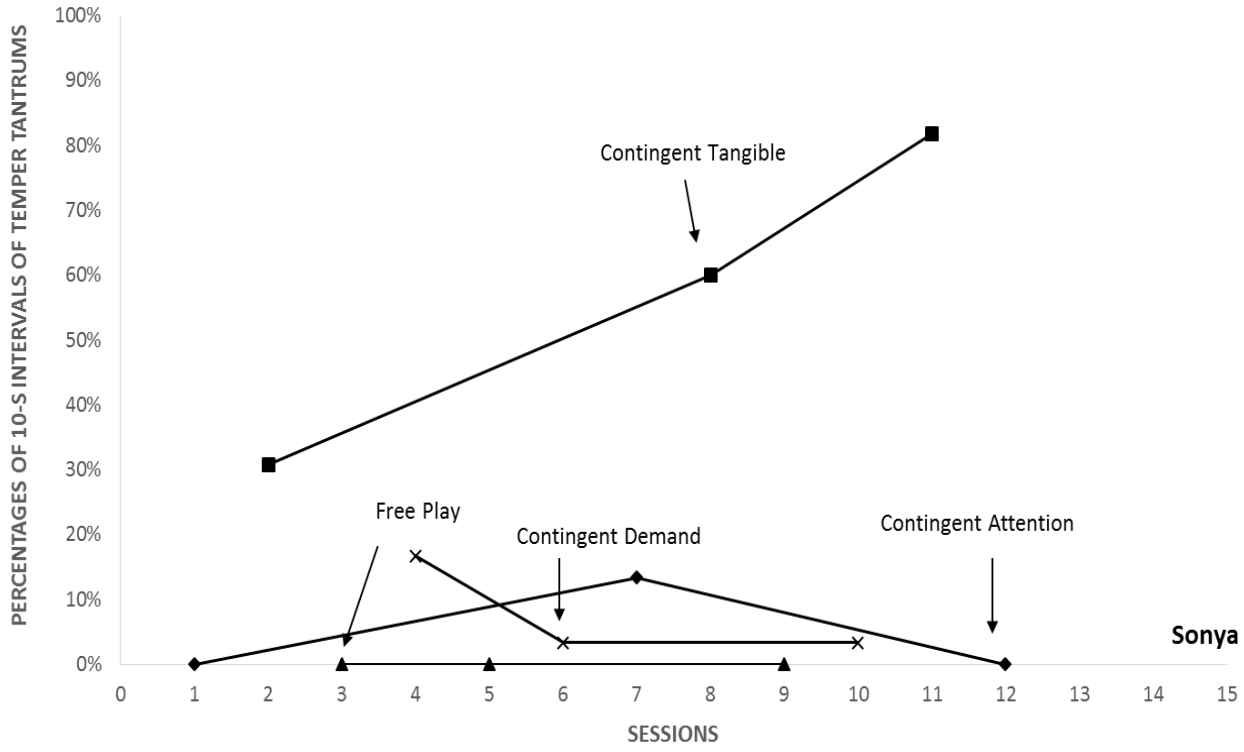


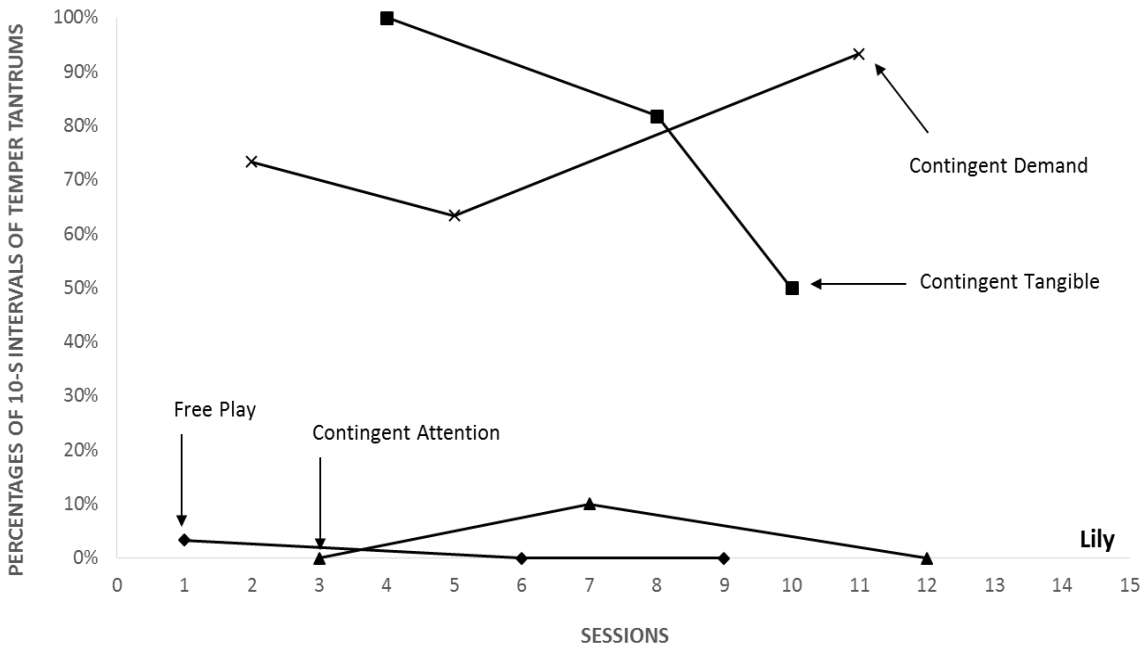
Table 30

The Sequences of the 4 FA Conditions (Lily)

Days	Sequences of Sessions
Day 1	play-demand-attention-tangible
Day 2	demand-play-attention-tangible
Day 3	play-tangible-demand-attention

Figure 9

The Percentages of 10 seconds Intervals with Temper Tantrum Behavior Displayed by Lily during the Functional Analysis



Uno. Table 31 shows the sequences of the four conditions were given to Uno. Figure 10 displays the percent of 10 seconds intervals in which Uno displayed temper tantrum behavior across sessions during four experimental functional analysis conditions. Low to zero levels of temper tantrum behavior occurred during the free play condition with a mean of 6.56% (range= 0% to 16.67%). High levels of temper tantrum behavior occurred in the contingent tangible condition with a mean of 72.60% (range=63.64% to 87.5%). Elevated levels of temper tantrum behavior were observed both in the contingent demand condition (*M*=30%, range=20% to 40%) and in the contingent attention condition (*M*=33.3%, range=0% to 60%). The results suggested multiple reinforcer functions for Uno's temper tantrum behavior.

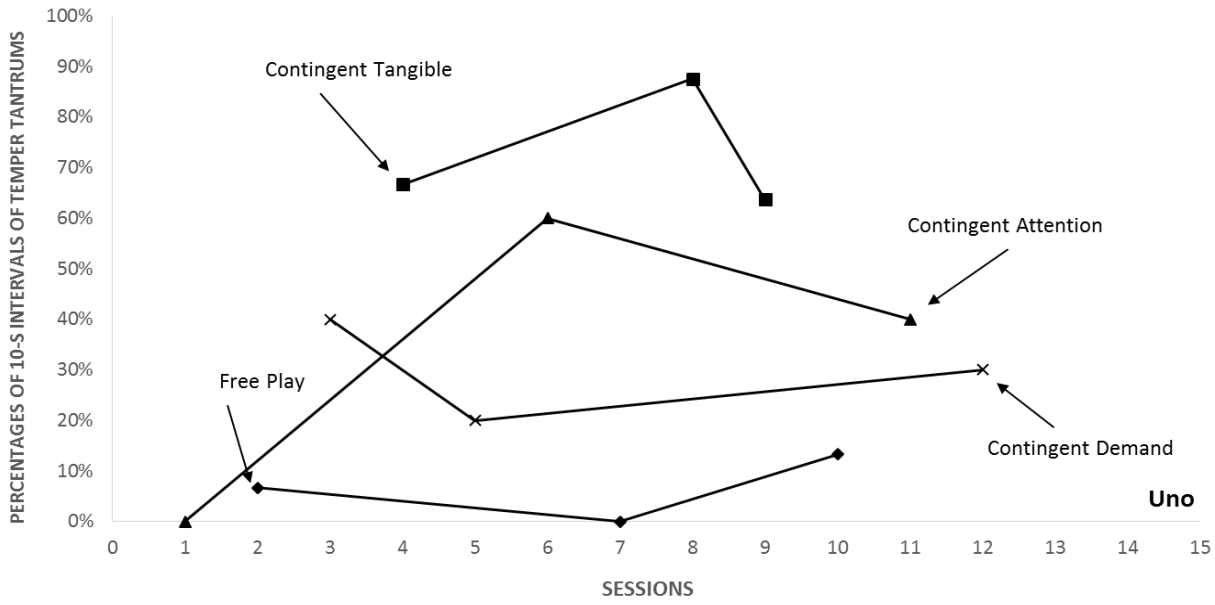
Table 31

The Sequences of the 4 FA Conditions (Uno)

Days	Sequences of Sessions
Day 1	attention-play-demand-tangible
Day 2	demand-attention-play-tangible
Day 3	tangible-play-attention-demand

Figure 10

The Percentages of 10 seconds Intervals with Temper Tantrum Behavior Displayed by Uno during the Functional Analysis



Baseline measure. In the case of Sonya, the result showed that her problem behavior was maintained by the contingent tangible condition. Thus, the trend in the contingent tangible condition served as the baseline. In the case of Lily, the result showed that her problem behavior was maintained by both the contingent tangible and demand conditions. However, since the trend in the contingent tangible condition was slightly higher than that of the contingent demand condition, the trend in the contingent tangible condition served as the baseline. Uno's case was the same as Lily, although the result showed that multiple reinforcer functions for Uno's temper tantrum behavior.

The Results: Paired Stimulus Preference Assessment Data

Preference assessments were conducted to obtain a hierarchy of preferred tangible items that were then used during the FCT and the three delayed gratification phases. Table 32, 33, and, 34 on the next page showed the most preferred item (i.e., the reinforcer) for all participants. For both Sonya and Lily, playdoh was used as the reinforcer during the FCT and the three delayed gratification phases. For Uno, both fruit snacks (ranked as the number 1) and Pringles chips (ranked as the number 2) were used as the reinforcer during the two treatment phases. See Table 32, 33, 34 on the next page for the results of this assessment across participants.

The Results: Functional Communication Training with Extinction (FCT with *ext*)

The experimenter conducted the FCT+*ext* after defined which condition maintained the problem behavior in the FA. The protocol for FCT (see Appendix E) was given to the experimenter prior to run the experiment. Multiple baseline across participants were used for this phase. Sonya was the first participant who moved to the FCT because her problem behavior was clearly maintained by the contingent tangible condition. The other two participants were remained in the baseline (i.e., the contingent tangible condition). When low to zero levels of Sonya's temper tantrum behavior were shown (as well as Sonya's alternative communicative response was increased), Lily moved to the FCT. Uno was remained in the baseline until Lily showed a clear effect on the FCT (i.e., low to zero levels of Lily's temper tantrum behavior and high to 100% levels of her communicative response). The FCT phase was completed when all participants showed the treatment efficacy.

Table 32

Results of the Stimulus Preference Assessment (Sonya)

Item	Number of selections	Percentage of selections	Rank
Playdoh	6	30%	1
Mr. Potato's hands	5	25%	2
Chinese doll	4	20%	3
Cat doll	3	15%	4
Chick doll	2	10%	5

Table 33

Results of the Stimulus Preference Assessment (Lily)

Item	Number of selections	Percentage of selections	Rank
iPad	6	30%	1
Playdoh	5	25%	2
Doll house	5	25%	2
Cooking toys	3	15%	4
Puzzle	1	5%	5

Table 34

Results of the Stimulus Preference Assessment (Uno)

Item	Number of selections	Percentage of selections	Rank
Fruit Snacks	8	40%	1
Pringles (i.e., chips)	6	35%	2
Sports car	3	15%	3
Ironman	3	15%	3
Mini car	0	0%	5

Definition and measurement of independent verbal and non-verbal communicative response during the FCT. Independent item request emitted using verbal languages (Sonya) was defined as the participant said "My turn" in the absence of verbal instruction from the experimenter. Independent item request included the participant, with or without the experiment's model, saying "My turn" so that the complete message was audible to deliver the reinforcer. Independent item request excluded the participant with the experimenter's clear verbal instruction of "My turn."

Independent item request emitted using the picture "hand symbol" communication card (Lily) was defined as the participant handling over the picture card in the absence of physical assistance from the experimenter. Handling over the picture card was defined as (a) the participant extending her hand, (b) picking up or making contact with the card, and (c) placing it in the palm of the experimenter's hand. However, during the FCT sessions, the definition of independent item request was extended to include Lily touching the picture card with one physical prompt.

Independent item request emitted using both verbal and non-verbal languages (Uno) were defined as the participant said "More, please" or touched his hands on his chest in the absence of physical assistance from the experimenter. However, during the FCT sessions, the definition of independent item request was extended to include Uno's use of both languages with one physical prompt because of his sensory difficulty.

All of the independent item requests were measured using an event recording procedure and were summarized as percent of communicative response, as well as the temper tantrum behavior. Both the primary and the secondary observers watched 5-minute videotaped sessions and used the recording procedures identical to those used for the FA. Figure 11 on page 154

shows the percentages of 10 seconds intervals with temper tantrum behavior and communicative response displayed by the three participants during the FCT.

Sonya. Results for Sonya's FCT can be found on the top panel of Figure 11. Her temper tantrum behavior was 0% across all of the FCT sessions. Her communicative response was high with a mean of 96.85% (range=80% to 100%). The low level of temper tantrum behavior and high level of communicative response indicated communicative response served as a replacement for her temper tantrum behavior, which showed a clear effect of the FCT.

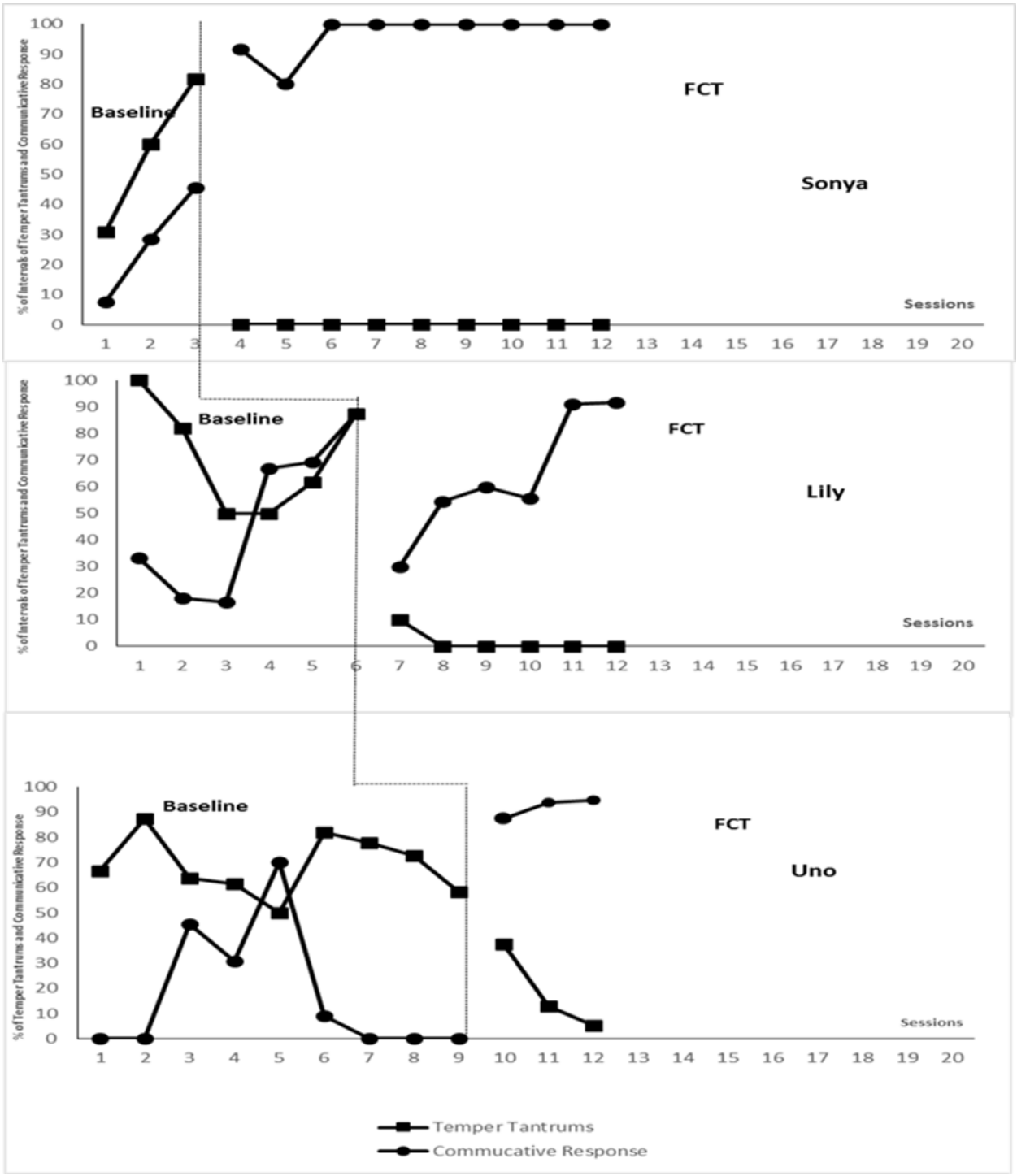
Lily. Results for Lily's FCT can be found on the middle panel of Figure 11. Low level of her temper tantrum behavior was observed across all 6 FCT conditions with a mean of 1.67% (range=0% to 10%). Her communication response was moderately high with a mean of 62.78% (range=30% to 91.66%). The results indicated FCT decreased the temper tantrum behavior, but its effect on communicative response was less clear than Sonya.

Uno. Results for Uno's FCT can be found on the bottom panel of Figure 11. Downward slope trend of the temper tantrum behavior was shown with a mean of 18.50% (range=5.26% to 37.5%). His communicative response showed upward slope trend with a mean of 91.99% (range=87.5% to 94.73%). The high level of communicative response indicated Uno's communicative response served as a replacement for his temper tantrum behavior, but its treatment effect on temper tantrum behavior was less clear compared to Sonya's results.

Overall, the results of the FCT assessment showed that all of the three participants had acquired communicative responses and that their responses served as a replacement for their temper tantrum behavior. Therefore, all participants met the criterion for participating the three delayed gratification conditions.

Figure 11

The effects of FCT on Temper Tantrum Behavior and Communicative Response across Participants



The Results: The Three Delayed Gratification Procedures

After the FCT phase was completed, each of the three participants was introduced to the three, delayed gratification conditions (i.e., the fixed delay, the progressive with verbal praises, and the progressive with visual cues conditions). Alternating treatments design was used to compare three treatments within a single subject. The protocol for DG (see Appendix E) was given to the experimenter prior to conduct sessions. The sequence of introducing three delayed conditions were randomized by the experimenter.

Sonya. Table 35 on the next page shows the sequences of the three delayed gratification conditions were given to Sonya. Figure 12 displays the percent of 10 seconds intervals in which Sonya displayed temper tantrum behavior across sessions during the baseline and the three delayed gratification conditions. The maximum wait time per session is also shown as bar graphs. A high level in temper tantrum behavior was observed in the first fixed delayed condition, but the trend was gradually decreased with a mean of 53.39% (range=13.63% to 77.78%). A moderately high level in temper tantrum behavior was observed in the first progressive delay with verbal praises condition, but the trend was gradually decreased with a mean of 38.09% (range=0% to 42.85%). Low to zero levels of temper tantrum behavior occurred during the progressive delay with visual cues condition with a mean of 3.03% (range= 0% to 9.09%). The results suggested Sonya's temper tantrum behavior was gradually decreased when the three delayed conditions were introduced, but the one with visual cues was the most effective intervention to teach her how to wait. In addition, Sonya tolerated the maximum 50 seconds of waiting with the progressive delay with visual cues condition across the three settings.

Table 35

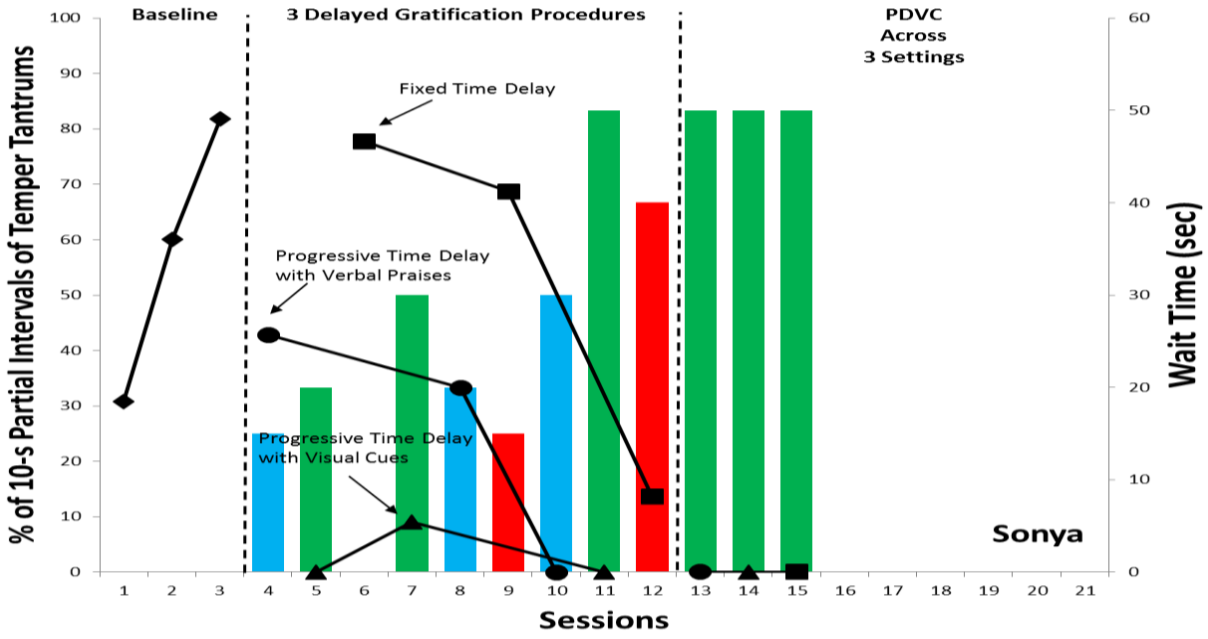
The Sequences of the 3 DG Conditions (Sonya)

Days	Sequences of Sessions
Day 1	PDVP-PDVC-FD
Day 2	PDVC-PDVP-FD
Day 3	PDVP-PDVC-FD
Day 4	PDVC across the 3 settings

*Note=FD (Fixed Delay), PDVP (Progressive Delay with Verbal Praises), PDVC (Progressive Delay with Visual Cues)

Figure 12

The Effects of the Three DG Conditions on Temper Tantrum Behavior and Wait Time per Session (Sonya)



Lily. Table 36 below shows the sequences of the three delayed gratification conditions were given to Lily. Figure 13 on the next page displays the percent of 10 seconds intervals in which Lily displayed temper tantrum behavior across sessions during the baseline and the three delayed gratification conditions. The maximum wait time per session is also shown as bar graphs. A high level in temper tantrum behavior was observed in the first fixed delayed condition. Then, the level was elevated in the second fixed delayed condition, but the trend was rapidly decreased with a mean of 51.66% (range=11.53% to 80.95%). A moderately level in temper tantrum behavior was observed in the first progressive delay with verbal praises condition. Then, the trend was elevated to the next condition, then rapidly decreased with a mean of 40.21% (range=0% to 42.85%). Low to zero levels of temper tantrum behavior occurred during the progressive delay with visual cues condition with a mean of 4.16% (range= 0% to 12.50%). The results suggested Lily's temper tantrum behavior was shown to be near to zero level with the progressive delay condition with visual cues. Same as Sonya, Lily also tolerated the maximum 50 seconds of waiting with the progressive delay with visual cues condition across the three settings.

Table 36

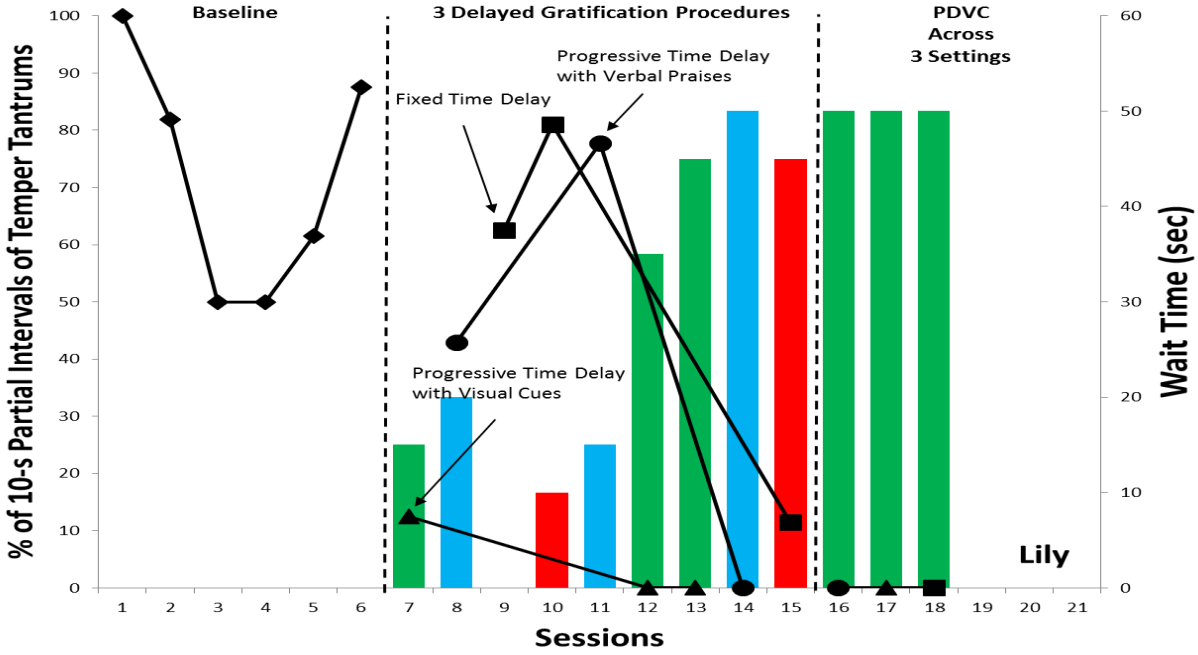
The Sequences of the 3 DG Conditions (Lily)

Days	Sequences of Sessions
Day 1	PDVC-PDVP-FD
Day 2	FD-PDVP-PDVC
Day 3	PDVC-PDVP-FD
Day 4	PDVC across the 3 settings

*Note=FD (Fixed Delay), PDVP (Progressive Delay with Verbal Praises), PDVC (Progressive Delay with Visual Cues)

Figure 13

The Effects of the Three DG Conditions on Temper Tantrum Behavior and Wait Time per Session (Lily)



Uno. Table 37 on the next page shows the sequences of the three delayed gratification conditions were given to Uno. Figure 14 on page 159 displays the percent of 10 seconds intervals in which Uno displayed temper tantrum behavior across sessions during the baseline and the three delayed gratification conditions. The maximum wait time per session is also shown as bar graphs. A high level in temper tantrum behavior was observed in the first fixed delayed condition. Then, the level was elevated and the trend was gradually increased with a mean of 52.76% (range=47.06% to 57.89%). A low level in temper tantrum behavior was observed in the first progressive delay with verbal praises condition. Then, the trend was gradually increased with a mean of 22.70% (range=14.29% to 31.58%). A moderate level of temper tantrum behavior

occurred during the progressive delay with visual cues condition, but the trend was rapidly decreased with a mean of 25.48% (range= 4.76% to 46.67%). The results suggested Uno's temper tantrum behavior was decreased to be near to zero level with the progressive delay condition with visual cues. Same as the other two participants, Uno also tolerated the maximum 50 seconds of waiting with the progressive delay with visual cues condition across the three settings.

Table 37

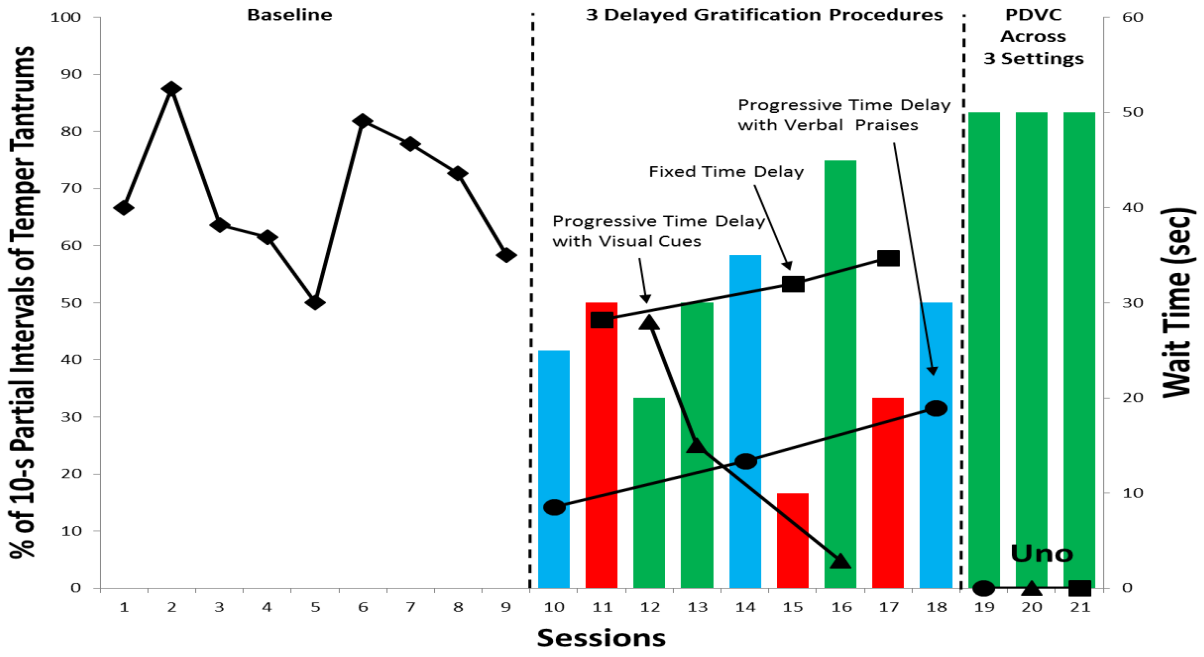
The Sequences of the 3 DG Conditions (Uno)

Days	Sequences of Sessions
Day 1	PDVP-FD-PDVC
Day 2	PDVP-PDVC-FD
Day 3	PDVC-FD-PDVP
Day 4	PDVC across the 3 settings

*Note=FD (Fixed Delay), PDVP (Progressive Delay with Verbal Praises), PDVC (Progressive Delay with Visual Cues)

Figure 14

The Effects of the Three DG Conditions on Temper Tantrum Behavior and Wait Time per Sessions (Uno)



The Results: Interobserver Agreement (IOA)

IOA results (means and ranges) were collected during the FA, FCT, and DG phases both in-vivo and video recording. The secondary data observer recorded data with the primary data observer during 42.85% of all FA sessions, 44.44% of all FCT sessions, and 30% of all DG sessions. Both the primary and secondary observers recorded data independent of each other. IOA were calculated by dividing the number of agreements by agreements plus disagreements and multiplying by 100. Overall, IOA were collected for 37.5% of all sessions.

IOA: Functional analysis. IOA across all measures of temper tantrum behavior for each participant are shown in Table 38 through 40. In the case of Sonya, IOA across all measures of temper tantrum behavior was 96.06% (range=88% to 100%). In the case of Lily, IOA across all

measures of temper tantrum behavior was 91.80% (range=80% to 100%). In the case of Uno, IOA across all measures of temper tantrum behavior was 98.08% (range=90% to 100%).

Table 38

Mean Interobserver Agreement on Temper tantrum behavior during FA (Sonya)

FA	In vivo (33.33% collected)	Video (67% collected)
Tangible	94.33% (range 88-100%)	97.78% (range 95%-100%)
Demand	100%	100%
Attention	100%	100%
Play	100%	100%

Table 39

Mean Interobserver Agreement on Temper tantrum behavior during FA (Lily)

FA	In vivo (100% collected)	Video (41.67% collected)
Tangible	87.34% (range 80-96.67%)	94.72% (range 90%-100%)
Demand	96.67% (range 95%-98.33%)	100%
Attention	100%	100%
Play	100%	100%

Table 40

Mean Interobserver Agreement on Temper tantrum behavior during FA (Uno)

FA	In vivo (50% collected)	Video (38.89% collected)
Tangible	94.67% (range 90-95%)	93% (range 90%-100%)
Demand	100%	100%
Attention	100%	100%
Play	100%	100%

IOA: FCT. IOA across all measures of target behaviors for each participant during FCT are shown in Table 41 through 43. Table 41 shows IOA across all measures of Sonya's temper tantrum behavior, vocal response, instruction, and verbal praises. Table 42 shows IOA across all measures of Lily's temper tantrum behavior, picture exchange, instruction, and verbal praises. Table 43 shows IOA across all measures of Uno's temper tantrum behavior, vocal response, instruction, and verbal responses.

Table 41

Mean Interobserver Agreement on Target Behavior during FCT (Sonya)

FCT	In vivo (33.33% collected)	Video (33.33% collected)
Temper tantrums	92.22% (range 90-93.33%)	96.67% (range 90-100%)
Vocal response	97.78% (range 93.33-100%)	100%
Instruction	92.22% (range 90-93.33%)	93% (range 90-100%)
Verbal Praises	100%	100%

Table 42

Mean Interobserver Agreement on Target Behavior during FCT (Lily)

FCT	In vivo (33.33% collected)	Video (33.33% collected)
Temper tantrums	92.22% (range 90-93.33%)	96.67% (range 90-100%)
Picture exchange	97.78% (range 93.33-100%)	100%
Instruction	92.22% (range 90-93.33%)	93% (range 90-100%)
Verbal Praise	100%	100%

Table 43

Mean Interobserver Agreement on Target Behavior during FCT (Uno)

FCT	In vivo (33.33% collected)	Video (33.33% collected)
Temper tantrums	92.22% (range 90-93.33%)	96.67% (range 90-100%)
Communicative response	97.78% (range 93.33-100%)	100%
Instruction	92.22% (range 90-93.33%)	93% (range 90-100%)
Verbal Praise	100%	100%

IOA: Delayed Gratification Procedures. IOA across all measures of target behaviors for each participant during the three delayed gratification conditions are shown in Table 44 through 46. Table 44 shows IOA across all measures of Sonya's temper tantrum behavior and wait time. Table 45 shows IOA across all measures of Lily's temper tantrum behavior and wait

time. Table 46 shows IOA across all measures of Uno's temper tantrum behavior and wait time. Overall, IOA were collected for 30% of all sessions.

Table 44

Mean Interobserver Agreement on Target Behavior during the three Delay Gratification Procedures (Sonya)

FCT	In vivo (30% collected)	Video (30% collected)
Fixed Time Delay	90% (range 88-92%)	92% (range 90-94%)
Progressive Time Delay with Verbal Praises	85% (range 80-90%)	90% (range 88-92%)
Progressive Time Delay with Visual Cues	92.22% (range 90-93.33%)	88% (range 86-90%)
Wait Time per Session	100%	100%

Table 45

Mean Interobserver Agreement on Target Behavior during the three Delay Gratification Procedures (Lily)

FCT	In vivo (30% collected)	Video (30% collected)
Fixed Time Delay	97.78% (range 93.33-100%)	100%
Progressive Time Delay with Verbal Praises	89% (range 80-96.67%)	92.22% (range 90-93.33%)
Progressive Time Delay with Visual Cues	87.34% (range 80-96.67%)	88% (range 86-90%)
Wait Time per Session	90% (range 88-92%)	100%

Table 46

Mean Interobserver Agreement on Target Behavior during the three Delay Gratification Procedures (Uno)

FCT	In vivo (30% collected)	Video (30% collected)
Fixed Time Delay	99.6% (range 88-100%)	100%
Progressive Time Delay with Verbal Praises	92% (range 83-100%)	95.5% (range 95-100%)
Progressive Time Delay with Visual Cues	87.34% (range 80-96.67%)	88% (range 86-90%)
Wait Time per Session	90% (range 88-92%)	97.5% (range 95-100%)

The Results: Procedural Integrity Measures

Procedural integrity data are shown in Table 47 below. Overall, procedural integrity score across all conditions was 100%.

Table 47

Overall Procedural Integrity Scores across All Sessions

Phase	Procedural fidelity data (in vivo)	Procedural fidelity data (video)
Functional Analysis	100%	100%
FCT	100%	100%
3 DG Procedures	100%	100%
Social Validity	100%	N/A (this section was not videotaped)

The Results: Social Validity

The social validity questionnaire survey was first given to the experimenter for intervention acceptability. The experimenter was asked to respond to the first six questions since the remaining four questions were for the primary caregiver. Table 48, 49, and 50 on the following pages show the experimenter's intervention acceptability rating across participants. In the case of Sonya, the experimenter rated the intervention very acceptable. He also rated the intervention very acceptable to both Lily and Uno, but he responded that it might take a little more time to see the treatment effectiveness on Lily.

The same survey was given to the secondary observer. Her rating on Sonya and Lily were pretty much identical to the experimenter's response. Some differences on rating between the experimenter and secondary observer were shown in the case of Uno. The experimenter responded that more time would take to see the treatment effectiveness whereas the secondary observer rated as "less time." In addition, the experimenter responded "very confident" for the treatment efficacy whereas the secondary observer rated as "neutral."

Although all primary caregivers were unable to fill out the survey, they were debriefed at the end of the study. Sonya's primary caregiver was pleased to see Sonya's improvements on using alternative communicative response. She was also happy to see the decline of Sonya's temper tantrum behavior. Lily's primary caregivers thanked the researcher that Lily was able to wait when it was told. Uno's primary caregiver's response was also similar to the two parents, but she told the researcher that Uno still needed to work on verbal communication skills and self-control. Overall, all respondents verbally consented that delayed gratification in the course of temper tantrums helped the participants gain positive behavior skills. The researcher thanked them and gave them a Target gift card as a token of appreciation.

Table 48

Intervention Acceptability Rating Sores (Sonya)

Question	Response (the Experimenter)	Response (the Secondary Observer)
How acceptable do you find the treatment to be regarding your concerns about your child?	7 (Very acceptable)	7 (Very acceptable)
How likely is this treatment to make permanent improvements in your child's behavior?	7 (Very likely)	7 (Very likely)
How costly will it be to carry out this treatment?	1 (Not at all costly)	1 (Not at all costly)
How willing are you to carry out this treatment?	7 (Very willing)	7 (Very willing)
How much time will be needed each day for you to carry out this treatment?	2 (Less time)	1 (Little time)
How confident are you that the treatment will be effective?	7 (Very confident)	7 (Very confident)

Table 49

Intervention Acceptability Rating Sores (Lily)

Question	Response (the Experimenter)	Response (the Secondary Observer)
How acceptable do you find the treatment to be regarding your concerns about your child?	7 (Very acceptable)	7 (Very acceptable)
How likely is this treatment to make permanent improvements in your child's behavior?	7 (Very likely)	7 (Very likely)
How costly will it be to carry out this treatment?	2 (Less costly)	2 (Less costly)
How willing are you to carry out this treatment?	6 (Mostly willing)	6 (Mostly willing)
How much time will be needed each day for you to carry out this treatment?	2 (Little more time)	2 (Little more time)
How confident are you that the treatment will be effective?	6 (Mostly confident)	6 (Mostly confident)

Table 50

Intervention Acceptability Rating Sores (Uno)

Question	Response (the Experimenter)	Response (the Secondary Observer)
How acceptable do you find the treatment to be regarding your concerns about your child?	7 (Very acceptable)	6 (Mostly acceptable)
How likely is this treatment to make permanent improvements in your child's behavior?	7 (Very likely)	7 (Very likely)
How costly will it be to carry out this treatment?	2 (Less costly)	1 (Not at all costly)
How willing are you to carry out this treatment?	7 (Very willing)	7 (Very willing)
How much time will be needed each day for you to carry out this treatment?	2 (Little more time)	4 (Neutral)
How confident are you that the treatment will be effective?	7 (Very confident)	7 (Very confident)

CHAPTER 6: CONCLUSION AND FUTURE RESEARCH DIRECTIONS

Summary and Discussion

The current study examines the participants' ability to wait for the reinforcer and examines whether it has helped them to promote their tolerance toward waiting after learning alternative communicative responses (Feldman et al., 2011; Reichle et al., 2010). In developmental psychology, delayed gratification (i.e., forgoing immediate satisfaction to gain something more desirable) has been used as a measure of self-regulation in young children (Feldman et al., 2011; Mischel, Shoda, & Rodriguez, 1989). The literature in autism research has provided evidence that instructional strategies (e.g., verbal and visual cues) are closely associated with children with ASD's longer wait time (Athens & Vollmer, 2010; Reichle et al., 2010). Many studies have been conducted regarding children with neurotypical development, but little research has examined the coping strategies that children with ASD employ to promote positive behavior during periods of waiting. There is a paucity of studies that investigate the way in which delayed gratification in children with ASD may be related to self-control. The current study seeks to find effective early behavioral intervention that can contribute to autism research based on teaching self-regulation.

To address the need for coordination between empirically supported treatment and newly developed interventions, the study first evaluated the main function of participants' temper tantrum behavior using a functional analysis. The study then evaluated the effects of FCT, an evidence-based intervention that systematically teaches appropriate communicative responses to participants. Next, the study examined the effects of the three delayed gratification conditions. Very little has been written regarding the effectiveness of such treatment. The last chapter

discusses (a) the findings based on the research questions and hypotheses, (b) implications and limitations of the study, and (c) suggestions for future research.

Research Questions and the Findings

Research Question 1. The first research question is in regard to the treatment efficacy of FCT: "Is there any significant reduction of temper tantrum behavior and increase of alternative communicative response from the baseline when FCT is implemented?" Based on the given research question, it was hypothesized that all participants' temper tantrum behavior would decrease when FCT is implemented. The researcher also hypothesized that the participants' temper tantrum behavior would increase when the three delayed conditions were implemented, because the non-immediate delivery of the reinforcer may function as an aversive event across participants.

The results of the FCT for two (Sonya and Lily) of the three participants indicated that their temper tantrum behavior were decreased when the FCT was implemented. In the case of Sonya, her problem behavior was decreased to zero across all of the FCT conditions. In addition, Sonya's alternative communicative response was significantly increased with a mean of 96.85%, which showed that this served as the replacement behavior for her temper tantrum behavior. The result suggested that the first hypothesis was confirmed (i.e., Sonya had a clear effect based on the FCT implementation). In the case of Lily, her problem behavior was decreased to zero after the second FCT was implemented. Her alternative communicative response was gradually increased across all FCT conditions, so the result showed that the first hypothesis was moderately confirmed (i.e., a positive effect was shown after the FCT was implemented). The result, however, did not show a clear effect compared to that of Sonya, because her alternative

communicative response partially served as the replacement behavior for her temper tantrum behavior, but not as a whole. One explanation for this result is that Lily had more than one function that maintained her problem behavior other than contingent tangible condition (i.e., contingent demand condition).

The data from Uno's FCT, however, suggested that the overall FCT effect was supported with some reservations. In general, there was a functional relationship between temper tantrum behavior and alternative communicative response (i.e., the more Uno made alternative communicative response, the less he showed temper tantrum behavior). In the beginning, Uno's FA data showed that the influential effects of contingent tangible, attention, and demand conditions might affect his temper tantrum behavior (although the function of his temper tantrum behavior was maintained as the highest during the contingent tangible condition). In addition, while in the last 4 sessions of the baseline, both trends of his temper tantrum behavior and alternative communicative response were down at a steady rate. The data indicated there might be other variables contribute to make the functional relationship be weaken.

One possible explanation might be that Uno's response allocation between temper tantrum behavior and alternative communicative response might have been influenced by the duration of reinforcer. Another possibility can be explained as *extinction burst*. In other words, the temporal increase of the temper tantrum behavior that the experimenter tried to eliminate during the first FCT session when extinction had just provided can be interpreted as *extinction burst,* since the temper tantrum behavior was decreased afterwards. Still, the data showed that Uno's problem behavior was decreased when the participant used alternative communicative response, so the treatment efficacy of FCT was supported by the data.

Despite some variables, it can be concluded that the treatment efficacy of FCT was well supported if the cause of problem behavior was maintained by the contingent tangible condition, because the data from Sonya's FCT suggested a functional relationship between her temper tantrum behavior and alternative communicative response.

The second hypothesis regarding delayed gratification procedures was also supported by the three participants' data. Figure 12, 13, and 14 indicate that all participants' temper tantrum behavior was increased when the first delayed gratification condition was introduced. The non-immediate delivery of the reinforcer evoked the problem behavior since their alternative communicative response did not result in the immediate return of the reinforcer.

Research Question 2. The second research question intends to evaluate whether a functional relationship exists when each of the three delayed gratification procedures are utilized with a given component on all participants' temper tantrum behavior. The question asks, "Do progressive time-delay procedures result in a clinically significant decrease in temper tantrum behavior displayed by children with ASD compared to the fixed time-delay procedure?" This question also examines which delayed gratification procedures result in a decrease of the participants' temper tantrum behavior and an increase of waiting by comparing the two progressive delay conditions and the fixed delay condition. It was hypothesized that the two progressive delay conditions would result in a decrease of the participants' temper tantrum behavior and an increase of waiting tolerance, when compared to the data using fixed delay conditions.

Sonya. Her temper tantrum behavior was high in the beginning, but gradually decreased to zero when she was in the progressive delay with visual cues (see Figure 12). The percentage of ten-second partial-intervals of Sonya's temper tantrum behavior showed a mean of 53.39%

(across the three fixed delay conditions), 38.09% (across the three progressive delay with verbal praises conditions), and 3.03% (across the three progressive delay with visual cues conditions). The results showed that the two progressive delay conditions resulted in a decrease of the participant's temper tantrum behavior when compared to the fixed delay condition. The data also confirmed the given hypothesis.

Sonya's tolerance toward waiting was increased when her temper tantrums gradually decreased across all delayed gratification conditions. The maximum time that the participant waited during the three fixed delay conditions was 0s, 20s, and 40s. The maximum time the participant waited for the three progressive delay with verbal praise conditions was 15s, 20s, and 30s. The maximum time of waiting for the three progressive delay with visual cues conditions was 20s, 30s, and 50s. The data indicated that Sonya gradually increased her wait time. The longest time she waited was 50 seconds when she was in the progressive delay with visual cues.

Lily. Her temper tantrum behavior slightly increased during the second sequence of the three delayed gratification conditions, but drastically decreased to zero in the end (see Figure 13). The percentage of ten-second partial-intervals of Lily's temper tantrum behavior showed a mean of 51.66% (across the three fixed delay conditions), 40.21% (across the three progressive delay with verbal praises conditions), and 4.16% (across the three progressive delay with visual cues conditions). The results showed that the two progressive delay conditions resulted in a decrease of the participant's temper tantrum behavior, when compared to the fixed delay conditions. The data also confirmed the given hypothesis, but the mean percentages of Lily's data across all delayed gratification conditions were slightly higher than Sonya's.

Lily's tolerance toward waiting was gradually increased when her temper tantrums decreased across all delayed gratification conditions. The maximum time the participant waited

during the three fixed delay conditions was 0s, 10s, and 45s. The maximum time the participant waited for the three progressive delays with verbal praise conditions was 20s, 15s, and 50s. The maximum time of waiting for the three progressive delays with visual cues conditions was 15s, 35s, and 45s. The data indicated that Lily's wait time was gradually increased during the progressive time with visual cues. The longest time she waited was 50 seconds when she was in the progressive delay with verbal praises.

Uno. His temper tantrum behavior gradually increased both in the fixed delay and the progressive delay with verbal praise conditions, although the progressive delay with visual cues resulted in a decrease of temper tantrums (see Figure 14). The percentage of ten-second partial-intervals of Uno's temper tantrum behavior showed a mean of 52.76% (across the three fixed delay conditions), 22.70% (across the three progressive delays with verbal praise conditions), and 25.48% (across the three progressive delay with visual cues conditions). The results showed that the two progressive delay conditions resulted in a decrease of the participant's temper tantrum behavior when compared to the fixed delay condition. The data also confirmed the given hypothesis, but the mean percentage across the three progressive delay conditions with visual cues was slightly higher than that of the three progressive delays with verbal praise.

Uno's tolerance toward waiting gradually increased when his temper tantrums decreased during the progressive delay with visual cues condition. The maximum time the participant waited during the three fixed delay conditions was 30s, 10s, and 25s. The maximum time the participant waited for the three progressive delays with verbal praise conditions was 25s, 35s, and 30s. The maximum time of waiting for the three progressive delay with visual cues conditions was 20s, 30s, and 45s. The data indicated that Uno's wait time gradually increased

during the progressive time with visual cues. The longest time he waited was 45 seconds when he was in the progressive delay with visual cues.

The results suggested that the two progressive delay conditions resulted in longer wait time than that of the fixed delay condition. The findings also indicated the two progressive delay conditions resulted in a decrease of the participants' temper tantrum behavior more so than the other conditions.

Research Question 3. The third question evaluates which delayed gratification condition was shown to be the most effective intervention: "Are the progressive time-delay procedures more effective than the fixed time-delay procedure in teaching delayed gratification to children with ASD? Among the three conditions, which one shows the most clinically significant reduction of temper tantrum behavior?" Based on the given question, it was hypothesized that the progressive time-delay condition with visual cues is the most effective intervention in terms of the clinically significant reduction of temper tantrum behavior across participants.

The findings showed that the progressive time-delay procedures were more effective than the fixed time-delay procedure across all participants. The results of the three delayed gratification procedures for Sonya and Lily suggested that the progressive time-delay condition with visual cues resulted in a significant decrease of their temper tantrum behavior. Uno's data indicated that the progressive time-delay condition with visual cues was the only intervention that showed the reduction of his temper tantrum behavior (see Figure 14).

The Implications and Limitations of the Current Study

One possible variable that may limit the interpretations of the findings in the current study relates to the underlying purpose that served the participants' problem behavior during a

functional analysis. An increasing trend in Sonya's problem behavior was found in the contingent tangible condition while low trends were observed in the other three conditions. The finding suggested that her temper tantrum behavior was maintained by the contingent tangible condition. Similar results were shown in the case of Lily, but high and variable levels of her problem behavior occurred during the contingent tangible and demand conditions. The findings based on Uno's case were even more complex than Lily's, because his problem behavior was maintained by multiple functions (i.e., the contingent tangible, demand, and attention conditions). Although the function that maintained problem behavior among the three participants was the contingent tangible condition, the results for Sonya clearly demonstrated the functional relationship between her problem behavior and the two clinical interventions (i.e., FCT and the three delayed gratification conditions). Lily's results also demonstrated the functional relationship, but Uno's results were less clear than the other two participants.

Another limitation in the methodology utilized in this research relates to sequential effects (i.e., order effects) used to manipulate the three delayed gratification conditions for all participants. The sequence of introducing the three delayed gratification conditions were randomized across all participants, but each participant was introduced one condition at a time. Thus, it is not outside the realm of possibility that their experience in the preceding delayed condition might have affected the subsequent delays. It is possible that all participants' experiences on the first delayed gratification may have served as aversive conditioning. The extent to which the level of all participants' temper tantrum behavior was gradually decreased during the three delayed conditions might be a result of sequential effects. It is also possible, however, that all participants might have been exposed to repeated experiments (i.e., testing effects).

The phase involving the three delayed gratification conditions in the study was conducted in fewer than two months for the following reasons: a) The procedure was a novel design, b) The mean age for all participants was three years and six months at the time of the study, which were considered a fairly young age to understand the concept of waiting, and c) Once they successfully tolerated the 50 seconds of waiting during any of the given three delayed gratification conditions, the experiment was concluded. Due to the given constraints, the study did not further investigate whether the progressive time delay with visual cues may have resulted in a longer duration of wait time. Future research can address this question by utilizing the progressive time-delay with visual cues condition across participants, behaviors, or settings. The question can be also addressed by investigating the extent to which the progressive time-delay with visual cues may result in the maximum duration of wait time.

The results on social validity are also limited, because all primary caregivers were unable to observe the given sessions and complete the survey form. However, the researcher set up an individual meeting, debriefed at the end of the study, and asked for their opinions. They said they were pleased to see the results and that the participants displayed positive behavior at home. Future research can investigate family satisfaction by asking family members to complete social validity survey.

Suggestions for Future Research

The results of the present study suggest teaching delayed gratification in a single-subject research design after children with ASD learn an alternative response during the FCT. The inclusion of the FCT component prior to implementing the three delayed gratification conditions for tangible-maintained problem behavior created a learning opportunity in which the

participants promoted positive, socially acceptable behavior. Based on the findings (see Figure 11), treatment efficacy was well-supported, because alternative communicative responses suppressed problem behavior to a clinically acceptable level. For children with tangible-maintained problem behavior, alternative communicative response to gain access to the reinforcer increased their chances of engaging in socially acceptable behavior. The results of the study on the three delayed gratification conditions, however, showed that environmental arrangements can create situations in which children with ASD must work on waiting and on their tangible-maintained problem behavior. The study can be extended by investigating both children with and without ASD as a group study (e.g., ANOVA).

The most important contribution of this study evaluated which behavioral interventions children with ASD gradually learned to understand the concept of waiting while manipulating three different, delayed gratification conditions. Considering the fact that the age of the participants was approximately three years and six months, this study can be viewed as novel and possibly contributing to the development of more tailored early behavioral interventions both in clinical and educational settings. Additionally, having those with ASD understand the concept of delayed gratification is important in promoting self-regulating negative emotions (Reichle et al., 2010). Based on the findings, the proposed study resulted in an early behavioral intervention that can be used to teach children with ASD the concept of delayed gratification after FCT has been introduced. By expanding the empirically supported treatment with added components, treatment efficacy can be maximized.

The results of the study (see Figures 12, 13, and 14) have implications for clinical practice in situations in which waiting may be challenging for children with ASD. All participants' problem behavior was moderately increased when they experienced the first, non-

immediate delivery of their reinforcer. One possible interpretation can be that children with ASD have sensory difficulties. Thus, the results of the first fixed time delay procedure across all participants might have been aversive although alternative communicative response was taught beforehand. In the case of Uno, his temper tantrum behavior was gradually increased every time fixed time delay conditions were introduced. The fixed time delay condition served as a new baseline, because all participants' temper tantrum behavior increased. Among the three delayed gratification procedures, this condition was shown to be the least effective. Another possible interpretation can be the participants might have been fatigued when the three delayed gratification conditions were continuously introduced.

Another contribution of this study is the utilization of a single-subject research design based on the developmental concept called delayed gratification. Understanding the concept of waiting among the three different conditions, when each response option is associated with quantitatively different levels of wait time, shows the visual cues were useful in teaching the participants how to wait. The progressive time delay with visual cues condition was the most effective intervention for Sonya and Lily and the only effective one for Uno. The findings suggest that this condition may improve self-regulation of children with ASD's impulsive behavior. It can also be concluded that teaching delayed gratification could be closely related to the emotional regulation of children with ASD. More studies will be needed to evaluate the effectiveness of the intervention. In addition, the research methodology can be utilized as a means of support that promotes the development of appropriate skills among young children.

The generalizability of these finding are somewhat limited, however. The study was an initial foray into autism research based on introducing delayed gratification in early childhood. The findings indicated the methodology might work for tangible-maintained behavior, but future

research should investigate the effectiveness of the given interventions for other functions (e.g., demand or attention). It is also recommended that the findings should be replicated in educational settings and with other age groups. The three, time-delay strategies have not been fully investigated in the field of developmental psychology, so comparative studies between young children with ASD and those with neurotypical development would definitely be a plus. Some reservations remain, but the study still provides preliminary evidence on the effects of teaching the concept of delayed gratification to children with ASD's problem behavior maintained by the contingent tangible condition. This can be considered as a significant stepping stone for both ABA and developmental psychology. The study was instrumental in introducing children with ASD, their families, and educators to the importance of teaching delayed gratification as a means of positive behavior support (PBS).

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APPENDIX A

RESEARCH CONSENT FORM

Teaching Delayed Gratification: Reducing Temper tantrums of Children with Autism Spectrum Disorders after Functional Communication Training
Protocol # 13649
Dr. Matt Reese, Ph.D. & Seungyeon Lee, M.A.

You are being asked to consider a research study for you and your child who has Autism Spectrum Disorders (ASDs) and problem behaviors. Participating in research is different from getting standard medical care. The main purpose of research is to create new knowledge for the benefit of future patients and society in general. Research studies may or may not benefit the people who participate.

Research is voluntary, and you may change your mind at any time. There will be no penalty to you or your child if you decide not to participate, or if you start the study and decide to stop early. Either way, you can still get medical care and services at the University of Kansas Medical Center (KUMC) and Children's Therapeutic Learning Center (TLC).

This consent form explains what your child will have to do if you and your child are in the study. It also describes the possible risks and benefits. Please read it carefully and ask as many questions as you need to before deciding about this research.

You can ask questions now or anytime during the study. The researchers will tell you if they receive any new information that might cause you to change your mind about participating.

This research study will take place at both KUMC and Children's TLC with Matt Reese, Ph.D. and Seungyeon Lee, M.A. as the researchers and will involve about three to five families.

Why are my child and I being asked to take part in this study?
You and your child are being asked to take part in this study because your child has 1) a developmental disability, such as autism or a related disorder, 2) is between 3 and 5 years, 11 months old, and 3) has shown temper tantrum behavior that occur at least five times per day in order to obtain his or her favorite item(s). For example, you child may do one of the followings: a) pinching others to get his/or her favorite toy, b) yelling or screaming for getting a candy bar, and/or c) crying for his or her favorite blanket. While all children may show some of these behaviors once in a while, having temper tantrum behavior such as these happen every day is

stressful for families and makes it hard for families to get along and do activities together.

Why is this study being done?

* Research has shown that problem behaviors such as yelling and screaming can be harmful to children with ASDs and their families. Children with ASDs who exhibit those problem behaviors need effective behavioral intervention to achieve the best possible educational, behavior, and therapeutic outcomes. To do so, clinical psychologists, behavioral analysts, and mental health professionals have continuously shown their best intentions and efforts in order to make a good progress.
* In order to decrease problem behaviors, parents often obtain services from community mental health agencies, physicians, and private mental health professionals. Both CCHD and Children's TLC are the organizations that utilize the most effective practice.
* By doing this study, we hope to learn how to improve children with ASDs' behavioral outcomes. In addition, we want to find out if teaching how to wait (i.e., how to delay gratification) after functional communication training (FCT) helps children with ASDs to use socially acceptable behavior.

Are there reasons why my child and I should not take part in the study?

You and your child should not take part in this study if 1) your child's temper tantrum behavior does not happen very often (i.e., less than 5 times per day), 2) the cause of your child's temper tantrum behavior is not to obtain his or her favorite item, or 3) your child's temper tantrum behavior may bring some potential harms for both himself/or herself (i.e., self-injurious behavior) and others. We want to see the temper tantrum behavior during several of your visits so we can determine why it is happening. You should not do this study if you are not comfortable with what you and your child will be asked to do as part of the study. You should not participate if your child's temper tantrum behavior is hurting himself or others and if the behavior is severe enough to pose a danger to him/her or others. You should also not participate in this study if you are unable or unwilling to attend the required visits.

How long will my child and I be in the study?

The length of time that you will be in the study is different for all families. It also depends on how long it takes for your child's behavior to improve. The study will take approximately 8-10 visits. Visits will be 45 minutes to 1 hour, once or twice a week depending on family and researcher schedules. You will also come back to our center one time for follow-up session after 8 or 10 visits. That will be the last visit and you will stop being in the study.

What will I be asked to do?

You are being asked to read and sign this consent form if you are interested in participating. You will have an opportunity to ask questions before signing up for the study. Your child will be asked to do various activities during this study depending on what phase (part) of the study you are in. All children will do the total six parts of the study. Please see below.

Baseline

Part One: Initial Interview and Data Collection (1 visit):

You will be asked to:

- Answer questions about which behaviors you are most concerned about, when they usually happen, and how often they happen.
- Complete a data collection sheet for one day about how often one of the behaviors you are concerned about happens and give the data sheet to one of the researchers. The researcher will collect the data.

Part Two: Provider Implemented Functional Analysis (approximately 1-2 visits).

You will:

- Bring your child to each session
- Get information about how the function of your child's temper tantrum behavior is identified

Your child will complete functional analysis procedures with one of the researchers in 5 ten-minute activities during each visit. This means observing your child during specific activities that challenging behavior is more or less likely to happen. For example:

- Asking the child to do something and then taking it away if he has challenging behavior
- Providing toys to play with.
- Not interacting with your child will be observed in the absence of any structured activity.
- We will watch your child during the activities and collect information about what the researcher and your child do. We will also videotape your child during these activities so we can watch them later.

Part Three: Stimulus Preference Assessment (1 visit)

You will:

- Bring your child's favorite items (6 or 7)

Your child will:

- Be asked to pick his or her favorite one between two of the paired items.
- We will watch you during the activities and collect information about what your child does. We will also videotape your child during these activities so we can watch them later to collect information.

Intervention

Part Four: Teaching appropriate communication skill using Functional Communication Training (approximately 1-2 visits)

You will:

- Get information about how a replacement for the temper tantrum behavior is taught by showing the child how to use an appropriate form of communication.
- Complete several 5-minutes activities with your child during each visit and practice using the communication replacement skill that replaces the temper tantrum behavior.
- We will watch you during the activities and collect information about what your child do. We will also videotape your child during these activities so we can watch them later to collect information.

Your child will:

- Complete the activities with the researchers during each visit.

Part Five: Provider Implemented "How to Wait" Training (approximately 2-4 visits):

You will:

- Get information about how your child is taught the concept of waiting by using three different 5-minute, waiting procedures.
- The order of the three procedures will be introduced to the child randomly.
- Your child will complete several 5-minutes sessions that require him or her to wait. During each 5-minute waiting time, you child will be asked 1) to wait for the entire 5

minutes, 2) to receive verbal signals when a short period of time is passed, and 3) to receive stickers when a short period of time is passed. Your child will allow to do his or her preferred activity when s/he tolerates the entire 5-minute of waiting.

- We will watch your child during the sessions and collect information about what you and your child do. We will also videotape your child during these activities so we can watch them later to collect information.

Follow Up: Parent Satisfaction Survey

Part Six: Follow-up session (1 visit)

You will:

- Get information about how to prevent temper tantrum behavior and what to do if they still happen.
- Be asked to fill out a satisfaction survey that asks you what you think about the intervention plans. The survey consists of 10 items that measure three factors, which are treatment acceptability (item 1, 2, and item 4), effectiveness of the given treatment (item 6 through 9), and time and cost effectiveness of the given treatment (item 3, item 5, and item 10) about the treatment.
- We will watch and videotape you and your child during this interview process so we can watch them later to collect information.

What information will be collected during the study?

We will collect information about you and your child during the study in several ways, including:

Child Measures

Challenging Behaviors- We will evaluate your child's challenging behavior by asking you questions and observing your child. We will collect information about your child before he or she begin training, during each visit, and after he or she completes training, to determine what improves your child's challenging behaviors.

Alternative Behaviors-We will evaluate your child's alternative behavior (i.e., communication skills) by observing your child. We will collect information about your child during each visit to determine what improves your child's challenging behaviors.

Tolerance on 5-minute waiting- We will evaluate your child's tolerance on 5-minute

waiting (i.e., not leaving the session room) by observing your child. We will collect information about your child during each visit to determine which delay of gratification procedure improves your child's tolerance on waiting.

Observational Measures - We will watch you during the activities and collect information about what you and your child do. Information from each session will be reviewed and the researchers will talk to you about what you did well and what to do differently.

Videotapes - All sessions will be videotaped so we can collect information after the visit. All videotaped observations will be labeled with a number, rather than your name, will be stored in a locked file cabinet and area, and will be destroyed within 10 years after the end of the study.

Parent Measures:

Parent demographics - This survey will ask about you and your family (age, number of children, education background, etc.). You will be asked to fill out this form before participating in the study.

Parent Satisfaction Survey - This survey asks about your satisfaction with the training. You will be asked to fill out this survey after the training is complete.

What are the benefits to being in this study?

Whether benefits are not guaranteed, there are quite a few potential benefits for your child, including: decreased temper tantrums, improved positive behavioral outcomes (e.g., communicating with others), improved emotion regulation, and increased positive social skills. Although participation will require a certain time commitment, the potential benefits for you and your child are numerous. Previous studies found that FCT were highly effective in decreasing problem behaviors and increasing positive behaviors when implemented (Mancil, 2006). Parents, teachers, and mental health professionals reported higher levels of satisfaction, acceptability, and goal attainment when FCT was utilized (Harding and Wacker, 2009). Previous research also found that teaching children with ASDs how to wait helps them increase positive social skills (Reichle et al., 2011). Overall, effective treatment of behavior problems may result in reduced risk for your child's problem behavior and increases in socially adaptive behavior.

What are the risks to being in this study?

Your child may experience frustration and exhibit temper tantrums when he or she is not being able to access the most favorite item immediately. Those temper tantrum behavior will be shown either as a mild or as a severe form of the following:

- Weeping (mild)

- Disruptive muttering (mild)
- Biting (mild/severe)
- Crying (mild/and severe)
- Throwing things (severe)
- Falling to ground (severe)
- Yelling (severe)
- Screaming (severe)
- Behaviors that bring some potential harms to him or herself (e.g., banging his or her head on hard surfaces)

Almost all children may exhibit temper tantrums. Please be assured that the types of behavior skills taught during training are in addition to normal parenting and are not a reflection of your parenting skills. However, if your child engages in challenging behaviors that brings some potential harms (such as banging their head on hard surfaces) please let the researchers know during the first phase.

You and your child have the right to discontinue the study at any time. Both the PI and the co-PI will sit next to the child and safeguard him or her during each session. If the child's temper tantrums escalates into violent behaviors that may endanger him or herself or others (e.g., hitting self or others) during the study, the session will be terminated immediately. During each of the sessions, both the PI and the co-PI will make sure to prevent any potential harm.

If any of the listed behaviors escalates or does not improve, the session will be terminated immediately for that day and the PI will ask the primary caregiver if he or she wants to continue at later time. If severity of temper tantrums causes bruising, tissue damage, property destruction, or any form of life-threatening events, the subject will no longer be in the study and the PI will notify HSC of an adverse event.

Some parents are not used to this and may feel uncomfortable or have difficulties completing the task. In order to protect our participants, both the PI and the co-PI will always be available in session room and safeguard participants one at a time.

NEW FINDINGS STATEMENT

You will be informed if any significant new findings develop during the course of the study that may affect your willingness to participate in this study.

Will it cost anything to be in the study?

You will not be charged for you and your child's participation in the study.

Will my child get paid to participate in the study?
You will receive payment of up to a total of $100 in gift cards for your participation. You will receive $10 in a gift card when you have completed each session. The KUMC Research Institute will be given your name, address, social security number, and the title of this study to allow them to write checks for the study payments. Study payments are taxable income. A Form 1099 will be sent to you and to the Internal Revenue Service if the payments are $600 or more in a calendar year.

What happens if my child or I get hurt or sick during the study?
If it is an emergency and is after 5:00 p.m., a holiday or a weekend, you should call 911. After an emergency situation has been stabilized, you should contact Dr. Matt Reese at 913-945-6604. If it is a non-emergency or your child has a serious side effect or other study-related problem during this study, you should also contact Dr. Matt Reese immediately.

Do my child and I have to be in the study?
Being in research is voluntary. You can choose whether or not to participate. Even if you decide not to join the study, you or your child can still come to KUMC and Children's TLC for services and treatment.

What other choices are available?
You or your child can choose not to be in the study. Instead of being in this study, your child can receive treatment that is already available, such as the Problem Behavior Clinic at KUMC. Please contact 310-500-8634 to schedule an appointment. There are other agencies that work with children with challenging behaviors. These are available in your local service directories, on the internet, or in a resource packet that is available upon request.

How will my privacy and my child's privacy be protected?
The researchers will protect you and your child's information, as required by law. Absolute confidentiality cannot be guaranteed because persons outside the study team may need to look at your child's study records. Your health information and your child's health information are protected by a federal privacy law called HIPAA. By signing this consent form, you are giving permission for KUMC to use and share your health information and your child's health information. If you decide not to sign the form, you and your child cannot be in the study.

The researchers will only use and share information that is needed for the study. To do the study, they will collect health information from the study activities and from your child's medical

record. Your child may be identified by information such as name, address, phone, date of birth, social security number, or other identifiers. Your child's health information will be used at KUMC by Dr. Matt Reese, members of the research team, The University of Kansas Hospital Medical Record Department, the KUMC Research Institute and officials at KUMC who oversee research, including members of the KUMC Human Subjects Committee and other committees and offices that review and monitor research studies. All information collected during the course of the study will be coded with an alpha-numeric coding system and stored in a locked room at the University of Kansas Medical Center. All video-tapes will be coded and labeled with the same alpha-numeric system, and will also be kept in a secure, locked space. All video-tapes will be destroyed within 5 years from the end of the study.

All study information that is sent outside KU Medical Center will have my name and other identifying characteristics removed, so that my identity will not be known. Because identifiers will be removed, my health information will not be re-disclosed by outside persons or groups and will not lose its federal privacy protection. Your permission to use and share your child's health information will not expire unless you cancel it. Any research information that is placed in your child's medical record will be kept indefinitely.

The researchers may publish the results of the study. If they do, they will use an alternate name for you and your child. Neither your name nor your child's name will be used in any publication or presentation about the study.

Can we stop being in the study?
You and your child may stop being in the study at any time. You have the right to cancel your child's permission for researchers to use your and your child's health information. If you want to cancel your permission, please write to Dr. Matt Reese. The mailing address is Dr. Matt Reese, University of Kansas Medical Center, 3901 Rainbow Boulevard, Kansas City, KS 66160. If you cancel permission to use your child's health information, your child will be withdrawn from the study. The researchers will stop collecting any additional information about your child. They may use and share information that was gathered before they received your cancellation. Ending participation in the study will in no way impact your ability to receive care from both KUMC and Children's TLC.

Could our participation be stopped early?
You and your child have the right to discontinue the study at any time. Both the PI and the co-PI will sit next to the child and safeguard him or her during each session. If the child's temper tantrums escalates into violent behaviors that may endanger him or herself or others (e.g., hitting self or others) during the study, the session will be terminated immediately. During each of the

sessions, both the PI and the co-PI will make sure to prevent any potential harm.

This study might be stopped by the investigator without your consent. If the investigator feels that it is in you or your child's best interests or if you do not follow the study requirements, your participation might be stopped by the investigator.

Neither the sponsor, nor the investigator, nor the University of Kansas Medical Center will be obligated to provide your child with any treatment if the study is stopped early. Your child's physician will decide about future treatment, if it is needed.

Who can I talk to about the study?
Before you sign this form, Dr. Matt Reese or other members of the study team should answer all your and your child's questions. You and your child can talk to the researchers if you have any more questions, suggestions, concerns or complaints after signing this form. If you have any questions about your child's rights as a research subject, or if you want to talk with someone who is not involved in the study, you may call the Human Subjects Committee at (913) 588-1240. You may also write the Human Subjects Committee at Mail Stop #1032, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160.

CONSENT
Dr. Matt Reese or the research team has given you and your child information about this research study. They have explained what will be done and how long it will take. They explained any inconvenience, discomfort or risks that your child may experience during this study.

By signing this form, you say that you and your child are freely and voluntarily consenting to participate in this research study. You and your child agree to the time commitment and the activities described earlier in the document. You have read the information and had your questions answered.

You will be given a signed copy of the consent form to keep for your records.

Date ___/___/___

Child's Name: _____

Child's Age: _____

Parent's Name: _____

(Please print)

Parent's Signature: _____

Name of Person Obtaining Consent: _____

(Please print)

Signature of Person Obtaining Consent: _____

If you learned of this study through a different source, by checking the box below, you give the research team permission to include your information in the CRIS system. The CRIS system is a clinical database that allows researchers to look through de-identified information to identify families who might qualify for research studies.

	By checking this box, I give the research team permission to include my information in the CRIS system.

Children's TLC
THERAPEUTIC LEARNING CENTER

3101 Main Street
Kansas City, MO 64111
Phone 816-756-0780
Fax 816-756-1677
www.childrenstlc.org

Ms. Seungyeon Lee
R. Matt Reese, Ph.D
Co-Principal Investigators
Center for Child Health and Development
3901 Rainbow Boulevard, MSN 4003
Kansas City, Kansas 66160-7340

Dear Ms. Lee and Dr. Reese:

Children's Therapeutic Learning Center is pleased to serve as a location for both recruitment and research activities in your study on the effects of delayed gratification. We will assist in whatever ways we can with this research as we are committed to excellence in the care of children who have been diagnosed with Autism.

Sincerely,

Patti Glass
Interim Executive Director

APPENDIX B

FAST

Functional Analysis Screening Tool

Client:_____ Date:_____

Informant:_____ Interviewer:_____

To the Interviewer: The FAST identifies factors that may influence problem behaviors. Use it only for screening as part of a comprehensive functional analysis of the behavior. Administer the FAST to several individuals who interact with the client frequently. Then use the results to guide direct observation in several different situations to verify suspected behavioral functions and to identify other factors that may influence the problem behavior.

To the Informant: Complete the sections below. Then read each question carefully and answer it by circling "Yes" or "No." If you are uncertain about an answer, circle "N/A."

Informant-Client Relationship

1. Indicate your relationship to the person: ___Parent ___Instructor ___Therapist/Residential Staff _____(Other)
2. How long have you known the person? ____Years ____Months
3. Do you interact with the person daily? ____Yes ____No
4. In what situations do you usually interact with the person?
   ___ Meals ___ Academic training
   ___ Leisure ___ Work or vocational training
   ___ Self-care _____(Other)

Problem Behavior Information

1. Problem behavior (check and describe):
   __ Aggression _____
   __ Self-Injury _____
   __ Stereotypy _____
   __ Property destruction _____
   __ Other _____
2. Frequency: __Hourly __Daily __Weekly __Less often
3. Severity: __Mild: Disruptive but little risk to property or health
   __Moderate: Property damage or minor injury
   __Severe: Significant threat to health or safety
4. Situations in which the problem behavior is <u>most</u> likely to occur:
   Days/Times_____
   Settings/Activities _____
   Persons present _____
5. Situations in which the problem behavior is <u>least</u> likely to occur:
   Days/Times_____
   Settings/Activities _____
   Persons present _____
6. What is usually happening to the person right <u>before</u> the problem behavior occurs?_____
   _____
   _____
7. What usually happens to the person right <u>after</u> the problem behavior occurs?_____
   _____
   _____
8. Current treatments_____
   _____
   _____
   _____
   _____

1. Does the problem behavior occur when the person is not receiving attention or when caregivers are paying attention to someone else?	Yes	No	N/A
2. Does the problem behavior occur when the person's requests for preferred items or activities are denied or when these are taken away?	Yes	No	N/A
3. When the problem behavior occurs, do caregivers usually try to calm the person down or involve the person in preferred activities?	Yes	No	N/A
4. Is the person usually well behaved when (s)he is getting lots of attention or when preferred activities are freely available?	Yes	No	N/A
5. Does the person usually fuss or resist when (s)he is asked to perform a task or to participate in activities?	Yes	No	N/A
6. Does the problem behavior occur when the person is asked to perform a task or to participate in activities?	Yes	No	N/A
7. If the problem behavior occurs while tasks are being presented, is the person usually given a "break" from tasks?	Yes	No	N/A
8. Is the person usually well behaved when (s)he is not required to do anything?	Yes	No	N/A
9. Does the problem behavior occur even when no one is nearby or watching?	Yes	No	N/A
10. Does the person engage in the problem behavior even when leisure activities are available?	Yes	No	N/A
11. Does the problem behavior appear to be a form of "self-stimulation?"	Yes	No	N/A
12. Is the problem behavior <u>less</u> likely to occur when sensory stimulating activities are presented?	Yes	No	N/A
13. Is the problem behavior cyclical, occurring for several days and then stopping?	Yes	No	N/A
14. Does the person have recurring painful conditions such as ear infections or allergies? If so, list:_____	Yes	No	N/A
15. Is the problem behavior <u>more</u> likely to occur when the person is ill?	Yes	No	N/A
16. If the person is experiencing physical problems, and these are treated, does the problem behavior usually go away?	Yes	No	N/A

Scoring Summary

Circle the number of each question that was answered "Yes" and enter the number of items that were circled in the "Total" column.

Items Circled "Yes"				Total	Potential Source of Reinforcement
1	2	3	4	____	Social (attention/preferred items)
5	6	7	8	____	Social (escape from tasks/activities)
9	10	11	12	____	Automatic (sensory stimulation)
13	14	15	16	____	Automatic (pain attenuation)

APPENDIX C

Functional Behavioral Assessment Inventory

I. General Information

Name:_____ Sex: M F Date of Birth:_____

Class/Residence:_____ Date of Interview:_____

Informant/Relationship: _____ Interviewer: _____

II. Problem Behavior Identification

List the problem behaviors of concern. Describe each in clear, objective terms.

1. _____
2. _____
3. _____

III. Dimensions of Problem Behavior

Provide an estimate of the frequency and severity of each problem behavior. Use the following criteria for severity: Mild (disruptive but not dangerous), Moderate (destructive to physical environment), Severe (poses physical danger to student or others).

	Frequency	Severity
1.	Hourly / Daily / Weekly / Less often	Mild / Moderate / Severe
2.	Hourly / Daily / Weekly / Less often	Mild / Moderate / Severe
3.	Hourly / Daily / Weekly / Less often	Mild / Moderate / Severe

IV. Critical Situations

1. Describe the situations in which problem behavior is most likely to occur.

Days/times:_____ Setting: _____

Persons present:_____ Activity: _____

What is usually happening to the person right before the problem behavior occurs? _____

_____

What happens to the person right after the problem behavior occurs? _____

_____

2. Describe the situations in which problem behavior is least likely to occur.

Days/times:_____ Setting: _____

Persons present:_____ Activity:_____

V. Daily Schedule

Fill in the student's daily schedule. For each time period, indicate the setting, activity taking place, and whether problem behavior is likely or unlikely to occur.

Time	Setting	Activity	Behavior (circle)	
7:00	_____	_____	Likely	Unlikely
8:00	_____	_____	Likely	Unlikely
9:00	_____	_____	Likely	Unlikely
10:00	_____	_____	Likely	Unlikely
11:00	_____	_____	Likely	Unlikely
12:00	_____	_____	Likely	Unlikely
1:00	_____	_____	Likely	Unlikely
2:00	_____	_____	Likely	Unlikely
3:00	_____	_____	Likely	Unlikely
4:00	_____	_____	Likely	Unlikely
5:00	_____	_____	Likely	Unlikely
6:00	_____	_____	Likely	Unlikely
7:00	_____	_____	Likely	Unlikely
8:00	_____	_____	Likely	Unlikely
9:00	_____	_____	Likely	Unlikely
10:00	_____	_____	Likely	Unlikely
Later	_____	_____	Likely	Unlikely

Does the problem behavior occur more often/less often (circle) on weekends? If so, elaborate.

VI. Functions of Problem Behavior

Circle the number of any item to which the respondent answers "Yes."

A. Function: Access to Attention or Preferred Activities (Positive Reinforcement)

1. Does the person engage in this behavior when (s)he is being ignored or when the caregiver is paying attention to someone else?
2. Does the person engage in this behavior when preferred games or toys are taken away?
3. Does the person usually get preferred activities (leisure items, snack, etc.) when (s)he engages in this behavior?
4. Is the person usually well behaved while (s)he is getting lots of attention or when (s)he has access to preferred toys/games?

_____ Total number of circled items

B. Function: Escape from Task Demands (Negative Reinforcement)

1. Is the person usually noncompliant when asked to perform a task?
2. Does the person frequently engage in this behavior when asked to perform a task?
3. Is the person usually given a "break" from work when this behavior occurs?
4. Is the person usually well behaved when there are no task requirements present?

_____ Total number of circled items

C. Function: Sensory Stimulation (Automatic Reinforcement)

1. Does this behavior occur repeatedly (for long periods of time) and usually in the same way?
2. Does the person engage in this behavior when no one is around or watching?
3. Does the person engage in this behavior even though no one pays attention to it?
4. Does it appear that the behavior provides some type of sensory stimulation?

_____ Total number of circled items

D. Function: Pain Attenuation (Automatic Reinforcement)

1. Does the person have a history of recurrent illness (e.g., ear infections, allergies, dermatitis)? If so, please list: _____
2. Does the person have any other periodic physical difficulties (e.g., irregular sleep or diet)? If so, please list: _____
3. Does the person engage in this behavior more often when ill?
4. If the person has medical problems and they are treated, does this behavior usually go away?

_____ Total number of circled items

VII. Replacement Behaviors

Describe some alternative behaviors that could be strengthened as replacements for the person's problem behaviors.

Problem Behavior	Replacements
1. _____	_____
2. _____	_____
3. _____	_____

VIII. Communication Skills

1. Indicate the person's primary form of communication:

____Speech ____Signs ____Gestures Other: _____

2. How does the person communicate to others a want or need (for attention, food, etc.)?

_____

3. How does the person communicate a desire to stop an ongoing activity?

_____

IX. Preferences

List things that the person seems to like a lot and might be used as reinforcers to strengthen appropriate behavior.

1. Preferred persons:

_____

2. Leisure activities or hobbies: _____
3. Games or toys: _____
4. Foods, snacks, drinks:_____

X. Previous Interventions

APPENDIX D

Antecedent Data Sheet

Name ____________________________

Targeted Behaviors ____

Please fill in for each occurrence of targeted behavior. Circle all antecedent codes that apply.

Date	**Time**	**Antecedent**	**Description of situation** (What happened right before the behavior occurred?)	**Frequency** (How many?)	**Consequence** (What did you do?)
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**

Antecedent Codes

1 – presented with instructions or tasks
2 – wants something and can't have it

Consequence Codes

1 – ignore
2 – verbal attention (e.g.,say something)

3 – an object/food item is taken away
4 – during/after attention for other behaviors
5 – change of activities (explain)
6 – awakened from night sleep/nap
7 – other (explain)

3 – time out/other punishment (explain)
4 – escape (e.g., stop making him do a task or work)
5 – physical attention (e.g., massage)
6 – other (explain)

Explanation of Antecedent Codes

1 – Presented with instructions or tasks
You have told the child you want him/her to do something (e.g., throw something in the trash, pick up toys, put on shoes, go to room)
2 – Wants something and can't have it
The child is requesting something (e.g., wants a drink, wants to go for a walk, wants to play with a toy,) either appropriately or inappropriately

Antecedent Data Sheet (Sample)

Name : XX **Observer: Mom**

Targeted Behaviors: Hitting, Grabbing, Pinching, Screaming "Good bye!" "No no"

Please fill in for each occurrence of targeted behavior. Circle all antecedent codes that apply.

Date	**Time**	**Antecedent**	**Description of situation** (What happened right before the behavior occurred?)	**Frequency** (How many?)	**Consequence** (What did you do?)
12/7	7:30 PM	**1 2 3 4 5 6 7**	**The child was trying to play in the fridge to peel labels. She was asked to stop once. We then tried to get her attention on something else, which didn't work. She started screaming "Goodbye", "See you later!", "See you next time!". She grabs my hand, and makes me wave bye to her. She then started acting out by touching things that are off limits. For example she opened a bottle of nail polish and started painting her toe nails. When I told her no and took it away she cried out "No!", then began crying uncontrollably. I asked her if she needed a hug. She ran into my arms, sobbed for about a minute, and the went back to being happy while following the rules.**	**1**	**1 2 3 4 5 6**
12/8	9:00 PM	**1 2 3 4 5 6 7**	**We set up the Christmas tree Sunday night. The child played while the tree was put up. She helped decorate the tree with excitement. The tantrum came when we were done decorating the tree. She kept trying to hang the extra ornaments on the tree and I told her we were all done. She refused to listen to me, and I was more firm the second time I told her no. She went into a full tantrum using the same lines as listed above. I explained to her that we were all done, and tried to get her attention on her tablet while I cleaned everything up. She then tried to pull an ornament out of my hand. I then put her in time out for 3 minutes. She cried and sobbed while she sat there. When her timer went off I got down to her level, to let her know why she was there in the first place. She tried to interrupt me, but I said it was my turn to talk that she needed to listen. I explained that we were done decorating but she could help me clean up, then we could look at the tree together. I asked her if she could be a good girl for Mommy. She said "Okay", gave me a hug & kiss, then put her chair away. After that she was fine.**	**1**	**1 2 3 4 5 6**

1/4/2014	8:15 PM	**1 2 3 4 5 6 7**	**Brother took water bottle from her because she was removing labels and she started hitting him**	**1**	**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**
		1 2 3 4 5 6 7			**1 2 3 4 5 6**

Antecedent Codes

1 – presented with instructions or tasks
2 – wants something and can't have it
3 – an object/food item is taken away
4 – during/after attention for other behaviors
5 – change of activities (explain)
6 – awakened from night sleep/nap
7 – other (explain)

Consequence Codes

1 – ignore
2 – verbal attention (e.g.,say something)
3 – time out/other punishment (explain)
4 – escape (e.g., stop making him do a task or work)
5 – physical attention (e.g., massage)
6 – other (explain)

Explanation of Antecedent Codes

1 – Presented with instructions or tasks
You have told the child you want him/her to do something (e.g., throw something in the trash, pick up toys, put on shoes, go to room)
2 – Wants something and can't have it
The child is requesting something (e.g., wants a drink, wants to go for a walk, wants to play with a toy,) either appropriately or inappropriately

APPENDIX E

Observer Training Video Session Descriptions

Video Session 1 (Error Correction): Data are recorded on the behavior of the student, who sits across from the teacher. The teacher presents sight words to the student, and the student responds correctly or incorrectly. Student incorrect responses result in three correction responses.

Distracters: Card presentation by therapist, incorrect response by student, error-correction procedure by therapist

Targets	**Operational Definition**	**Measure**
Correct Response (student)	Correct pronunciation of sight word within 3 seconds of presentation. Score after emission of response. **Do not score correct responses emitted during the error-correction procedure*	Percent Interval and Frequency

Video Session 2 (Match to Sample): Data are recorded on the behavior of the student, who sits across from the teacher. The teacher presents a sample and two comparison cards to the student, and the student responds correctly (chooses target) or incorrectly (chooses distracter). The student's correct responses result in praise, and the student's incorrect responses result in no programmed consequences.

Distracters: Card presentation by therapist, praise for correct response by therapist

Targets	**Operational Definition**	**Measure**
Correct Response (student)	Pointing to or touching card that matches sample card. Score after emission of response.	Percent Interval and Frequency
Incorrect Response (student)	Pointing to or touching card that does not match sample card. Score after emission of response.	Percent Interval and Frequency

Video Session 3 (Classroom Observation): Data are recorded on the behavior of the target student (female with pony tail) who sits second from front right, and teacher (female with green shirt) who sits at the desk in front of classroom during in-class math work period. The target student's requests for assistance (hand raise) result in verbal attention (assistance) by teacher. Target student also engages in on and off task behavior.

Distracters: Teacher working at desk, off-task behavior of target student, behavior of other students in class

Targets	**Operational Definition**	**Measure**
Communication **(hand raise)** **(student)**	Elevation of either hand above head. Score after emission of response.	Percent Interval
Assistance **(teacher)**	Verbal attention to target student by teacher. Score at beginning of verbal emission.	Percent Interval
On-task **(student)**	Student seated with buttocks in contact with chair.	Percent Interval

Video Session 4 (Demand Session of Functional Analysis): Data are recorded on the behavior of target child (male) and therapist (female). Therapist initiates instructions using a three-step prompting sequence, consisting of a verbal prompt (followed by a 5-s delay), a modeled prompt (followed by a 5-s delay), and a physical prompt (physical guidance to complete task). Child aggression (hitting) and self-injurious behavior (SIB; head-hit) result in 30-s escape from therapist instruction. Compliance results in praise. Disruption results in no programmed consequences.

Distracters: Gestural and physical prompts in three-step prompting sequence by therapist, child compliance, child disruption

Targets	Operational Definition	Measure
SIB (head-hit) **(child)**	Forceful contact between one of child's hands and child's head. Score after emission of response.	Percent Interval
Aggression **(child)**	Forceful contact between one of child's hands and therapist's body. Score after emission of response.	Percent Interval
Verbal Instruction **(therapist)**	Initial verbal instruction in three-step prompting sequence. Score after emission of response.	Percent Interval

Video Session 5 (Classroom Observation): Data are recorded on the behavior of the target student (female with pony tail) who sits second from front right, and teacher (female with green shirt) who sits at the desk in front of classroom during in-class math work period. The target student's requests for assistance (hand raise) result in verbal attention (assistance) by teacher. Target student also engages in on and off task behavior.

Distracters: Teacher working at desk, off-task behavior of target student, behavior of other students in class

Targets	Operational Definition	Measure
Communication **(hand raise)** **(student)**	Elevation of either hand above head. Score after emission of response.	Frequency
Assistance **(teacher)**	Verbal attention to target student by teacher. Score at beginning of verbal emission.	Frequency
On-task **(student)**	Student seated with buttocks in contact with chair.	Percent Interval

Video Session 6 (Caregiver Training): Data are recorded on the behavior of the target child (female seated farthest right), caregiver (female seated farthest left), and therapist (male with clipboard). Caregiver provides attention for communication, and blocks SIB (hand-biting). Therapist provides feedback to caregiver for incorrect consequences for SIB and communication.

Distracters: Incorrect consequence by caregiver (e.g., no attention for mand), therapist note-taking, child playing

Targets	**Operational Definition**	**Measure**
SIB (hand-bite) **(child)**	(1) Movement of hand in direction of mouth (when mouth is open), or (2) Insertion of hand into mouth past the plane of the lips. Score after emission of response.	Percent Interval
Communication **(child)**	Verbal utterance of "talk to me." Score after emission of response.	Percent Interval
Correct Consequence (caregiver)	(1) Verbal attention directed toward child that begins within 2 seconds of child communication (but not if communication occurs immediately before hand-bite), or (2) Emission of block (see definition) contingent on child hand-bite in the absence of attention (Example: If block + no attention follows hand-bite, score 1 correct consequence). Score for each instance of SIB and communication.	Percent Interval

Protocols

Protocol 1: Functional Analysis

Test Condition for Maintenance by Social-Positive Reinforcer

1. Antecedent event:
    a) Attention condition: Begin the session by informing the client that you are busy and "need to do some work." Then move away and ignore all client behavior except as noted below.
    b) "Tangible" variation: Identify an item that is highly preferred by the client and allow the client free access to it just prior to the session. Begin the session by requesting and removing the item and then move away from client as in the attention condition. The tangible condition is just presession across to high-preferred item for 1 minute, then during the session, you take away the toys and deliver them for 30 seconds when problem behavior occurs.
2. Consequent event:
    a) Non-target behavior: If the target problem behavior does not occur (or if any behavior other than the target occurs), the antecedent event will remain in effect until the end of the session.
    b) Problem behavior: If the target problem behavior occurs, deliver attention, usually in the form of a mild reprimand, a statement of concern, and some comforting physical contact (or response blocking). In the tangible variation, deliver the tangible item briefly (about 30 sec). After delivering attention or the tangible item, reinstate the antecedent event.

Test Condition for Maintenance by Social-Negative Reinforcer

1. Antecedent event:

a) Task-Demand condition: Conduct repeated learning trials throughout the session using academic or vocational tasks that are appropriate to the client's skill level but that are somewhat effortful. Typically, a trial begins with an instruction, followed as needed by prompts consisting of a demonstration and then physical assistance.

b) Social-Avoidance variation: Initiate social interaction with the client at frequent intervals throughout the session. Do not conduct learning trials (academic or vocational) per se, but simply try to prompt some type of interaction by making comments about things in room, asking questions, etc.

2. Consequent event:

a) Non-target behavior: Deliver praise following appropriate responses (compliance in the task-demand condition, any appropriate social response in the social-avoidance condition).

b) Problem behavior: If the target problem behavior occurs, immediately terminate the task (or ongoing interaction) and turn away from the client for about 30 sec, then reinstate the antecedent condition.

Test Condition for Maintenance by Automatic-Positive Reinforcer

1. Antecedent event: This condition is designed to determine whether problem behavior will persist in the absence of stimulation; if so, it is not likely maintained by social consequences. Therefore, the condition is conducted ideally with the client alone in a relatively barren environment, and there is no programmed antecedent event.

2. Consequent event: None.

Control (Play) Condition

This condition is designed to eliminate or minimize the effects likely to be seen in the test conditions. Thus, it typically involves free access to preferred leisure items throughout the session, the frequent delivery of attention, and the absence of demands (Note: If social avoidance is suspected, attention will be deleted). Occurrences of problem behavior produce no consequences, other then the delay of attention for a brief period (5-10 sec).

Protocol #2: Functional Communication Training with Extinction (Tangible condition)

1. Rationale: The purpose of this procedure is to teach an alternative response for the tangible condition response.

2. Before training: Identify a behavior that will be taught as the new tangible response. Examples include raising a hand, signing the preferred item, picture exchange with the preferred item, or saying "please, give me (the name of the preferred item)." Also, identify several items that are known to revoke the problem behavior. These tasks may be toys, edible items, etc.

3. Sessions: Conduct at least 8 or 9 sessions per visit. Each session lasts 5 minutes and consists of 10 trials.

a) Begin by requesting that the child can play with the preferred item for 1 minute.

b) Then, gently take away the item and immediately prompt the new response (i.e., picture exchange, signing, raising a hand, or verbal communication). When the child completes the task, give the child the item.

c) Then, begin another trial.

d) If the child engages in the problem behavior before the new response prompted, the child should be prompted to complete the task (i.e., communication) with the least amount of physical guidance necessary. That is, the child should not be allowed to have the preferred

item after engaging in inappropriate behavior. After the child completes the trial, immediately begin the next trial.

e) If, after presenting instruction, the child emits the new response independently, immediately give the child the preferred item about 1 minute. Then, begin another trial.

f) If the child completes with the instruction, deliver ample positive reinforcer. Then, begin another trial.

Protocol 2: Functional Communication Training

Purpose: To teach appropriate communicative response/ or replacement behavior that will serve the same purpose for the child.

Conditions: After identifying the purpose of problem behavior, appropriate communicative response (e.g., vocal or non-vocal response) will be determined based on the child's current level of receptive vocabulary. Each session lasts for 5 minutes.

Non-Vocal Response (i.e., Picture Exchange)

1. Materials: High preferred items (e.g., Thomas the train, lego, or edible item, etc.)
2. The therapist can child will enter the therapy room together
3. Prior to session, the child will be taught to hand a picture card of his or her preferred on demand to the therapist independently for 10 consecutive trials.
4. During this initial training, the therapist displays a picture card and the preferred item in front of the child. The card is in reach of the child, while the item is next to the therapist.
5. The therapist says, "if you want [the name of the item], give me the card."
6. If the child does not respond, hand-over-hand physical guidance will be provided.
7. The initial training continues until the child is able to hand the card to the therapist following a verbal mand 10 consecutive times within 6 seconds (Harding et al., 20009; Mancil, 2006)
8. Once the child successfully completes the initial training, then the therapist will start session. To start session, observers count "3, 2, 1, start" to begin recording data.
9. The therapist then says, "if you want [the name of the item], give me the card." If the child does not respond, hand-over-hand physical guidance will be provided.
10. Once the child hands the card on demand to the therapist, s/he will allow the child to access the item for 15 seconds. At the end of 15 seconds, the item will be removed and the therapist does the step 9.
11. If the child refuses to hand over the card and does not follow the therpist's demand, s/he will prevent the child from touching the item until the child hands over the card.

Vocal Response

1. Materials: High preferred items (e.g., Thomas the train, lego, or edible item, etc.)
2. The therapist can child will enter the therapy room together.
3. Prior to session, the child will be taught to say "please, give me [the name of the item]." on demand to the therapist independently for 10 consecutive trials.
4. During this initial training, the therapist displays the preferred item in front of the child. The card is in reach of the child, while the item is next to the therapist.
5. The therapist says, "if you want [the name of the item], say 'please, give me [the name of the item]."
6. If the child does not respond, the therapist will model the vocal response.
7. The initial training continues until the child is able to say the appropriate communicative response to the therapist following a verbal mand 10 consecutive times within 6 seconds (Harding et al., 20009; Mancil, 2006).

8. Once the child successfully completes the initial training, then the therapist will start session. To start session, observers count "3, 2, 1, start" to begin recording data.
9. The therapist then says, "if you want [the name of the item], say 'please, give me [the name of the item]." If the child does not respond within 10 seconds, the therapist will model the vocal response.
10. Once the child hands the card on demand to the therapist, s/he will allow the child to access the item for 15 seconds. At the end of 15 seconds, the item will be removed and the therapist does the step 9.
11. If the child refuses to hand over the card and does not follow the therapist's demand, s/he will prevent the child from touching the item until the child hands over the card.

Protocol 3: Delayed Gratification Training

Purpose: To teach the child to tolerate delayed access to reinforce(s) systematically, which later can assist in increasing the child's compliancy and decreasing problem behaviors.

Conditions: After appropriate communicative response (e.g., vocal or non-vocal response) is taught, the therapist begins teaching the child to wait by manipulating three different conditions (i.e., the fixed time delay, the progressive time delay with verbal cues, and the progressive time delay with a visual schedule). Each condition will represent each room so that the child can discriminate the condition in which he or she enters. Each session will last for 5 minutes (i.e., 300 seconds) and consist of the total 10 trials.

Fixed Time Delay Condition

12. Materials: High preferred item(s) (e.g., Lego, playdoh, or edible item, etc.)
13. The therapist can child will enter the therapy room together.
14. Then, the therapist will start session. To start session, observers count "3, 2, 1, start" to begin recording data.
15. Prior to session, the child will be allowed to play with his or her reinforcer.
16. 1st trial: After 30 seconds, the therapist will take the reinforce away and say, "you need to wait."
17. **Each trial (i.e., the duration of waiting) is 50 seconds.**
18. **If the child waits**, he or she will get the reinforcer back before the next trial comes. The operational definition of the child's waiting can be one of the following categories: 1) The child quietly sits in without showing the problem behavior or 2) the child engages in other activities before he or she gets the reinforcer back.
19. **If the child provides his or her communicative response after the first trial**, the therapist say "You still need to wait." If the child waits after the instruction is given, he or she will get the reinforcer back before the next trial comes.
20. **If the child shows the problem behavior after the first trial**, the therapist calms the child down, but say "you still need to wait" or "not now, but later." If the child waits after the instruction is given, he or she will get the reinforcer back before the next trial comes.
21. Once the child successfully completes each trial, the child can access the reinforcer and move to the next trial. Up to 10 trials will be given based on the child's ability to wait for delayed gratification.
22. **If the child escalates the problem behavior after the first trial and the instruction is given**, the therapist calms the child down until the child ceases the behavior. **However, the therapist must not give the reinforcer back in order to cease the child's problem behavior.** Once the child stays calm, the therapist moves to the other delayed condition (either the progressive condition with visual cues or the one with a visual schedule).

The progressive time delay with verbal praise

12. Materials: High preferred items (e.g., Thomas the train, lego, or edible item, etc.)
13. The therapist can child will enter the therapy room together.

14. Then, the therapist will start session. To start session, observers count "3, 2, 1, start" to begin recording data.
15. Prior to session, the child will be allowed to play with his or her reinforcer.
16. After 30 seconds, the therapist will take the reinforce away and say, "you need to wait."
17. **If the child waits**, he or she will get the reinforcer back **after 5 seconds**. The operational definition of the child's waiting can be one of the following categories: 1) The child quietly sits in without showing the problem behavior or 2) the child engages in other activities before he or she gets the reinforcer back. Once the child tolerates the 5 second waiting, he or she will have the reinforcer back but delays to the child's reinforcer will gradually be increased: 5s, 10s, 15s, 20s, 25s, 30s, 35s, 40s, 45s, and 50s.
18. **If the child provides his or her communicative response after the first trial**, the therapist says "Good asking!" but give the reinforcer back **after 5 seconds**. If the child provides his or her communicative response **after the second trial**, the therapist says "Good asking!" but give the reinforcer back **after 10 seconds**.
19. Once the child successfully completes each trial, the child can access the reinforcer and move to the next trial. Up to 10 trials will be given based on the child's ability to wait for delayed gratification.
20. **If the child refuses to follow the therapist's waiting and escalates the problem behavior at any point**, the therapist calms the child down until the child ceases the behavior. **However, the therapist must not give the reinforcer back in order to cease the child's problem behavior.** Once the child stays calm, the therapist moves to the other delayed condition (either the fixed time delayed condition or the one with a visual schedule).

The Progressive Time Delay with Visual Cues

1. Materials: High preferred items (e.g., Thomas the train, lego, or edible item, etc.)
2. The therapist can child will enter the therapy room together. **There will be a sticker chart attached on a big poster board. The chart has the total 10 columns. Right next to the board, there will be 10 plastic stickers.**
3. Then, the therapist will start session. To start session, observers count "3, 2, 1, start" to begin recording data.
4. Prior to session, the child will be allowed to play with his or her reinforcer.
5. After 30 seconds, the therapist will take the reinforcer away and say, "you need 1 sticker to have your [the name of the reinforcer]." **1 sticker is equal to 5 second waiting.**
6. **If the child waits**, he or she will get 1 sticker and have the reinforcer back. The operational definition of the child's waiting can be one of the following categories: 1) The child quietly sits in without showing the problem behavior or 2) the child engages in other activities before he or she gets the reinforcer back. Then, the therapist will take the reinforcer away and say, "you need 2 stickers to have your [the name of the reinforcer]." **2 stickers is equal to 10 second waiting**. Once the child tolerates the 10 second waiting again, he or she will have the reinforcer back but delays to the child's reinforcer will gradually be increased: **3**

stickers for 15s, 4 stickers for 20s, 5 stickers for 25s, 6 stickers for 30s, 7 stickers for 35s, 8 stickers for 40s, 9 stickers for 45s and 10 stickers for 50s.

7. **If the child provides his or her communicative response after the first trial**, the therapist says "Good asking! But you need 1 sticker." If the child provides his or her communicative response **after the second trial**, the therapist says "Good asking!But you need 2 stickers."
8. Once the child successfully completes each trial, the child can access the reinforcer and move to the next trial. Up to 10 stickers will be given based on the child's ability to wait for delayed gratification.
9. **If the child refuses to follow the therapist's waiting and escalates the problem behavior at any point**, the therapist calms the child down until the child ceases the behavior. **However, the therapist must not give the reinforcer back in order to cease the child's problem behavior.** Once the child stays calm, the therapist moves to the other delayed condition (either the fixed time delayed condition or the one with verbal priases).

APPENDIX F

Partial Interval Recording (Baseline)

Name: Date:

		Behavior 1:		Behavior 2:		Behavior 3:	
Interval	Minutes	Primary	Reli	Primary	Reli	Primary	Reli
1	:00-:09						
2	:10-:19						
3	:20-:29						
4	:30-:39						
5	:40-:49						
6	:50-:59						
7	1:00-1:09						
8	1:10-1:19						
9	1:20-1:29						
10	1:30-1:39						
11	1:40-1:49						
12	1:50-1:59						
13	2:00-2:09						
14	2:10-2:19						
15	2:20-2:29						
16	2:30-2:39						
17	2:40-2:49						
18	2:50-2:59						
19	3:00-3:09						
20	3:10-3:19						
21	3:20-3:29						
22	3:30-3:39						
23	3:40-3:49						
24	3:50-3:59						
25	4:00-4:09						
26	4:10-4:19						
27	4:20-4:29						
28	4:30-4:39						
29	4:40-4:49						
30	4:50-4:59						

Partial Interval Recording (FCT and DG)

Name: Date:

		Target Behavior		Replacement Behavior		Tolerance on DG	
Interval	Minutes	Primary	Reli	Primary	Reli	Primary	Reli
1	:00-:09						
2	:10-:19						
3	:20-:29						
4	:30-:39						
5	:40-:49						
6	:50-:59						
7	1:00-1:09						
8	1:10-1:19						
9	1:20-1:29						
10	1:30-1:39						
11	1:40-1:49						
12	1:50-1:59						
13	2:00-2:09						
14	2:10-2:19						
15	2:20-2:29						
16	2:30-2:39						
17	2:40-2:49						
18	2:50-2:59						
19	3:00-3:09						
20	3:10-3:19						
21	3:20-3:29						
22	3:30-3:39						
23	3:40-3:49						
24	3:50-3:59						
25	4:00-4:09						
26	4:10-4:19						
27	4:20-4:29						
28	4:30-4:39						
29	4:40-4:49						
30	4:50-4:59						

APPENDIX G

Behavior Observation Data Collection
Procedural Fidelity Checklist

Interventionist: _____ Date: _____ Video_____

Observer:_____

Did (or were) the interventionist:	Yes	No
1. Set all necessary materials (e.g., session summary sheet, data sheet, etc.)?		
2. Clearly explain the whole procedure?		
3. Model or demonstrate the strategy with explanation for trainees?		
4. Arrange aspects of the environment to start the training?		
5. Make sure each trainee will sit in a separate room for IOA?		
6. Monitor each trainee occasionally (i.e., avoid the issue of drifting?)		
7. Collect & score the training sheet (including review of the answer key) once completed?		
8. Ask the trainee re-do the data collection if IOA is below 80%		
9. Collect the equipment from the trainees for later use?		

APPENDIX H

Paired-Stimulus Preference Assessment Data Sheet (Sample)

Participant: _XX_____ Classroom: Speech Therapy Room at Children's TLC
Assessed by: _the experimenter_____

Date: _1.24.2014_____ Time: _2:30-2:45PM_____

Stimulus Items:	Overall rank (largest percent is #1)
1. Playdoh	1
2. Mr. Potato's hands	3
3. Chinese doll	2
4. Cat doll	5
5. Chick doll	4

Record item with corresponding item number:							
1. Playdoh	2. Mr. Potato's hands	1	**2**	3	4	5	N
5. Chick doll	4. Cat doll	1	2	3	4	**5**	N
3. Chinese doll	1. Playdoh	1	2	**3**	4	5	N
2. Mr. Potatos' hands	4. Cat doll	1	**2**	3	4	5	N
4. Cat doll	5. Chick doll	1	2	3	**4**	5	N
3. Chinese doll	2. Mr. Potato's hands	1	2	**3**	4	5	N
1. Playdoh	5. Chick doll	**1**	2	3	4	5	N
3. Chinese doll	4. Cat doll	1	2	**3**	4	5	N
5. Chick doll	1. Playdoh	**1**	2	3	4	5	N
1. Playdoh	4. Cat doll	**1**	2	3	4	5	N
2. Mr. Potato's hands	3. Chinese doll	1	2	**3**	4	5	N
3. Chinese doll	5. Chick doll	1	2	3	4	**5**	N
4. Cat doll	2. Mr. Potato's hands	1	2	3	**4**	5	N
5. Chick doll	2. Mr. Potato's hands	1	**2**	3	4	5	N
4. Cat doll	3. Chinese doll	1	2	**3**	4	5	N
2. Mr. Potato's hands	5. Chick doll	1	**2**	3	4	5	N
1. Playdoh	3. Chinese doll	**1**	2	3	4	5	N
4. Cat doll	1. Playdoh	**1**	2	3	4	5	N
5. Chick doll	3. Chinese doll	1	2	3	4	**5**	N
2. Playdoh	1. Playdoh	**1**	2	3	4	5	N

1. _6__/__20___ x 100 = _30_____%
2. _4__/__20___ x 100 = _20_____%
3. _5__/__20___ x 100 = _25____ %
4. _2__/__20___ x 100 = _10____ %
5. _3__/__20___ x 100 = _15_____ %

APPENDIX I

Social Validity Form (adapted from Wacker et al., 1990): You may only do the first 6 items.

Date: _____ Child: _____ Parent: _____

TREATMENT ACCEPTABILITY RATING FORM

Please complete the items below by circling the number under the question that best indicates how you feel about the treatment recommendations for your child.

1. How acceptable do you find the treatment to be regarding your concerns about your child?

Not at all acceptable			Neutral			Very acceptable
1	2	3	4	5	6	7

2. How likely is this treatment to make permanent improvements in your child's behavior?

Unlikely			Neutral			Very likely
1	2	3	4	5	6	7

3. How costly will it be to carry out this treatment?

Not at all costly			Neutral			Very costly
1	2	3	4	5	6	7

4. How willing are you to carry out this treatment?

Not at all willing			Neutral			Very willing
1	2	3	4	5	6	7

5. How much time will be needed each day for you to carry out this treatment?

Little time			Neutral			Much time
1	2	3	4	5	6	7

6. How confident are you that the treatment will be effective?

Not at all confident			Neutral			Very confident
1	2	3	4	5	6	7

7. How willing would you be to change your family routine to carry out this treatment?

Not at all willing			Neutral			Very willing
1	2	3	4	5	6	7

8. How disruptive will it be to your family (in general) to carry out this treatment?

Not at all disruptive			Neutral			Very disruptive
1	2	3	4	5	6	7

9. How effective is this treatment likely to be for your child?

Not at all effective			Neutral			Very effective
1	2	3	4	5	6	7

10. How well will carrying out this treatment fit into the family routine?

Not at all well			Neutral			Very well
1	2	3	4	5	6	7