SOCIAL STORIES: AN INTERVENTION TOOL TO HELP DECREASE UNDESIRED BEHAVIORS IN CHILDREN WITH CHARACTERISTICS OF AUTISM SPECTRUM DISORDERS

by

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ABSTRACT

An adapted alternating treatment design was implemented to explore whether (a) a Social Story presented in a paper-based format was effective in decreasing undesired behaviors when compared to a no-intervention baseline condition, (b) a Social Story presented in a tablet computer-based format was effective in decreasing undesired behaviors when compared to a no-intervention baseline condition, and (c) a difference existed between the efficiency and the effectiveness of paper-based format and tablet computer-based format Social Story interventions. Four children from early childhood special education classrooms participated in the study. Data regarding frequency of undesired behaviors during target activities as well as social validity data regarding the perceived effectiveness and efficiency of the interventions were collected. Results revealed that Social Stories presented in both paper-based and iPad-based formats were effective and efficient in decreasing undesired behaviors when compared to baseline conditions, and that a notable difference did not exist between the efficiency and the effectiveness of the paper-based and iPad-based formats.

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CHAPTER 1

INTRODUCTION

Autism spectrum disorder (ASD) is a diagnostic label used to describe a wide range of neurodevelopmental impairments or deficits. Children can be identified with ASD as early as 18 months of age, and are typically diagnosed by age 3 (McCormick, Frome Loeb, & Schiefelbush, 2003; Rogers, 2010). Characteristics of ASD include: (a) mild to severe impaired reciprocal social interaction and communication skills, (b) stereotypical behaviors (i.e., hand flapping, body rocking, echolalia speech patterns), (c) persistence with sameness, routines, or patterns, (d) intense or highly specialized interests in specific topics or activities, and (e) atypical patterns of processing sensory information from the environment (i.e., touch, sound and movement; American Psychiatric Association [APA], 2013; Rogers, 2010). Additionally, persons with ASD can have associated impairments such as seizure disorders, intellectual disabilities, and developmental delays that can affect their overall functional abilities (Rogers, 2010).

Behavioral characteristics used in the diagnosis of an ASD can be organized into four categories that include deficits in social interactions, communication, restricted, repetitive, or stereotypical patterns of behavior, and hyper- or hyporeactivity to sensory information from the environment (APA, 2013; Centers for Disease Control and Prevention [CDC], 2014a; Rogers, 2005). The combination of these atypical behavioral characteristics can have considerable negative effects on a child's ability to participate in

home, school, and community activities (Rogers, 2005). For example, children with ASD are at a higher risk than typically developing children for acquiring at least one challenging behavior that could disrupt learning and development (Neitzel, 2010). These challenging behaviors might include repetitive or stereotypic behaviors (e.g., hand flapping, finger flicking, body rocking back and forth), disruptive behaviors (e.g., tantrums, screaming, aggression, non-compliance), and withdrawal from social situations (Love, Carr, & LeBlanc, 2009; Neitzel, 2010). Challenging behaviors, in combination with difficulties in social interaction, communication, and sensory processing may impede opportunities for development and learning (Love et al., 2009; Neitzel, 2010).

The prevalence of children diagnosed with autism spectrum disorders (ASD) has been increasing. The Centers for Disease Control and Prevention (CDC) collect data related to the prevalence of ASD, and synthesize information that is collected from various Autism and Developmental Disabilities Monitoring Network (ADDM) sites across the United States. Data indicates that for the year 2006, the projected number of 8-year-old children with ASD among 11 ADDM sites was 1 in 110 children. Later records from the CDC reveal that in the year 2010, the estimated number of 8-year-old children with ASD was 1 in 68 children among 11 ADDM sites. This shows approximately a 62% growth in the prevalence of children diagnosed with ASD from the year 2006 to 2010 (Centers for Disease Control and Prevention [CDC], 2014b).

As the diagnostic rate of ASD has grown in recent years, education services have expanded to address the educational needs of students with ASD. While amending the Education for all Handicapped Children Act in 1990, Congress increased the number of disability categories entitled to receive special education services, including the addition

of the category of autism (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2011). Since the addition of this category, schools have experienced an increase in the number of students receiving special education services under the classification of autism (Ryan et al., 2011). For the 1992-93 school year, the U.S. Department of Education reported that the total number of students who received Part B services in the disability category of autism under the Individuals with Disabilities Education Act (IDEA) was 15,580 (U.S. Department of Education, 1995). In the fall of 2003, this number had risen to 140,280 resulting in an approximately 800% increase over 10 years (U.S. Department of Education, 2005). With increased diagnostic rates and the recognition of the unique behavioral characteristics seen in children with ASD, caregivers and educators are presented with significant challenges in meeting the needs of individuals with ASD and need to be equipped with successful intervention strategies (Cohn, Miller, & Tickle-Degnen, 2000; Simpson, de Boer-Ott, & Smith-Myles, 2003).

CHAPTER 2

LITERATURE REVIEW

Interventions Designed to Meet the Needs of Children with Autism

Educators and practitioners are in search of interventions that are effective and that will improve the quality of life for persons with ASD (Horner, Carr, Strain, Todd, & Reed, 2002). Myers and Plauche' Johnson (2007) state that there is not a cure for ASD, and individuals with this diagnosis require continued treatment and monitoring. Furthermore, they propose that the key goals of treatment should include: (a) addressing the common features seen in ASD, (b) expanding the child's independence in functional life activities, (c) improving quality of life, and (d) easing family stressors. In order to help educators, practitioners, and caregivers accomplish these goals, the treatment focus for children with ASD should include the facilitation of age-appropriate development and learning, the development of prosocial behavioral skills, and an emphasis on decreasing atypical behaviors (Myers & Plauche' Johnson, 2007).

One education based intervention that is among the treatment methods supported by Myers and Plauche' Johnson (2007) is Social Stories™. Social Story interventions have been found to help decrease nonappropriate behaviors and improve social skills and overall communication (Myers & Plauche' Johnson, 2007; Reynhout & Carter, 2007; Rust & Smith, 2006). An emerging body of evidence has been established that supports the efficacy of Social Stories in helping children with characteristics of ASD achieve

functional goals and abilities (e.g., Agosta, Graetz, Mastropieri, & Scruggs, 2004; Barry & Burlew, 2004; Beh-Pajooh, Ahmadi, Shokoohi-Yekta, & Asgary, 2011; Chan & O'Reilly, 2008; Chan et al., 2011; Cihak, Kildare, Smith, McMahon, & Quinn-Brown, 2012a; Crozier & Tincani, 2005, 2007; Delano & Snell, 2006; Iskander & Rosales, 2013; Ivey, Heflin, & Alberto, 2004; Kuoch & Mirenda, 2003; Scattone, Wilczynski, Edwards, & Rabian, 2002; Swaggart, Gagnon, Bock, & Earles, 1995; Thompson & Johnston, 2013; Wright & McCathren, 2012).

Social Stories

Introduced by Carol Gray in 1991, Social Stories are used to share, with a student, relevant information including where and when a situation takes place, who is involved, what is occurring, and why (Gray, 2004). Stories can be written to help teach a student about a situation or event that may be problematic during a school day. For example, Social Stories could include information about why it is important to follow directions in school, why a student should stay seated during a specific school activity, or how to transition between activities (Gray, 2010). Foundational theories used in the development of Social Stories are based on the concept of social cognition in autism and the observation that many individuals with ASD have difficulty reading and understanding social situations and then formulating appropriate responses (Dawson & Fernald, 1987; Gray & Garand, 1993; Yirmiya, Sigman, Kasari, & Munday, 1992). Social Stories provide explanations and appropriate behavioral options for specific situations, and may help individuals with ASD compensate for deficits in social perceptions (Gray & Garand, 1993).

In an attempt to quantify the effectiveness of Social Stories as a whole, along with

specific aspects of Social Story interventions, Kokina and Kern (2010) conducted a meta-analysis and used percentage of nonoverlapping data (PND) scores to examine the effectiveness of 18 single-subject research studies that were published between 2002 and the spring of 2009. PND scores are used to determine whether or not specific aspects of a study are correlated with higher intervention effectiveness (Kokina & Kern, 2010; Scruggs, Mastropieri, & Casto, 1987; Scruggs & Mastropieri, 1998). A PND score above 90% indicates very effective treatments; scores between 70% and 90% indicate effective treatments; scores between 50% and 70% represent questionable effectiveness; and scores below 50% are considered ineffective (MacArthur, Graham, & Fritzgerald, 2006). Kokina and Kern's (2010) analysis revealed that the overall effectiveness of Social Stories varied widely (i.e., overall mean PND=60%; range, 11-100). They suggested that one possible reason for this wide range in effectiveness could be due to variability in the implementation of Social Stories interventions as well as variability in the research methodology used across studies. Specifically, Social Story interventions included in the analysis varied with regard to the behaviors addressed, settings, time of day for the intervention, length of the Social Story, presentation format (i.e., paper-based, song-based, computer-based, etc.), method for identifying interfering behaviors, use of comprehension plans following the Social Story, and procedures used during the implementation of the intervention (Kokina & Kern, 2010).

Although there is emerging data demonstrating that Social Stories can result in increases in desired behaviors and decreases in unwanted behaviors, forthcoming research should carefully consider the individual aspects of Social Story interventions in order to ensure quality, efficacy, and to improve the overall evidence base. The

following section will examine the evidence base as it relates to the individual aspects of Social Story interventions.

Social Story Characteristics

Social Stories were designed to assist a wide range of individuals within a broad scope of social situations (Gray & Garand, 1993; Gray, 2004). As illustrated by Tables 1 and 2, Social Story research has varied with regard to: (a) age of participants, (b) strategies for identifying target situations and related behaviors, (c) criteria used for writing the Social Story, (d) plans for comprehension, (e) story presentation (i.e., paper booklet-based, song-based, computer-based, video-based, iPad-based), (f) implementation of the intervention, (g) use of additional treatment strategies, (h) measurements of interobserver agreement and procedural fidelity, and (i) examination of social validity.

Age of Research Participants

Social Story research has been conducted with participants ranging in age from 2-15 years (see Table 1). The majority of research reviewed (72%) has been conducted with participants who were 6-10 years old. The second largest age group is 11-15-year-old participants (28%). The smallest number of studies (26%) has been conducted with participants ages 5 and under. It is noted that several studies included participants from more than one age, and those studies were included in more than one age range category.

Although limited in number, Social Story research that has been conducted with early childhood aged children is promising. This research has demonstrated positive outcomes, including increased rates of desired behaviors and reductions in undesired behaviors across a range of situational concerns and behaviors including sleep patterns, social

interactions, social talk with peers, sitting appropriately in classroom settings, coping with novel events, tantrums, increasing play participation, and reducing negative verbal and physical behavior (Burke, Kuhn, & Peterson, 2004; Chan & O'Reilly, 2008; Crozier & Tincani, 2007; Ivey et al., 2004; Kuoch & Mirenda, 2003; Lorimer, Simpson, Myles, & Ganz, 2002; Moore, 2004; Schneider & Goldstein, 2010; Soenksen & Alper, 2006; Thompson & Johnston, 2013; Vandermeer, Milford, Beamish, & Lang, 2013; Wright & McCathren, 2012). Given empirical evidence supporting the importance and effectiveness of early intervention for young children with ASD (Fenske, Zalenski, Krantz, & McClannahan, 1985; Myers & Plauche Johnson, 2007; Rogers, 1996), additional information regarding the effectiveness of Social Stories with early childhood aged children is warranted.

Identifying Target Situations and Related Behaviors

Gray (2010) emphasizes the importance of gathering information regarding the target situation and related behaviors prior to writing the Social Story, and specifies that within the process of identifying target situations and behaviors, at least two data collection sessions (one from a third-person perspective and one from a first-person perspective) should take place. Specifically, an interventionist should consider the target situation and related behaviors from the participant's viewpoint as well as their own perspective before selecting a topic to address within a Social Story (Gray, 2010).

A review of Social Stories research reveals that a wide range of strategies has been used to identify target situations and related behaviors (see Table 1). These strategies have included video analyses (2%); functional behavioral assessment (22%); interviews with educators, parents and caregivers (33%); parent, physician, teacher, and student

reports (11%); informal/direct observations (35%); researcher, teacher and interventionist predetermination of problem behaviors (4%); behavioral diaries (2%); and environmental analysis (2%). Of the studies reviewed, 15% did not provide specific information about the methods used to identify target situations and related behaviors. It is noted that several studies included more than one strategy for identifying target situations and related behaviors, and those studies were included in more than one category.

In addition to a range of strategies for identifying the target situations and behaviors, studies reviewed have varied with regard to whether the strategy resulted in the identification of only the form of the behavior (81%), or the form as well as the function of the behavior (19%). Although Gray (2010) does not recommend a specific method for collecting information related to targeted situations and related behaviors, she does describe processes that are similar to the procedures of functional behavioral assessment (FBA), which result in information regarding form as well as function. Furthermore, in a symposium led by Gray (2012), she discussed the use of FBA as a method to collect and record situational and behavioral data.

The use of FBA in conjunction with Social Story interventions has been limited (e.g., Adams, Gouvousis, VanLue, & Waldron, 2004; Bernad-Ripoll, 2007; Cihak et al., 2012a; Crozier & Tincani, 2005; Hagiwara & Myles, 1999; Iskander & Rosales, 2013; Lorimer et al., 2002; Moore, 2004; Okada, Ohtake, & Yahagihara, 2008; Quilty, 2007). The data gathering instruments used in Social Story interventions for conducting a FBA include the motivation assessment scale (Durand & Crimmins, 1992), tools developed by O'Neill, Horner, Albin, Storey, and Sprague (1990), the brief-functional analysis (brief-FA; Cihak et al., 2012a), the problem behavior questionnaire (PBQ; Lewis, Scott, &

Sugai, 1994), and other nonspecified functional assessments (Adams et al., 2004; Bernad-Ripoll, 2007; Crozier & Tincani, 2005; Hagiwara & Myles, 1999; Lorimer et al., 2002; Moore, 2004; Okada, et al., 2008; Quilty, 2007).

Preliminary research suggests that the inclusion of FBA could improve Social Story efficacy. A meta-analysis conducted by Kokina and Kern (2010) examined PND scores to compare the effectiveness of Social Story interventions that utilized FBA in their story planning processes to those that did not. While exploratory in nature, outcomes of Kokina and Kern's analysis suggest that Social Story interventions appear to be more effective when a FBA is used to guide the treatment. Specifically, the 3 studies included in the meta-analysis that employed FBA obtained higher PND scores (86% median PND) than the 15 studies that did not use FBA (53% median PND). Given the promising outcomes of Social Stories that include FBA, the following section will discuss the purpose and components of a FBA, along with associated strengths and limitations.

Functional Behavioral Assessments (FBA)

Despite the limited information regarding the use of FBAs and Social Stories, interventionists outside of the area of Social Story research have successfully used FBA as a technique to gather information that can be used to maximize behavioral support plans. FBAs have been shown to help increase the overall effectiveness of behavioral interventions for students who are both typically and nontypically developing (Carr et al., 1999; DiGennaro Reed, Hirst, & Hyman, 2012; Dufrene, Doggett, Henington, & Watson, 2007; Herzinger & Campbell, 2007; Horner et al., 2002; Wilder, Harris, Reagan, & Rasey, 2007; Wood, Ferro, Umbreit, & Liaupsin, 2011). Love et al. (2009) indicate that FBAs can provide interventionists with the ability to: (a) identify the function or purpose

of the behavior, so that the interventionist can address the reinforcement of the behavior, rather than trying to suppress the behavior, (b) identify intervention strategies that should not be used in relation to the function of the behavior (e.g., using time out when the behavior is supported by escape from demanding tasks), and (c) develop a plan to address negative behaviors and to support appropriate behaviors. Positive outcomes have been observed when FBAs have been used to guide intervention. These outcomes have included decreases in undesired behaviors (e.g., aggression, classroom disruptions, tantrums, noncompliance) as well as increases in desired behaviors (e.g., Boyajian, DuPaul, Wartel-Handler, Eckert, & McGoey, 2001; Dufrene et al., 2007; Wood et al., 2011).

When conducting a FBA, antecedents (something that consistently occurs before the negative behavior), the function (purpose of behavior), and the reinforcement of the behavior are identified (Carr et al., 1999; Horner et al., 2002; O'Neill et al., 1997). Procedures for conducting a FBA include informant or indirect methods (e.g., interviews, rating scales, checklists), direct-descriptive methods/direct observations (e.g., narrative observations that describe the antecedents, behaviors, and consequences associated with challenging situations), and experimental functional analysis/functional analysis manipulations (e.g., experimental determination of behavioral variables; Dunfrene et al., 2007; O'Neill et al., 1997). Informant or indirect methods might include talking directly with the individual about events related to the problem behavior and/or incorporating information from persons who know the individual well. Direct-descriptive methods/direct observations are behavioral examinations in which the person who demonstrates challenging behavior is directly observed in a natural environment over a

period of time and data are collected regarding the time of day and situation in which the problem behavior occurs, what happens just prior to the behavior, what occurs after the behavior, and the observer's perceived function of the behavior in that specific instance. In an experimental functional analysis/functional analysis manipulation, investigators methodically manipulate or change variables or consequences for behaviors, and analyze the effects of the changes on the person's behavior (Dufrene et al., 2007; O'Neill, 1997).

Although FBAs can provide practitioners with information to support and develop effective intervention plans, FBAs also present with some limitations. First, because FBA is a process and not a prescribed set of assessment tools, the information derived from any given FBA tool may not provide enough detail to determine the function of a behavior. For example, if information collected for a FBA is acquired from an informant (which could be the case for young children, nonverbal individuals, and individuals with severe cognitive disabilities), it could be possible that other behavioral functions are present, but not identified by the informant during the assessment (Love et al., 2009). This limitation can be addressed by following Horner and Carr's (1997) recommendation that, if the hypothesis that was developed based on the information from interviews is supported by direct observations, it is then appropriate to move towards intervention. However, if the interview and observation information is conflicting, then a formal functional analysis may be needed (Horner & Carr, 1997). Second, there are a number of tools available for use when conducting a FBA, with limited empirical guidance as to which tool(s) may be most effective for a specific individual. Given this, it is possible that an interventionist may select an assessment based on ease and length of administration rather than based on ability to provide accurate and useable information

(Johnston & O'Neill, 2001). This limitation can be addressed through the recommended practice of using a combination of functional assessment tools (i.e, interviews, rating scales, observations) to help validate the accuracy and usability of their data (Ellingson, Miltenberger, Stricker, Galensky, & Garlinghouse, 2000). Information gathered from more than one tool can help provide evidence to support a behavioral hypothesis, and can help clarify information obtained from multiple instruments (Carr et al., 1994).

In summary, studies outside the area of Social Story research have demonstrated that FBA can enhance interventionists' ability to identify the function of problem behaviors and effectively direct treatment-planning procedures (e.g., Carr et al., 1999; Herzinger & Campbell, 2007; Horner et al., 2002; Wood et al., 2011). While data regarding the use of FBA when developing Social Stories is limited, preliminary research indicates that FBA may enhance the outcomes of Social Story interventions (Cihak et al., 2012a; Crozier & Tincani, 2005; Iskander & Rosales, 2013; Kokina & Kern, 2010; Lorimer et al., 2002). Future Social Story research should include specific information related to the tools used for conducting a FBA, and should further investigate the outcomes of Social Story interventions that utilize FBA versus those that do not. Doing this will help practitioners understand how to use FBA in the context of Social Story interventions as well as increase our understanding of the extent to which the use of FBA improves the outcomes of Social Story interventions.

Writing Social Stories

Once an interventionist has determined a target situation and related behaviors, they can begin to write a Social Story. The goals and criteria for writing a Social Story are discussed in the following sections. Since the initial introduction of Social Stories in

1991, Gray has emphasized specific Social Story guidelines that include the goals and criteria for writing Social Stories. These goals and criteria have changed minimally from the time of their original presentation (Gray, 2004). The primary goal of a Social Story is to "share accurate information using a process, format, voice and context that is descriptive, meaningful, and physically, socially, and emotionally safe" for a student (Gray, 2010, p. 30). Gray asserts that Social Stories should be written in a way that provides individuals with information regarding where and when a situation takes place, who is involved, what is occurring, and why (Gray, 2004, 2010). One of the common misconceptions about Social Stories, according to Gray (2010), is that the goal of a Social Story is to change an individual's behavior. The fallacy related to the goal of Social Stories may be due to the fact that a change in behavior often occurs as a result of individuals receiving a more accurate understanding of a situation, specific expectations, or appropriate behavioral options for a particular circumstance (Gray, 2010). To address this misconception and to ensure that Social Stories are written in a way that supports students' attempts to function in home, school, and community environments, Gray developed specific Social Story criteria (Gray, 2010).

Gray's Criteria

From the time that Social Stories were first introduced, writing instructions for Social Stories have been included in a number of publications (i.e., Gray 1995; Gray 1998a; Gray 1998b; Gray 2000a; Gray 2000b; Gray, 2004; Gray & Garand, 1993). Gray's most current publication (Gray, 2010) expanded and reorganized the original instructions into 10 criteria for writing a Social Story. These criteria were intended to help writers produce a story that can help address a student's unique situations and concerns in a way that is

individualized, meaningful, and useful (Gray, 2010). The guidelines for writing a Social Story are specific with regard to the content as well as the structure of the story.

Content of the Story

The content of a Social Story includes the information contained within the title, introduction, body, and conclusion of the story. According to Gray (2010), each Social Story should have a title and introduction that identifies the topic of the story. The introduction should include a topic sentence or a statement that draws in the reader's attention. An example of a topic sentence for a Social Story designed to help a child understand the importance of hand washing before eating a snack at school might be: "Washing hands is something that many people do everyday." Following the introduction, the body of the story should add details and support to the main topic of the story (Gray, 2010). The body of the story provides further description of the topic and can include explanatory statements such as, "People often wash their hands many times a day," "There are a lot of reasons that people wash their hands," "People may wash their hands to get yucky things like germs, dirt, play-doh, or paint off of their hands," "Sometimes I can see yucky things on my hands, and sometimes I cannot see yucky things on my hands, but it is usually a good idea to wash my hands before eating," "Washing my hands gets the yucky things off my hands, so that they don't get into my mouth when I eat," "Sometimes I cannot see the germs on my hands. That is okay, they are still there and need to be washed away," "My teacher may ask me to wash my hands before I can eat my snack," "This is okay because my teacher knows that washing hands before eating a snack is good for me," "My teacher will turn on the water so that it will not be too hot or too cold," "My teacher will help me put soap on my hands so that I can

wash off all of the yucky things on my hands," "I can use soap to help me get my hands clean," "When I am washing my hands, I can think of my yummy snacks." A conclusion follows the body and finalizes the story by referring the reader back to the situations, ideas, and achievements discussed in the story (Gray, 2010). The conclusion is intended to reinforce and summarize the presented information. Examples of conclusion statements might include, "Washing my hands before snack is a good way to get yucky things off my hands before I eat," "Washing my hands is a good way to keep me clean and healthy," "I will try to listen to my teacher when she asks me to wash my hands," "I will try to wash my hands everyday before snack."

Structure of the Story

In addition to considerations regarding content, interventionists should also consider the structure of the Social Story. The structure of a Social Story is guided by criterion that helps identify and define each sentence that is used within a story. Specifically, Social Stories should include descriptive sentences, perspective sentences, coaching sentences, and affirmative sentences (Gray, 2010).

Descriptive sentences are fact based and neutral statements that do not include opinions and/or assumptions (Gray, 2010). Examples of descriptive sentences from the prior example of a Social Story designed to help a child understand the importance of hand washing include, "People often wash their hands many times a day," or "Washing hands is something that many people do everyday."

Perspective sentences are statements that discuss a person's feelings, internal state, their knowledge/thoughts, views, motivation, or physical condition (Gray, 2010). Examples of perspective sentences from the prior example related to hand washing

include, "People may wash their hands to get yucky things like germs, dirt, play-doh, or paint off of their hands," or "Sometimes I can see yucky things on my hands and sometimes I cannot see yucky things on my hands, but it is usually a good idea to wash my hands before eating."

Coaching sentences help guide the behavior of the reader or individuals involved with the reader (Gray, 2010). Examples of sentences that coach the reader from the prior example include, "I will try to listen to my teacher when she asks me to wash my hands," or "I will try to wash my hands everyday before snack." Examples of sentences that coach individuals involved with the reader include, "My teacher will turn on the water so that it will not be too hot or too cold," or "My teacher will help me put soap on my hands so that I can wash off all of the yucky things on my hands." Coaching sentences can also describe a recommended response related to a specific situation, suggest a choice of responses, or describe ways in which readers could coach themselves (Gray, 2010). Examples of this type of coaching sentence include, "I can use soap to help me get my hands clean," or "When I am washing my hands, I can think of my yummy snacks."

Affirmative sentences help enrich the sentences that are a part of the story, and typically state a common value that is shared among a group or culture (Gray, 2010). Sample affirmative sentences from the prior example include, "My teacher may ask me to wash my hands before I can eat my snack. This is okay because my teacher knows that washing hands before eating a snack is good for me," or "Sometimes I cannot see the germs on my hands. That is okay, they are still there and need to be washed away."

In addition to considerations regarding sentence type, the guidelines for writing a Social Story also define a specific structure that helps ensure a balanced relationship

between the sentence types. This structure is referred to as the "The Social Story Formula," and is designed to help confirm that a Social Story meets the goal of sharing or describing accurate information, and limits the number of sentences that direct the actions of the reader (Gray, 2004, p. 9). This is important because Gray (2010) asserts that a story should describe, explain, and teach social situations in ways that are supportive and significant to a student, rather than focus soley on changing behavior. The Social Story Formula allows an author to include an unlimited number of descriptive, perspective, and affirmative sentence, but does limit the number of coaching sentences. In order to use the formula, the author first writes and then labels the types of sentences that are included in their story. Then, the number of descriptive, perspective, and affirmative sentences are added together and divided by the number of coaching sentences. In order for a story to meet Gray's criteria for a Social Story, the quotient of the Social Story Formula must always be greater than or equal to 2 (Gray, 2010).

Gray's Criteria Used in Research

As shown in Table 1, 83% of the Social Story research studies that were reviewed have utilized Gray's criteria, while the remaining 17% of studies did not report use of the criteria. Although the use of Gray's criteria is frequently utilized by researchers, it is interesting to note that adherence to Gray's criteria does not ensure effectiveness. Specifically, Test, Richter, Knight, and Spooner's (2011) meta-analysis of 28 Social Story studies from the years 1995-2007 revealed that of the 21 studies that reported use of the criteria, 5 produced "very effective" or "effective" PND results. Of those same 21 studies, 2 investigations yielded "ineffective" PND results (Test et al., 2011). Test et al. (2011) did not report PND results for the remaining 14 studies that reported use of Gray's

criteria. This wide range of PND results may indicate that adherence to Gray's guidelines is not necessary in order to achieve desired outcomes. However, future research is needed to systematically investigate the effects of adherence and non-adherence to Gray's guidelines (Test et al., 2011). Doing this will help interventionists understand the implications of following Gray's guidelines as they develop their own Social Story interventions.

Plans for Comprehension

Comprehension plans are included in Gray's criteria, and can be delivered using different methods, depending on the specific learning needs and abilities of the participant (Gray, 2010). Plans for comprehension should be designed to review the Social Story information with a student, with the goals of building and assessing a student's understanding of the presented material. As illustrated in Table 1, 43% of the studies reviewed included methods for building and assessing Social Story comprehension. Plans for comprehension used in Social Story research have included: (a) asking the student specific questions related to the story with the expectation of a verbal response (Bernad-Ripoll, 2007; Chan et al., 2011; Crozier & Tincani, 2007; Delano & Snell, 2006; Dodd, Hupp, Jewell, & Krohn, 2008; Iskander & Rosales, 2013; Reynhout & Carter, 2007; Sansosti & Powell-Smith, 2008; Scattone, 2008; Scattone, Tingstrom, & Wilczynski, 2006; Scattone, Wilczynski, Edwards, & Rabian, 2002; Schneider & Goldstein, 2010; Thiemann & Goldstein, 2001; Wright & McCathren, 2012), (b) asking the student specific questions related to the story with the expectation that the student selects a response from a choice of two or more visual representations of a response (Crozier & Tincani, 2005, 2007), and (c) discussing, role playing, or

practicing the suggested behavioral options given in the story (Barry & Burlew, 2004; Chan & O'Reilly, 2008; Haggerty, Black & Smith, 2005; Moore, 2004; Thompson & Johnston, 2013; Wright & McCathren, 2012).

Kokina and Kern's (2010) meta-analysis is inconclusive with regard to whether comprehension plans impact the effectiveness of Social Story interventions. Specifically, PND scores for comprehension plans in the context of their analysis showed that studies that included comprehension plans (n=9) received a median PND score of 65% (questionable effectiveness) and studies that did not include comprehension plans (n=9) received a median PND score of 53% (questionable effectiveness).

Given the inconclusive results related to comprehension plans for Social Story interventions, it is important to consider whether the specific strategies used to build and assess comprehension may have impacted the effectiveness of the interventions. The majority of studies to date used a method that included asking specific questions that required a verbal response (Bernad-Ripoll, 2007; Chan et al., 2011; Crozier & Tincani, 2007; Delano & Snell, 2006; Dodd et al., 2008; Iskander & Rosales, 2013; Reynhout & Carter, 2007; Sansosti & Powell-Smith, 2008; Scattone, 2008; Scattone et al., 2006; Scattone et al., 2002; Schneider & Goldstein, 2010; Thiemann & Goldstein, 2001; Wright & McCathren, 2012). For many individuals with autism, this method may not effectively build or assess a student's comprehension of a story because children with ASD may demonstrate strong skills in word recognition and reading, but lack skills in constructing and applying the meaning of the words to themselves or a situation (Asberg & Dahlgren Sanberg, 2010; Gately, 2008; O'Connor & Klein, 2004; Randi, Newman, & Grigorenko, 2010). This may create a situation in which a student with autism appears to understand

the content of the story when, in fact, their comprehension is low (Randi et al., 2010). Furthermore, when asked a specific question that requires a verbal response, a student may mimic what they have read or heard, without comprehending the meaning of their response (Barnhill, 2004). For instance, when conducting a comprehension assessment, an interventionist may verbally ask, "What do we use to help clean our hands?" The student may respond with the correct word "soap." To the interventionist, it may appear that the student understands that soap should be used during hand washing. However, the student may have just repeated the word because it was used frequently in the text of the story.

As an alternative to asking specific questions that require a verbal response, some researchers have used comprehension plans that involve asking a student specific questions related to a story, but with the expectation that the student selects a response from two or more visual representations of the response (Crozier & Tincani, 2005, 2007). This strategy provides an opportunity for a student to visually analyze the response choices and to point to or circle their answer, which has been identified as a preferred learning strategy for some individuals with autism (Gately, 2008; Kana, Keller, Cherkassky, Minshew, & Adam Just, 2006). However, this method also presents with some limitations. First, although a student may be able to analyze and identify the correct response, they may not generalize the newly acquired information to a real life situation (Brown & Bebko, 2012; Noonan & Siegel, 2003). Second, once a student becomes familiar with the correct response, they may point to the correct visual representation without comprehending why the response is the correct choice.

Finally, some Social Story researchers have used comprehension plan strategies that

include discussing, role-playing, or practicing the desired behavioral strategies or outcomes as part of the Social Story intervention (Barry & Burlew, 2004; Chan & O'Reilly, 2008; Haggerty et al., 2005; Moore, 2004; Thompson & Johnston, 2013; Wright & McCathren, 2012). Discussion, role playing, and practicing desired behaviors have been successfully applied in research that has explored strategies for building and assessing the comprehension of reading materials for children with ASD (Asberg & Dahlgren Sanberg, 2010; Flores & Ganz, 2007; Randi et al. 2010). In relation to developing effective comprehension plans for Social Stories, future interventionists could support a student's comprehension of a Social Story by modeling and practicing the desired behaviors with the participant in a role-play situation immediately after reading the Social Story. Following the modeling and practicing of the desired behaviors, the interventionist could assess a student's comprehension by asking them to independently demonstrate the desired behaviors through role-playing or actual performance of the task. The student's ability or nonability to independently perform the desired behaviors could help the interventionist assess whether or not the student comprehended the target situation and behaviors presented in the Social Story. Future research related to plans for comprehension is needed to help interventionists determine which strategies most effectively and efficiently help build and assess a students' comprehension of Social Stories. Specifically, forthcoming Social Story research could examine different types of comprehension plans and the level of their effectiveness.

Social Story Presentation

As illustrated by Table 2, Social Story interventions in the studies reviewed have been presented in a number of ways. Studies have utilized paper-based booklet formats (85%),

computer-based formats (9%), song-based formats (2%), video-based formats (4%), and iPad-based formats (2%). One study did not report a specific format (2%). Gray does not specifically recommend one format over another, but encourages interventionists to use presentations that will meet the needs of the reader (Gray, 2012).

Gray's first publication related to Social Stories directed interventionists to create stories in a paper-based format (Gray & Garand, 1993). Following the introduction of Social Stories in a paper-based format, Hagiwara and Myles (1999) were among the first researchers to explore the efficacy of Social Stories presented in an alternative format. These investigators utilized multimedia software to create Social Stories that could be presented on a desktop computer. Specifically, the Social Stories were presented in a book-like format on a computer screen that included the text of a Social Story, video clips of the participants' actions that corresponded with the story sentences, and audio that read the story out loud with computer synthesized speech. The participants were allowed to navigate between the pages of the story with a clickable button. The computer-based Social Stories were presented to three elementary school-age students with the diagnosis of autism. The target behaviors included improved completion of hand washing for two of the participants, and increased duration of on-task behaviors for the third participant. Following the computer-based Social Story interventions, two participants demonstrated improved completion of hand washing skills, while the third participant showed no steady increase in their duration of on-task behaviors (Hagiwara & Myles, 1999).

More recent studies have begun to expand on the exploration of alternative formats (i.e., songs, computers, videos) and have started to compare the effectiveness paper-based formats to alternative formats (Brownell, 2002; Chan et al., 2011; Cihak et al., 2012a;

Mancil, Haydon, & Whitby, 2009; Sansosti & Powell-Smith, 2008; Scattone, 2008). Studies that have explored the efficacy of Social Story interventions when presented in alternative formats have reported encouraging outcomes (e.g., Chan et al., 2011; Cihak et al., 2012a; Sansosti & Powell-Smith, 2008; Scattone, 2008). Chan et al. (2011) examined the effectiveness of Social Stories presented on a computer in which three 8-year-old students with the diagnosis of autism read Social Stories presented in a PowerPoint format. Results revealed that mild to moderate positive changes in target behaviors occurred following the intervention (Chan et al., 2011). Sansosti and Powell-Smith (2008) examined the effectiveness of an intervention that included computer-based Social Stories with video models to support social communication skills for three students with high-functioning autism/Asperger's syndrome. Results revealed that, following intervention, all three participants improved in their rates of social communication (Sansosti & Powell-Smith, 2008). Studies from Scattone (2008) and Cihak et al. (2012a) also examined the efficacy of Social Stories when presented in an alternative format. In these studies, Social Stories were written for students ranging in age from 9-14 years old who had the diagnoses of Asperger's syndrome or autism. The Social Stories in both studies were presented in video-based formats and included video modeling of the target situations and behaviors. Results from Scattone (2008) demonstrated that the treatment was highly effective in facilitating increased use of appropriate eye contact and reciprocal interactions, but was not effective for facilitating desired smiling behaviors. Results from Cihak et al. (2012a) revealed improved task engagement for all participants during target situations.

Given the different format options for presenting Social Stories, researchers are

beginning to examine whether or not the presentation format influences outcomes (Brownell, 2002; Mancil et al., 2009). Brownell (2002) investigated the effectiveness of paper-based Social Stories and song-based Social Stories, and compared the outcomes of the two presentation formats with four individuals ages 4-6 with a diagnosis of ASD. Using a multiple treatment design, the researcher presented the same Social Story in a paper-based and a guitar accompanied song-based format for each participant. Outcomes of this study revealed that the intervention resulted in a reduction of undesired behaviors for both conditions. However, the frequency of undesired behaviors was lower and more stable under the song-based condition (Brownell, 2002). Similarly, Mancil, Hayden and Whitby (2009) employed a multicomponent reversal design to test the effects of using the same Social Stories in both paper-based and computer-based formats on decreasing the negative behaviors of three elementary school-aged participants with ASD. Results of the study demonstrated a decrease in the frequency of undesired behaviors in both conditions. However, the frequency of undesired behaviors was lower when the Social Stories were presented in the computer-based format (Mancil et al., 2009). Although preliminary, study results suggest that Social Story outcomes may be enhanced when presented in alternative formats (Brownell, 2002; Mancil et al., 2009).

Given the emerging data suggesting that alternative formats may enhance outcomes, future research examining the influence of mode of presentation should build upon current knowledge related to technology and learning. Accrediting bodies for teacher education support the incorporation of technology in early childhood learning environments, and emphasize the significance of technology in assisting students in learning new concepts, problem solving, writing, and drawing (CAEP, 2012; Couse &

Chen, 2010; ISTE, 2007, 2012; NAEYC, 2012). Researchers investigating the learning styles of children have found evidence to suggest that computers and digital media, including video modeling, can create more engaging and active opportunities for teaching and learning (Bellini & Akullian, 2007; Mason, Ganz, Parker, Burke, & Camargo, 2012; More, 2008). Investigators have found that many learners encounter improved motivation, participation, and attitude by participating in learning experiences delivered through multimedia products (Couse & Chen, 2010; Vernadakis, Avgerinos, Tsitskari, & Zachopoulou, 2005; Yildirim, Ozden, & Aksu, 2001). Finally, students may also benefit from the repetition and feedback that is offered through computer and multimedia products (More, 2008; Segers &Verhoeven, 2005).

While much of the research to date supports the utilization of technology for typically developing children, the use of computers to support learning for children with multiple disabilities, including ASD, is a comparatively new and limited area of research (DiGennaro Reed, Hyman, & Hirst, 2011; Segers & Verhoeven, 2005; Shane et al., 2012; Xu, Reid, & Steckelberg, 2002; Yildirim et al., 2001). Even more limited is research related to the use of tablet computers (i.e., iPad). Nonetheless, preliminary research, anecdotal reports, and case studies have shown promise for the use of tablet computers as an instructional tool to help meet the specific learning styles and abilities of children with disabilities (e.g., Aronin & Floyd, 2013; Beschorner & Hutchison, 2013; Couse & Chen, 2010; Flores et al., 2012; Harvey-Carter, 2007; McClanahan, Williams, Kennedy, & Tate, 2012; Murdock, Ganz, & Crittendon, 2013; Rodriguez, Strnadova, & Cumming, 2014; Vandermeer et al., 2013). In particular, features of a tablet computer such as a manipulative touch screen that promotes visual and tactile/kinesthetic learning, play back,

recording, and auditory features such as narrated stories or text provide additional modalities to support learning. Moreover, characteristics such as the lower cost compared to full sized computers, the portability of the device, the availability of teaching applications, and the small amount of training needed to operate a tablet computer help make this a desirable instructional tool (McClanahan et al., 2012; Murray & Olcese, 2011).

Although the utilization of tablet computer technology appears promising, there are a few limitations that should be discussed. First, although studies have been published related to teaching early childhood aged children with computer-assisted technology, only a small number of studies have been published related to early childhood aged children with disabilities utilizing tablet computer technology in classroom learning situations (e.g., Aronin et al., 2013; Couse & Chen, 2010; Gevarter et al. 2014; Harvey-Carter, 2007; McClanahan, et al., 2012; Murray & Olcese, 2011; Vandermeer et al., 2013). Second, because of the relative newness of tablet computers (e.g, the iPad was first released to the public in April 2010), educators are still learning first-hand appropriate methods for fully integrating this technology into early childhood curriculum (Couse & Chen, 2010; NAEYC, 2012). The use of tablet computers in early childhood special education settings should be studied further in order to help educators make evidence-based decisions related to the most effective use of tablet-computer assisted technology in their own classrooms.

In summary, preliminary studies related to computer-based Social Stories indicate that these formats may be more effective in teaching students information related to target situations and related behaviors (Mancil et al., 2009). Additionally, research related to

computer-assisted technology provides evidence to suggest that use of this technology may be beneficial in helping children with disabilities acquire new, functional skills (Kagohara, Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012; Sansosti & Powell-Smith, 2008; Shane et al., 2012). Based on this, additional studies are needed to investigate the impact of mode of presentation on the effectiveness of Social Story interventions. Specifically, research should expand on the research conducted by Brownell (2002) and Mancil et al. (2009) by comparing outcomes when using paper-based and tablet computer-based Social Stories.

Implementation of Social Story Interventions

Social Story implementation procedures include considerations of: (a) when the Social Story is read relative to the target situation, (b) the frequency of the intervention, and (c) the duration of the intervention. Gray (2010) does not offer specific guidelines or recommendations related to the above implementation procedures, instead she recommends that interventionists make these decisions based on the individual learning characteristics of the student. This corresponds with suggested practices within the field of special education (Chapparo & Lowe, 2012; Landrum & McDuffie, 2010; McCormick et al., 2003). However, exploring the impact of variables such as the time, frequency, and duration of interventions on treatment effectiveness can help practitioners and researchers design effective and efficient interventions.

Time

As summarized in Table 2, of the Social Story interventions that were reviewed, most were implemented immediately prior the target situation (70%). Social Story

interventions have also been offered to participants at times that were not immediately prior to target situations. These times include the beginning of therapy sessions (2%), during classroom routines (2%), at the start of a school day (4%), during variable times at the discretion of a parent (2%), during before and after school time at home (2%), during morning school routines (4%), and during clinical intervention sessions. Of the studies summarized in Table 2, 13% did not provide information related to the time of day in which the Social Story interventions were provided.

In their meta-analysis of Social Story research, Kokina and Kern (2010) examined 18 studies and found that, in 13 of the studies, Social Stories were read immediately before the target situation. These studies achieved a median PND score of 65% (questionable effectiveness). The 5 remaining studies examined by Kokina and Kern (2010) did not read the Social Stories just before the target situation and attained a median PND score of 53% (questionable effectiveness). These scores suggest that reading the Social Story immediately prior to the target situation may not play a significant role in the overall effectiveness of a Social Story (Kokina & Kern, 2010).

Frequency

As shown in Table 2, of the Social Story intervention studies that were reviewed, most have been implemented daily (70%; all days of the week in home settings and available school days in school settings), two times per day (4%), three times per week (4%), available upon participant request (2%), at variable times (2%), or the frequency was not reported (17%). Although Kokina and Kern (2010) did not examine the impact of frequency on the effectiveness of Social Story interventions, information from the studies examined in this review of the literature suggest that Social Story interventions can be

effective when presented across a range of frequencies. However, additional research information is warranted. This information would help interventionists to design and implement effective and efficient Social Story interventions.

Duration

Table 2 illustrates that the duration of the Social Story intervention studies that were reviewed ranged from 3-38 sessions. Data from a meta-analysis conducted by Kokina and Kern (2010) revealed that Social Story interventions that were 1-10 sessions in duration reached a median PND score of 71% (effective treatment), intervention sessions that were 11-20 sessions in duration achieved a median PND score of 66.5% (questionable effectiveness), and studies that were 21-30 sessions in duration attained a median PND score of 36.5% (ineffective). This analysis suggests that if a Social Story is going to have an effect, the effect will occur rapidly following the introduction of the intervention. Given the available information, it is not possible to determine why some Social Story interventions produce a fairly immediate effect while other Social Story interventions do not. However, it is plausible to consider that it may be related to a number of variables, including (a) the target situation, (b) the form, function, or history of related behaviors, and/or (c) participant characteristics. Additional research is needed to explore the relationship between these variables and overall effectiveness of the intervention. For example, research could explore whether the form, function, or history of the behavior influence the effect of a Social Story intervention.

Research Methodology Used in Social Story Research

One of the primary criticisms from researchers who have conducted Social Story meta-analyses is that many studies lack rigorous research methodology and do not effectively control for extraneous variables (Ali & Frederickson, 2006; Kokina & Kern, 2010; Reynhout & Carter, 2006; Rust & Smith, 2006; Sansosti, Powell-Smith, & Kincaid, 2004; Test et al., 2011). The methods that are used to plan and conduct a research investigation are critical for ensuring the reliability and validity of a study. It is important that a researcher accurately defines criterion measures, and controls for confounding variables that could affect the outcome of a study (Drew, Hardman, & Hosp, 2008). The following sections review issues related to conducting Social Story research, and the impact that these issues have on the reliability and validity of Social Story research.

Intervention Packaging

It is important to note that a number of research investigations include Social Stories as part of an intervention package along with other treatment techniques (i.e., verbal or visual cues during the target situation, social skills training, tangible reinforcers contingent on desired behaviors, etc.) rather than examine the exclusive effects of reading a Social Story (Test et al., 2011). For instance, of the 46 studies summarized in Table 2, 61% included additional treatment strategies other than reading a Social Story within their interventions. Although combining treatment approaches might increase the strength of the intervention, this practice weakens the research validity if the intent is to determine the effectiveness of Social Story interventions. When research investigates a single intervention and a behavior change is observed following the introduction of an

independent variable, it is more likely that the change can be attributed to a single variable rather than a combination of factors (Drew et al., 2008). Thus, future research should be conducted that uses Social Stories as the only independent variable. Doing this will allow researchers and interventionists to more accurately determine the extent to which Social Story interventions affect target situations and related behaviors.

Measurements of Interobserver Agreement

Measurements of interobserver agreement are used to help determine the reliability of an observer's data collection, and typically involve calculating a percentage of agreement between the observers (Drew et al., 2008). Interobserver agreement procedures also help verify whether or not a researcher has utilized quality measurement procedures, and has defined the target behavior in a way that can be measured objectively (McDonnell & Tuesday Healthfield, 2011). As shown in Table 2, 80% of Social Story studies that were summarized have provided data regarding interobserver agreement. The presence of interobserver agreement measures in the majority of the Social Story investigations is encouraging. However, given that interobserver agreement is an important factor to consider when interpreting research outcomes, as well as the fact that it is an indicator of quality single-subject research (Horner et al., 2005), it is important that all future Social Story investigations include these data.

Measurements of Procedural Fidelity

Procedural fidelity is a method that researchers use to demonstrate that an intervention has been reliably implemented during the entire length of a study (McDonnell & Tuesday Healthfield, 2011; Wood, Umbreit, Liaupsin, & Gresham, 2007). It is also an important

indicator of quality in intervention research (Horner et al., 2005). Information from Table 2 reveals that 52% of Social Story studies that were summarized provided data regarding procedural fidelity. This percentage is concerning. The absence of procedural fidelity data makes it difficult to demonstrate that experimental processes did not change over time and that the intervention, rather than extraneous variables, contributed to changes in a behavior (McDonnell & Tuesday Healthfield, 2011; Wood et al., 2007). In order to further our understanding, future Social Story studies should employ procedural fidelity procedures that include: (a) a clear operational definition of the independent variable that includes exact procedural steps of the intervention, (b) independent evaluations of the person implementing the intervention to ensure that the interventionist's procedures align with the operational definition of the independent variable, and (c) a collection of treatment fidelity data from no less than 25% of the intervention sessions in order to provide an illustrative sample of the treatment sessions (McDonnell & Tuesday Healthfield, 2011).

Social Validity

Measures of social validity provide information that can be used to help determine whether or not the outcomes of an intervention were believed to be socially important (McDonnell & Tuesday Heathfield, 2011). Social validity information can be obtained from participants, people associated with the participants, interventionists, or independent observers. Data from Table 2 illustrates that 29 of the 46 studies that were summarized (63%) included reports of social validity. The inclusion of social validity in over half of the studies is promising given that these measures help determine whether or not the interventions were perceived to have made a difference in the lives of the individuals

receiving the treatment. However, given that social validity is a quality indicator for evidence-based practice in special education (Horner et al., 2005), all future Social Story research should include social validity measures.

In considering the use of social validity measures in future studies, it is helpful to examine what measures have been used in the past. Social validity measures that have been used in prior Social Story research include: (a) interviews (e.g., Adams et al., 2004; Agosta et al., 2004; Crozier & Tincani, 2005, 2007; Dodd et al., 2008; Mancil et al., 2009; Moore, 2004; Sansositi & Powell-Smith, 2006), (b) standardized scales of social validity (e.g., Beh-Pajooh et al., 2011; Burke et al., 2004; Iskander & Rosales, 2013; Ozdemir, 2008; Reynhout & Carter, 2007; Sansosti & Powell-Smith, 2008; Scattone, 2008; Scattone et al., 2002; Scattone et al., 2006; Toplis & Hadwin, 2006), (c) Likert rating scales (e.g., Chan et al., 2011; Chan & O'Reilly, 2008; Cihak et al., 2012a; Crozier & Tincani, 2007; Haggerty et al., 2005; Ivey et al., 2004; Mancil et al., 2009; Thompson & Johnston, 2013; Wright & McCathren, 2012), (d) social comparisons (e.g., Chan et al., 2011; Delano & Snell, 2006; Soenksen & Alper, 2006), (f) participant journals (e.g., Sansositi & Powell-Smith, 2006), (g) subjective reports from participants, educators, and caregivers (e.g., Soenksen & Alper, 2006; Smith, 2001), and (h) video ratings of participant behaviors before and after the intervention (e.g., Thiemann & Goldstein, 2001). Each of these measures of social validity present with both strengths and limitations. For example, interviews, Likert rating scales, participant journals, and subjective reports can be tailored in order to ask specific questions about an intervention, study participants, and research settings. However, these methods result in opinions and personal perceptions rather than objective data. Other social validity measures such as

standardized scales provide standardized measurements of social validity; nevertheless, they cannot be adapted to ask potentially important questions about specific aspects of the intervention, persons, or settings (McDonnell & Tuesday Heathfield, 2011). Social validity measures that involve social comparisons provide information about the relationship between a group that represents typical performance in a particular setting and the participants of a study. This comparison helps demonstrate whether or not the behaviors of the study participants are similar to those that represent typical performance. However, it can be difficult for researchers to establish and demonstrate equivalency between the comparison groups (McDonnell & Tuesday Heathfield, 2011). Measures that involve asking independent observers to view videos of participants before and after the intervention and then rate participant behaviors can provide information about what changes in behavior can be observed by individuals who are not associated with the study. However, this method is labor intensive given that it requires technical equipment, permission for the participants to be filmed, and the recruitment of independent observers. In summary, each approach has its own advantages and disadvantages. Given this, McDonnell and Tuesday Heathfield (2011) recommend that researchers choose methods that facilitate a complete understanding of the impact of the intervention in an effective manner as well as enable researchers to link social validity data to the investigation's research questions and outcomes.

Conclusion

A review of the Social Story research literature yields emerging data demonstrating that Social Stories can result in increases in desired behaviors and decreases in unwanted behaviors (e.g., Agosta et al., 2004; Barry & Burlew, 2004; Beh-Pajooh et al., 2011;

Chan & O'Reilly, 2008; Chan et al., 2011; Cihak et al., 2012a; Crozier & Tincani, 2005, 2007; Delano & Snell, 2006; Iskander & Rosales, 2013; Ivey et al., 2004; Kuoch & Mirenda, 2003; Scattone et al., 2002; Swaggart et al., 1995; Thompson & Johnston, 2013; Wright & McCathren, 2012). However, the overall effectiveness of Social Stories remains in question (Kokina & Kern, 2010, Reynhout & Carter, 2006, 2011; Test et al., 2011). Meta-analyses suggest that specific aspects of Social Story interventions (i.e., use of FBA, presentation format, duration of intervention; Kokina & Kern, 2010) may influence the overall effectiveness of the intervention while the influence of other aspects of Social Story interventions are inconclusive (i.e., following Gray's criteria, plans for comprehension, time, frequency; Kokina & Kern, 2010; Reynhout & Carter, 2011; Test et al., 2011). Given the current evidence related to Social Story methodology and effectiveness, future research should investigate the influence of specific aspects of Social Story interventions (e.g., age of participants, use of FBA, adherence to Gray's criteria, plans for comprehension, mode of presentation, implementation characteristics, etc.) on effectiveness. Prospective research should also increase the methodological rigor of investigations by conducting studies that introduce only one independent variable, include measures of interobserver agreement and procedural fidelity, and information regarding social validity.

The proposed study is designed to answer the following questions:

1. Is a Social Story presented in a paper-based format more effective in decreasing undesired behaviors related to a target situation than a no-intervention baseline condition?

2. Is a Social Story presented in a tablet computer-based format more effective in

decreasing undesired behaviors related to a target situation than a no-intervention baseline condition?

3. Is there a difference between the efficiency and effectiveness of paper-based format and tablet computer-based format Social Story interventions?

Table 1

Summary of Published Social Story Research Studies and Characteristics of Social Story Interventions

Study	**N**	**Age(s)**	**Disability Type(s)**	**Setting**	**Study Design**	**Target Situations and Related Behavior(s)**	**Strategy for Identifying Target Situations and Related Behavior(s)**	**Criteria used for writing Social Stories**	**Compre-hension Plans**	**Outcomes**
Adams et al. (2004)	1	7	ASD	Home	ABAB	Crying, falling, hitting, and screaming	Video analysis; Functional behavioral analysis	Gray's criteria (Gray & Garand, 1993)	No	Overall decrease in all behaviors by phase B2
Agosta et al. (2004)	1	6	ASD	Special education self-contained classroom	ABCA	Screaming, yelling, loud humming during circle time	Informal observation	Gray's criteria (Gray & Garand, 1993)	No	Overall decrease in undesired behaviors; Increase in quiet sitting during circle time
Barry and Burlew (2004)	2	7-8	ASD	Special education self-contained classroom	ABCD multiple baseline across partic-ipants	Choice making and appropriate play during center time	Informal observation	Not reported	Yes	Level of prompting decreased for all participants; Duration of play increased

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Beh-Pajooh et al. (2011)	3	8-9	Autism	Special school classroom	Multiple baseline across partici-pants design	Crying, wandering, laying down on desk	Teacher, school psychologist interview	Not reported	No	Challenging behaviors decreased for 2 out of 3 participants
Bernad-Ripoll (2007)	1	9	Asperger Syndrome	Home	AB	Controlling anxiety, frustration, and anger	Functional behavioral assessment	Gray's criteria (Gray & Garand, 1993; Gray, 1994)	Yes	Increase in correct emotional labeling, explanations and responses
Bledsoe et al. (2003)	1	13	Asperger Syndrome ADHD	Special education self-contained classroom	ABAB	Eating behaviors (spills, use of napkins)	Informal observation	Not reported	No	Improved mouth wiping and decreased spillage of food

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Brown-ell (2002)	4	6-9	ASD	Special education self-contained classroom	ABAC/ ACAB counter-balanced multiple treat-ment design	Echolalia, following directions, using a quiet voice	Interview with teacher	Gray's criteria (Gray, 2007)	No	Reduction of undesired behaviors during both conditions for all participants; Frequency of undesired behaviors lower and more stable in singing condition

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Burke et al. (2004)	4	2-7	No medical diagnoses; Challeng-ing sleep patterns	Home	Multiple baseline across partici-pants design	Bedtime tantrums, frequent night waking, initiating & maintaining sleep without parent	Parent and physician report	Not reported	No	Immediate and sustained reductions in the frequency of disruptive bedtime behaviors
Chan and O'Reilly (2008)	2	5-6	Autism	Regular education	Multiple probe across behav-iors design	Non-appropriate social interactions and vocal-izations, appropriate hand raising	Direct observation	Gray's criteria (Gray, 1995)	Yes	Decrease in non-appropriate social interaction, increase in hand raising, decrease in non-appropriate vocalizations

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Chan et al. (2011)	3	8	Autism	Special Education/ Regular education classroom	Multiple baseline across partici-pants design	Appropriate sitting, attending to teacher, using instructional materials with the intended function	Not reported	Cray's criteria (Gray & Garand, 1993)	Yes	Mild to moderate improvement in desired behaviors
Cihak et al. (2012a)	4	11-14	Autism and Asperger Syndrome	Regular education classroom	Alter-nating treat-ment design	Task engagement in math	Functional behavioral assessment	Not reported	No	Improved task engagement

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Crozier and Tincani (2005)	1	8	Autism	Private school classroom	ABAC reversal design	Talking out at non-appropriate times	Direct observation	Gray's criteria "mod-ified" by authors (Gray, 2000)	Yes	Reduction in disruptive talking out
Crozier and Tincani (2007)	3	3-5	ASD	Full inclusion preschool classroom	ABAB reversal design & ABCACBC multi-comp-onent reversal design	Talking out at non-appropriate times	Functional behavioral assessment	Gray's criteria (Gray, 1995)	Yes	Reduction of inappropriate behaviors and increase in appropriate behaviors across all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Delano and Snell (2006)	3	6-9	Autism	Resource classroom	Multiple-probe-across-partic-ipants design	Attention seeking comments, requests, responses	Informal observation and teacher interview	Gray's criteria (Gray, 2000)	Yes	Decrease in non-appropriate social interaction, increase in hand raising, decrease in non-appropriate vocalization
Dodd et al. (2008)	3	8-12	Autism, PDD-NOS	Home	Multiple baseline across behavior and partic-ipants desig	Over directing siblings during play, giving appropriate compli-ments	Parent interviews	Gray's criteria (Gray, 2004)	Yes	Excessive directions decreased, appropriate comments increased for 1 participant, variable for the other participant

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Haggerty et al. (2005)	1	6	Not reported	School general education	Case Study	Tantrums, self-injurious behaviors, crying, screaming when student or work was corrected in school	Teacher report	Gray's criteria (Gray & White, 2002)	Yes	Decrease in the frequency of frustration behaviors
Hagiwara and Myles (1999)	3	7-9	ASD	Resource classroom, reading classroom, general education classroom	Multiple baseline across settings	Hand-washing and on-task behavior	Functional behavioral assessment	Multi-media Social Stories program	No	Increased desired behavior for 2 participants. No consistent effect found for 1 participant

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Iskander and Rosales (2013)	2	8-11	PDD-NOS, ADHD	Special education self-contained classroom	Multiple baseline across partici-pants design	Interrupting others, getting out of seat, off-task behaviors	Functional behavioral assessment	Gray's criteria (Gray, 2000)	Yes	Decrease in the target behaviors following intervention
Ivey et al. (2004)	3	5-7	PDD-NOS	Children's hospital campus; Home	ABAB design	Novel event participation	Selected by researchers based on common deficits for children with ASD	Grays's criteria (Gray, 1994; Gray and Garand, 1993)	No	Increase in targeted participation skills for all participants
Kuoch and Mirenda (2003)	3	3-6	ASD	Home; General education	ABA & ACABA	Aggression; Non-appropriate behaviors at lunchtime; Cheating during game play	Direct observation	Gray's criteria (Gray, 2000)	No	Reduction in rate of problem behaviors for all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Kuttler et al. (1998)	1	12	ASD, Fragile X syndrome, intermitt-ent explosive disorder	Special education self-contained classroom	ABAB design	Precursors to tantrum behavior during morning work and lunch time	Teacher and parent report	Gray's criteria (Gray, 1994); (Gray and Garand, 1993)	No	Reduction in the rate of problem behaviors
Lorimer et al. (2002)	1	5	ASD	Home	ABAB design	Precursors to tantrum behavior	Functional behavioral assessment	Not reported	No	Reduction in problem behaviors to a level of "0" frequency by the end of the intervention phase

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Mancil et al. (2009)	3	6-9	ASD	Regular education	ABABC BA multi-compo-nent reversal design	Pushing other children during transitions to lunch and reading	Informal parent and teacher interviews, direct observation	Gray's criteria (Gray, 2000)	No	Reduction in the frequency of pushing across all participants; Rates of pushing slightly lower with computer-based story
Moore (2004)	1	4	ASD	Home	Obser-vational	Bedtime routines, excessive night waking	Functional behavioral assessment, sleep diary	Not reported	Yes	Reduced bed time behavioral problems

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Norris and Dattilo (1999)	1	8	ASD	Regular education lunch room	AB design	Social interactions at lunch	Not reported	Gray's criteria (Gray, 1997)	No	Decrease in inappropriate social interaction; Results variable for appropriate interactions and absence of social interactions
Okada et al. (2008)	2	12-13	Moderate mental retard-ation, ASD	Special education self-contained classroom	ABCA and ABC	Aggressive verbal behaviors; Sitting neatly	Functional behavioral assessment	Gray's criteria (Gray, 2004)	No	Reduction in problem behaviors for all participants
Ozdemir (2008)	3	7-9	ASD	Regular education	Multiple baseline across partici-pants design	Loud voice; Chair tipping; Cutting in lunch line	Not reported	Gray's criteria (Gray, 1998	No	Reduction in problem behaviors for all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Quilty (2007)	3	6-10	ASD	Regular education classroom resource room and school day activities	Multiple baseline across partic-ipants design	Repeated requests to go home; Non-appropriate behaviors; Aggressive behaviors	Functional behavioral assessment	Gray's criteria (Gray, 2000)	No	Decrease in undesired behaviors for all participants
Reichow and Sabornie (2009)	1	11	ASD	Regular education and resource room	With-drawl design with cue fading phase	Social initiations and greetings	Not reported	Gray's criteria (Gray, 1994)	No	Increased frequency of acceptable verbal greeting initiations
Reynhout and Carter (2007)	1	8	ASD	Special education self-contained classroom	ABC	Tapping hands during reading	Direct observation; Teacher and staff interviews	Gray's criteria (Gray, 2000)	Yes	Rate of hand tapping decreased steadily

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Rogers and Myles (2001)	1	14	ASD	Regular education transition from lunch to PE class	Case study	Facial grimaces, flapping hands, talking to self, pacing	Teacher and student reports	Gray's criteria (Gray, 1995)	No	Reduction in problem behaviors
Rowe (1999)	1	6	Asperger Syndrome	Regular education	Inter-views with student, parents, support staff and direct obser-vation	Lunchtime routines and behaviors, refusal to enter lunch room, shouting, did not eat a full lunch	Interviews with student, parents, support staff and direct observation	Gray's criteria (Gray, 1994)	No	Decrease in undesired behaviors, consistently ate a full lunch without cues or assistance
Sansosti and Powell-Smith (2006)	3	9-11	Asperger Syndrome	Regular education recess and outdoor courtyard settings	Multiple baseline across parti-cipants design	Sportsman-ship; Maintaining conver-sation; Play	Informal interviews and observations	Gray's criteria (Gray 1995)	No	Rate of desired behaviors increased for all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Sansosti and Powell-Smith (2008)	3	6-10	ASD, Asperger Syndrome PDD-NOS	Regular education recess	Multiple baseline across parti-cipants design	Joining in play; Maintain-ing conver-sations	Informal interviews and direct observations	Gray's criteria (Gray, 1998, 2002; Gray and Garrand, 1993)	Yes	Increased rates of desired behaviors for all participants
Scattone (2008)	1	9	Asperger Syndrome	Medical center treatment room	Multiple baseline across behavior	Improving eye contact, smiling, and initiations	Not reported	Gray's criteria, refer-ence not reported	Yes	Increased conversation skill behaviors in 2 out of 3 target behaviors
Scattone et al. (2002)	3	7-15	ASD	Special education self-contained classroom	Multiple baseline across parti-cipants design	Tipping chair; Non-appropriate staring and shouting	Not reported	Gray's criteria (Gray, 1998)	Yes	Decrease in disruptive behaviors for all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Scattone et al. (2002)	3	7-15	ASD	Special education self-contained classroom	Multiple baseline across parti-cipants design	Tipping chair backwards; Non-appropriate staring; Non-appropriate shouting	Not reported	Gray's criteria (Gray, 1998)	Yes	Decrease in disruptive behaviors for all participants
Scattone et al. (2006)	3	8-13	ASD	General education recess and lunch time	Multiple baseline across parti-cipants design	Social initiation, response, comments, engagement	Informal interviews	Gray's criteria (Gray, 1998)	Yes	Increased rates of desired behaviors for 2 out of 3 participants
Schneid-er and Goldstein (2010)	3	5-10	ASD	Special education classroom and regular education classroom	Multiple baseline across parti-cipants design	On-task behaviors	Determined by parents, classroom teacher, SLP, and first author	Gray's criteria (Gray, 1998)	Yes	Increased rates of desired behaviors for all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Soenksen and Alper (2006)	1	5	Hyper-lexia	Regular education classroom	Multiple baseline across settings design	Appropriate methods to obtain peer attention	Interview with parents and teacher, direct observations	Gray's criteria (Gray, 1995)	No	Increased rates in target behaviors across recess, choice time and math
Smith (2001)	19	Key Stage 1-3	ASD, Learning challenges Tourettes Syndrome	Special and regular education	Case Study	Varied	Interview with parents, caregivers, school staff	Gray's criteria (Gray, 1994)	No	Mixed results for different students
Swaggart et al. (1995)	3	7-11	ASD	Special education self-contained classroom	Case Study	Appropriate greeting responses; Sharing play materials	Environment and task analyses; direct obser-vations	Cray's criteria (Gray, 1994); (Gray and Garrand, 1993)	No	Increased rates in target behaviors and decrease in undesired behaviors for all participants

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Thie-mann and Goldstein (2001)	5	6-12	ASD	Regular education media room in school library	Multiple baseline across two to three cond-itions	Appropriate social skills during play with peers	Not reported	Gray's criteria (Gray, 1995); (Gray and Garrand, 1993)	Yes	Improved and more consistent rates of desired social behaviors
Toplis and Hadwin (2006)	5	Year 2 Grade Group	"Special Needs" school grouping	Regular education lunch room	ABAB	Appropriate lunch time behavior, getting to lunch time seat without difficulty	Teacher and para-professional interview, direct observations	Gray's criteria (Gray, 1994)	No	Improved rates of target behaviors for 3 of the 5 students

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Thomp-son and Johnston (2013)	3	3-5	ASD or character-istics of ASD	Early childhood special education classroom	Multiple baseline across parti-cipants	Staying in seat at circle time, staying in seat at snack time, avoids tactile play activities	Teacher interview, direct observations	Gray's criteria (Gray, 2004)	Yes	Improved rates of desired behaviors for all participants
Vand-ermeer et al. (2013)	1	4	Autism	Pre-prepar-atory class in early interven-tion center for youth with ASD	Single baseline ABA design	Attention to task, materials or teacher while seated	Teacher interview	Gray's criteria (Gray, 2010)	No	Increased rates of attention to teacher and learning materials

Table 1 Continued

Study	N	Age(s)	Disability Type(s)	Setting	Study Design	Targeted Situations and/or Related Behavior(s)	Strategy for Identifying Target Situations and Related Behavior(s)	Criteria used for writing Social Stories	Compre-hension Plans	Outcomes
Wright and McCath-ren (2012)	4	4-5	Autism	Early childhood special education classroom and home	Multiple baseline across parti-cipants design	Lack of social initiation or responses to peers, negative verbal or physical behavior	Teacher report	Gray's criteria (Gray and Garrand, 1993)	Yes	Slight increases in pro-social behavior in 3 of 4 participants; some decreases in negative social interaction for all 4 participants

Table 2

Format and Implementation Characteristics of Social Story Interventions

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Interobserver Agreement	Procedural Fidelity	Social Validity
Adams et al. (2004)	Paper-based booklet	Immediately prior to target situation	Not reported	21-30 sessions	Yes	Yes	No	Yes
Agosta et al. (2004)	Paper-based booklet	Immediately prior to target situation	Daily	20 sessions	Yes	No	No	Yes
Barry and Burlew (2004)	Paper-based booklet	Immediately prior to target situation	Daily	7-8 sessions	Yes	Yes	No	No
Beh-Pajooh et al. (2011)	Not report-ed	Not reported	Not reported	15-21 sessions	No	Yes	No	Yes
Bernad-Ripoll (2007)	Paper-based booklet	Not reported	Not reported	10 sessions	Yes	No	No	No
Bledsoe et al. (2003)	Paper-based booklet	Immediately prior to target situation	Available upon student or teacher request	9 sessions	Yes	Yes	No	No

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Brown-ell (2002)	Paper-based booklet and song-based	Immediately prior to target situation	Daily	10 sessions	No	Yes	No	No
Burke et al. (2004)	Paper-based booklet	Immediately prior to target situation	Daily	15-36 sessions	Yes	Yes	Yes	Yes
Chan and O'Reilly (2008)	Paper-based booklet	Immediately prior to target situation	Daily	4-13 sessions	Yes	Yes	Yes	Yes
Chan et al. (2011)	Comp-uter-based	Condition 1: Immediately prior to target situation Condition 2: Start of school day	Daily	5-9 sessions	No	Yes	Yes	Yes
Cihak et al. (2012a)	Video-based	Immediately prior target situation	Daily	11 sessions	Yes	Yes	Yes	Yes

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Crozier and Tincani (2005)	Paper-based booklet	Not reported	Not reported	12 sessions	Yes	Yes	Yes	Yes
Crozier and Tincani (2007)	Paper-based booklet	Immediately prior to target situation	3 times per week	11-17 sessions	Yes	Yes	Yes	Yes
Delano and Snell (2006)	Paper-based booklet	Immediately prior to target situation	Daily	15 sessions	Yes	Yes	Yes	Yes
Dodd et al. (2008)	Paper-based booklet	Immediately prior to target situation	Not reported	3-4 sessions	Yes	Yes	Yes	Yes
Hagger-ty et al. (2005)	Paper-based booklet	During classroom routines	3 times per week	12 sessions	Yes	No	No	Yes
Hagi-wara and Myles (1999)	Comp-uter based	Immediately prior to target situation	Daily	4-17 sessions	Yes	Yes	No	No

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Iskander and Rosales (2013)	Paper-based booklet	Immediately prior to target situation	Daily	9-14 sessions	Yes	No	No	Yes
Ivey et al. (2004)	Paper-based booklet	Variable times-at the discretion of the parent	Daily	8 sessions	Yes	Yes	Yes	Yes
Kuoch and Mirenda (2003)	Paper-based booklet	Immediately prior to target situation	Daily	5-8 sessions	Yes	Yes	Yes	No
Kuttler et al. (1998)	Paper-based booklet	Immediately prior to target situation	Daily	11 sessions	Yes	Yes	No	No
Lorimer et al. (2002)	Paper-based booklet	Morning time, beginning of a therapy session, and/or prior to adult to adult conversation	Daily	14 sessions	No	Yes	No	No

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Mancil et al. (2009)	Paper-based booklet and computer-based story	Immediately prior to target situation	Daily	21-28 sessions	Yes	Yes	Yes	Yes
Moore (2004)	Paper-based booklet	Immediately prior to target situation	2 times daily	28 sessions	Yes	No	No	Yes
Norris and Dattilo (1999)	Paper-based booklet	Immediately prior to target situation	Daily	12 sessions	Yes	Yes	Yes	No
Okada et al. (2008)	Paper-based booklet	Not reported	Not reported	6-10 sessions	Yes	Yes	No	No
Ozdemir (2008)	Paper-based booklet	Immediately prior to target situation	Daily	27 sessions	No	Yes	Yes	Yes

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Quilty (2007)	Paper-based booklet	Not reported	Not reported	8-11 sessions	No	Yes	Yes	No
Reichow and Sabornie (2009)	Paper-based booklet	Beginning of school day	Daily	27 sessions	Yes	Yes	No	No
Reyn-hout and Carter (2007)	Paper-based booklet	Immediately prior to target situation	Daily	32 sessions	Yes	Yes	Yes	Yes
Rogers and Myles (2001)	Paper-based booklet	Immediately prior to target situation	Daily	12 sessions	Yes	No	No	No
Rowe (1999)	Paper-based booklet	Immediately prior to target situation	Daily	Not reported	No	No	No	No
Sansosti and Powell-Smith (2006)	Paper-based booklet	Before and after school	2 times daily	13-20 sessions	No	Yes	Yes	Yes

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Sansosti and Powell-Smith (2008)	Comp-uter based	Immediately prior to target situation	Daily	13-18 sessions	No	Yes	Yes	Yes
Scattone (2008)	Video based	During clinic session	1-2 times per week and at home on a variable schedule	20 sessions	No	Yes	Yes	Yes
Scattone et al. (2002)	Paper-based booklet	Morning time before class; One hour before target situation	Daily	7-18 sessions	No	Yes	Yes	Yes
Scattone et al. (2006)	Paper-based booklet	Immediately prior to target situation	Daily	13-29 sessions	No	Yes	Yes	Yes
Schneid-er and Gold-stein (2010)	Paper-based booklet	Immediately prior to target situation	Daily	12-33 sessions	No	Yes	Yes	No

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Soenk-sen and Alper (2006)	Paper-based booklet	Immediately prior to target situation	Daily	5-13 sessions	No	Yes	No	Yes
Smith (2001)	Paper-based booklet	Not reported	Not reported	Not reported	No	No	No	Yes
Swagg-art et al. (1995)	Paper-based booklet	During morning routines	Daily	18 sessions	Yes	No	No	No
Thie-mann and Gold-stein (2001)	Paper-based booklet	Immediately prior to target situation	Daily	30-38 sessions	Yes	Yes	Yes	Yes
Thomp-son and Johnston (2013)	Paper-based booklet	Immediately prior to target situation	Daily	7-10 sessions	Yes	Yes	Yes	Yes
Toplis and Hadwin (2006)	Paper-based booklet	Immediately prior to target situation	Daily	11 sessions	No	Yes	No	Yes

Table 2 Continued

Study	Story Format	Time of Intervention	Frequency of Intervention	Duration of Intervention	Intervention Packaging	Reliability/ Interobserver Agreement	Procedural Fidelity	Social Validity
Vander-meer et al. (2013)	iPad-based	Immediately prior to target situation	Daily	18 sessions	No	Yes	No	No
Wright and McCath-ren (2012)	Paper-based booklet	Immediately prior to target situation and available at home and at school	Daily	12 sessions	No	Yes	Yes	Yes

CHAPTER 3

METHOD

Overview

An adapted alternating treatment design was implemented to explore whether (a) a Social Story presented in a paper-based format was effective in decreasing undesired behaviors when compared to a no-intervention baseline condition, (b) a Social Story presented in a tablet computer-based format was effective in decreasing undesired behaviors when compared to a no-intervention baseline condition, and (c) a difference existed between the efficiency and the effectiveness of paper-based format and tablet computer-based format Social Story interventions.

Two Social Stories were written for each of 4 participants to address undesired behaviors that occurred in the context of two separate activities. One Social Story was delivered in a paper-based book format and one Social Story was delivered in a tablet computer-based format (i.e., iPad). Data regarding frequency of undesired behaviors during target activities as well as social validity data regarding the perceived effectiveness and efficiency of the intervention were collected.

Participants

Four early childhood aged students participated in this investigation. Participants met the following inclusion criteria:

1. Demonstrated characteristics of an ASD as determined by school classroom placement personnel, or had a diagnosis of an ASD (i.e., autistic disorder, Asperger syndrome, pervasive developmental disorder-not otherwise specified) from a physician, or licensed psychologist, or
2. Demonstrated characteristics of challenging behaviors that interfered with classroom learning and participation, and
3. Free of visual or hearing impairments that were not already corrected with assistive devices such as glasses or hearing aides, and
4. An interest in books as defined by a score of four or above on all questions on a teacher completed Preschool Book Interest 6-point Likert Scale (see Appendix A; Kuoch & Mirenda, 2003), and
5. No prior exposure to Social Stories in the classroom setting, and
6. Engaged in at least two challenging behaviors that occurred during different classroom activities, and served different behavioral functions.

The participants ranged in age from 3 years, 8 months to 6 years, 10 months. For the purposes of this study, participants are identified as Adan, Brad, Daniel, and Ethan. All participants were male. Table 3 provides a summary of participant characteristics, including: assessment data from the participant's school file, and each participant's average score from the preschool book interest scale. Table 4 provides a summary of functional assessment data collected for each participant, including: the activities during which undesired behaviors occurred, the form and function of the undesired behaviors, and replacement behaviors that matched the function of the undesired behaviors.

Experimental Design

An adapted alternating treatment design (AATD) was used to (a) examine the effect of Social Stories as a tool to decrease undesired behaviors in early childhood special education settings, and (b) determine if the story format (paper-based book format or tablet computer-based format) influenced outcomes.

An AATD can be used to compare the effects of two treatments on two independent behaviors and is an appropriate research design to employ when researchers are interested in comparing the effects of interventions that typically produce nonreversible behaviors (Gast & Wolery, 1988; McDonnell, Jameson, & Rose, 2011; Sindelar, Rosenberg, & Wilson, 1985). When implementing an AATD, the researcher alternates the presentation of two interventions or treatment conditions with individual participants to address two different behaviors that are equally difficult for a target student to participate in or achieve, but are functionally independent of one another. An AATD allows researchers to determine the extent to which each intervention facilitates meaningful changes in the target behaviors, as well as how quickly the treatments enable change (McDonnell et al., 2011). In the context of this investigation, the researcher introduced two different interventions to each participant. One intervention was a paper-based Social Story, and the other intervention was a tablet computer-based (iPad) Social Story. For the purposes of this study, the independent variables were the paper and iPad-based Social Stories, and the dependent variable was the frequency of undesired behaviors during identified activities.

Setting

This study was conducted in four different early childhood special education classrooms. Two participants (Adan and Brad) attended separate, self-contained preschool classrooms in the same private school for children with characteristics of ASD. A third participant (Daniel) attended a self-contained special education classroom in a different private school for children with characteristics of ASD. The fourth participant (Ethan) attended an inclusive preschool classroom in a public school that served children with and without disabilities.

Adan and Brad attended their preschool program for 6 hours a day, 4 days per week. Daniel attended his early childhood program for 6 hours a day, 4 days per week; and for 3.5 hours, 1 day per week. Ethan attended his preschool program for 2 hours a day, 3 days per week.

Five adults staffed Adan's classroom of 8 children, 5 adults staffed Brad's classroom of 9 children, and 5 adults staffed Daniel's classroom of 10 children. Four adults staffed Ethan's class of 11children (11 with disabilities) on Mondays, 15 children (10 with disabilities) on Tuesdays, and 16 children (11 with disabilities) on Wednesdays.

The teachers and paraeducators across the four classrooms had varying levels of education. The lead teacher in Adan's class had a master's degree in early childhood special education. The lead teacher in Brad's class had a bachelor's degree in psychology. The lead teacher in Daniel's class had a bachelor's degree in early childhood education. Finally, the lead teacher in Ethan's class had a bachelor's degree in early childhood special education. The paraeducators across each of the four classrooms had varying levels of education ranging from a high school diploma to a college

bachelor's degree.

Classroom consultants also supported the staff/children in each of the participants' classrooms. A speech-language pathologist served as an itinerant classroom consultant for Adan and Brad. Speech-language pathologists and occupational therapists served as itinerant classroom consultants for Daniel and Ethan.

Interventionist

In order to control for the potential effect of differences across interventionists, the researcher served as the interventionist for all participants. The researcher had 8 years of experience as a school-based occupational therapist and also held a master's degree in early childhood special education.

Materials

Social Stories

For each participant, two Social Stories were written. The two Social Stories addressed different undesired behaviors that served different functions and occurred in the context of different activities (see procedures). The Social Stories were written using the guidelines "Social Stories 10.1" established by Gray (2010). Data from FBAs conducted for each participant were used when writing the Social Stories. Specifically, the interventionist used information related to the form and function of the undesired behaviors, as well as the antecedents and consequences related to those behaviors when writing the Social Stories. Data from the FBAs were also used to help identify alternative behaviors for the undesired behaviors that would serve the same behavioral functions.

Variables related to length, presentation format, and reading ease were controlled

when the researcher created the two Social Stories for each participant. In order to control for the variable of length of the Social Stories, the researcher ensured that the two stories for each participant did not differ in length by more than two sentences per story. In order to control for variability in presentation format, the researcher ensured that the two stories for each participant were the same in terms of font size, font styles, font color, use of clip art, and use of photos. In order to ensure that the Social Stories for each participant were similar in terms of reading ease, all Social Stories were evaluated using the Flesch Reading Ease Formula (Flesch, 1948). The Flesch Reading Ease Formula yields a score that can be interpreted by using the Flesch Reading Ease Scale. The scale ranges from 0-100 and provides readability index scores that range from "very difficult" to "very easy." All Social Stories that were written and used in the context of this study received a Flesch Reading Ease score in the range of "80-100" indicating that the text was "easy" or " very easy" to read (Flesch, 1948).

All Social Stories were examined by three professionals with advanced training in writing Social Stories (one early childhood special educator, one school-based occupational therapist, and one clinic based/school-based occupational therapist) in order to confirm that each Social Story met Gray's criteria as listed in the Social Story Task Analysis (see Appendix B) and provided feedback on the stories. The researcher revised the Social Stories based upon the feedback provided.

Video Clips

The researcher created two video clips of typically developing early childhood aged children engaging in the desired behaviors discussed in each Social Story. These video clips were used in the iPad-based Social Story interventions (see below). The length of

video clips varied slightly based upon on the activity, the behavior being modeled, and the performance of the child actors. The mean length of the video clips across all stories was 40.5 seconds (*range* = 16-70 seconds). The mean difference in length of video clips used for the Social Stories with any given participant was 18.13 seconds (the difference in length of video clips within participants ranged from 3-34 seconds).

Development of Paper-based and Tablet Computer-based (iPad) Social Stories

After each Social Story was written, compared for sentence length and readability, verified as meeting Gray's criteria, and video models were obtained, the stories were transferred into a book-like format using the Keynote app. The Keynote app is specific to Apple, Inc. products (i.e., iPhone, iPod, iPad), and is used to make computer-based presentations (Apple, 2013). Keynote has multiple features that can be utilized when writing and presenting a Social Story. The features of Keynote that were used in the context of this investigation included the ability to: (a) type the text of a story onto book-like pages, (b) insert multiple clip-art or photo pictures per page, (c) insert up to one video clip per page, (d) move between the pages of the story by swiping a finger across the screen, (e) view the Social Story directly on an iPad, and (f) print the pages of the Social Story to allow it to be presented in a paper-based format. After developing, illustrating, and inserting the video clips for each Social Story using Keynote, the researcher randomly selected one story for each participant to be presented in a paper-based format and one story to be presented in an iPad-based format.

The story for each participant that was selected for the paper-based format was downloaded from the iPad on which it was created to a desktop computer, and then

printed in color onto 8 ½" X 11" white paper. The researcher then inserted the printed pages into clear page protector covers and assembled the pages in a booklet format. The story that was selected for the iPad-based format included the previously described video clips. These video clips were embedded into the relevant pages of the Social Story. An iPad tablet computer was used when presenting the iPad-based Social Story intervention to each participant.

Table 5 compares the characteristics of the paper-based and iPad-based Social Stories for each participant. As noted on Table 5, the characteristics of the paper-based and iPad-based Social Stories that were the same were: (a) use of Gray's criteria, (b) Social Story criteria verified by three professionals, (c) font size/style/color, (d) number of sentences (i.e., plus/minus two sentences), (e) Flesh Reading Ease score between 80-100, (f) number of clip art illustrations, and (g) number of photo illustrations. The characteristics of the paper-based and iPad-based Social Stories that were different were: (a) the use of two video modeling clips in the iPad-based Social Story, and (b) turning story pages by swiping a finger across the iPad screen versus manually turning the paper-based story pages.

Procedures

Identification of Target Activities and Related Behaviors

For each participant, the researcher conducted classroom observations and discussions with classroom teachers to identify two different activities in which the participants engaged in different undesired behaviors that were thought to serve different functions. Once identified, the researcher conducted a functional behavior assessment (FBA) for each activity/behavior using the functional assessment interview (FAI) and the functional

assessment observation (FAO; O'Neill et al., 1997; see Appendix C).

Functional Assessment Interview (FAI)

For each participant, the researcher conducted functional assessment interviews (FAI) with the lead teacher. The FAI is designed to help interventionists obtain information that can be used to: (a) describe challenging behaviors, (b) identify physical and environmental factors that can affect whether or not a challenging behavior occurs, (c) determine possible functions of behaviors, (d) assess the consequences of the challenging behaviors, (e) assess possible circumstances that may help maintain challenging behaviors, and (f) create summary statements that explain the connection between activities, behaviors, and their functions (O'Neill et al., 1997). The researcher used the FAI information to develop two separate summary statements that corresponded to the two separate undesired behaviors for each participant. After the summary statements were developed, direct behavioral observations were conducted to confirm and/or clarify the summary statements.

Functional Assessment Observation (FAO)

For each participant, the researcher conducted direct behavioral observations using the functional assessment observation (FAO; O'Neill et al., 1997). The FAO is designed to help interventionists document: (a) antecedent events and outcomes related to challenging activities/behaviors, (b) the number of challenging activities/behaviors, (c) challenging behaviors that occur together during a target activity, (d) predictable times that activities/behaviors may occur, (e) possible maintaining functions of the behaviors, and (f) real-life consequences that occur as a result of the challenging activities/behaviors

(O'Neill et al., 1997). For the purpose of this investigation, observations were conducted during the previously identified activities during which the undesired behaviors occurred. During observations, the researcher documented the frequency of the undesired behaviors, potential predictors of those behaviors, and their perceived functions (O'Neill et al., 1997). The researcher followed the recommendations of O'Neill et al. (1997) and collected data until a predictable behavioral pattern was documented.

In the case of this investigation, data from the FAO supported and confirmed the data from the FAI for all participants. However, if the data from the FAO had not clearly supported and confirmed the data from the FAI, the researcher would have gathered additional data for both the FAI and FAO in order to help clarify existing behavioral information. Once the researcher established that the information from both the FAI and the FAO supported and confirmed the behavioral summary statements related to the undesired behaviors, the researcher identified desired behaviors that served the same behavioral function as the undesired behaviors. Next, the undesired behaviors and desired behaviors were reviewed and evaluated for functional and procedural equivalence.

Functional and Procedural Equivalence

The researcher evaluated the undesired and desired behaviors for each participant in order to ensure functional and procedural equivalence. In order to conduct this evaluation, the researcher first compared each participant's related undesired and desired behaviors to ensure that they served the same behavioral function (see Appendix D). It was important to ensure that the desired behaviors fulfilled the same functional needs for the participant as the existing undesired behaviors so that undesired behaviors could be

replaced with more socially acceptable behaviors while continuing to serve a similar purpose for the student.

Next, the unrelated undesired and the unrelated desired behaviors for each participant were compared to make certain that they did not serve the same behavioral function (see Appendix D). It was important to ensure that the unrelated undesired and unrelated desired behaviors were functionally independent from one another in order to control for the generalization of the treatment effects. If generalization of treatment effects did occur, it would be difficult for the researcher to determine which intervention, if any, had the most effect on decreasing undesired behaviors and increasing desired behaviors (McDonnell et al., 2011).

Finally, the unrelated desired behaviors and unrelated undesired behaviors for each participant were compared with regard to rate of reinforcement, quality of reinforcement, level of response effort, immediacy of reinforcement (Mace & Roberts, 1993), activity type (i.e., teacher directed, student directed, free play, other), and student engagement (i.e., active, passive, other; see Appendix D). This was important in order to increase believability that the treatment affected the outcomes, rather than differences between the difficulty of the desired and/or undesired behaviors (Gast & Wolery, 1988; McDonnell et al., 2011). The completed functional and procedural equivalence worksheets for all participants are available upon request.

Once the researcher determined that a participant's desired and undesired behaviors were functionally independent and equally difficult, the researcher proceeded to the baseline phase of the study for that participant.

Baseline Phase

Baseline data were collected on the occurrence of the specified undesired behaviors during each of the two activities. Baseline data were collected until a steady pattern was documented.

Following collection of baseline data, the researcher compared the mean rates of undesired behaviors across the two activities to ensure that the rates were comparable. The researcher then randomly assigned the paper-based Social Story to one activity and the iPad-based Social Story to the remaining activity and proceeded to the comparison phase.

Comparison Phase

Each participant received daily counterbalanced presentations of the paper-based and iPad-based interventions during the comparison phase to control for potential ordering effects (Gast & Wolery, 1988; McDonnell & McFarland, 1988). The average length of intervention sessions (i.e., reading the Social Story with the participant) was 6.26 minutes (range = 4 to 10 minutes). Variability in length of intervention sessions was due to the presentation format (the use of video modeling in the iPad condition increased the length of those sessions) and the frequency of participant questions/comments during the intervention session. The length of time between presentations of the two daily interventions was approximately 1 hour.

Reading of the Social Stories took place in a one-on-one interaction between the interventionist and participant. Readings occurred in areas identified by the lead teacher as ones that would not be distracting for the participant or the other students in the classrooms. Intervention areas used in this study included office space adjacent to the

classroom (Adan and Daniel), a hallway next to a classroom (Brad), and a quiet area in the back of the classroom (Ethan).

The intervention occurred immediately prior to the identified classroom activity. During both the paper-based and iPad-based interventions, the interventionist read the Social Story directly to the participant. The participant was given the opportunity to turn the pages of the story, touch the illustrations, and make comments about the story as the interventionist read the Social Story. In addition, during the iPad-based intervention, the participant was given the opportunity to view the embedded video clips. Following the reading of each Social Story, the interventionist reviewed the story with the participant to assess and increase the participants' comprehension of the concepts and circumstances presented in the story (Gray, 2010; Kokina & Kern, 2010). During the review, the interventionist: (a) verbally described, modeled, and/or pictorially displayed the desired behavior, (b) used verbal, physical, and/or visual prompts to guide the participant to practice the desired behavior or point to a picture representing the desired behavior, (c) asked the participant to demonstrate or point to a picture representing the desired behavior, and (d) repeated the verbal, physical, and/or visual prompts to guide the participant to practice the desired behavior or point to a picture representing the desired if they did not demonstrate the desired behavior independently (Randi et al., 2010). Upon completion of the review, the interventionist helped the participant transition directly to the identified activity.

The comparison phase continued until a participant demonstrated either a differential effect or comparable level of performance between the two interventions (McDonnell et al., 2011). Data from the comparison phase was used to determine the next phase of the

investigation. Specifically, the researcher used visual analysis, comparison of mean rates of undesired behaviors, and the conservative dual-criterion (CDC) method (see data analysis) to examine performance in the two intervention conditions (Fisher, Kelley, & Lomas, 2003; Gast, 2010). If there was a comparable level of performance between the two conditions, then the participant entered a flipped intervention phase. If there was a differential effect between the two conditions, then the participant entered the most effective intervention phase (McDonnell et al., 2011).

Flipped Intervention Phase

If it was determined that there was a comparable level of performance between the two interventions, the interventions were flipped so that the activity that was paired with the paper-based Social Story in the comparison phase was now paired with the iPad-based Social Story intervention and the activity that was paired with the iPad-based Social Story was now paired with the paper-based Social Story. In order to accomplish this, the video modeling clips that were obtained during the development of the Social Story intervention materials were embedded into the paper-based Social Story and the story was then presented to the participant on the iPad. Further, the pages of the iPad-based story were printed in color on 8 ½"X 11" white paper and were inserted into clear page protector covers and then assembled in a booklet format. The flipped intervention phase was used to help determine and confirm whether or not a difference existed between the two interventions. Data were collected on the flipped intervention phase until a stable level of performance was achieved (McDonnell et al., 2011).

Most Effective Intervention Phase

If the comparison phase data revealed a difference between the rates of behavior when using paper-based and iPad-based Social Story interventions, then the "most effective" intervention was used across both activities. Specifically, if the paper-based format was the most effective intervention for a participant, then the pages from the Social Story that was originally delivered in the iPad-based format would be printed onto paper, inserted into clear page protector covers, and assembled into a booklet format. The video models originally used with the iPad-based Social Story intervention would not be used with the paper-based Social Story intervention.

Conversely, if the iPad-based story was the most effective intervention for a participant, then the Social Story that was originally delivered through a paper-based format would be delivered via the iPad and the video modeling clips that were obtained during the development of the Social Story intervention materials would be embedded in the iPad-based Social Story. This phase would help confirm whether one intervention was more effective than the other intervention, as the rates of undesired behaviors following the implementation of the most effective intervention for both target activities should become comparable. Data would be collected during the most effective intervention phase until a stable level of performance was achieved (McDonnell et al., 2011).

Maintenance

Following the completion of the flipped/most effective intervention phase, maintenance data were collected approximately 1 time per week for 4 weeks for each participant. During maintenance, all interventions were discontinued. Maintenance data

were collected in the context of the same activities as baseline and intervention sessions.

Data Collection

Intervention Strategy

Data to assess the effectiveness and efficiency of the intervention strategies were collected during baseline, comparison, flipped/most effective intervention, and maintenance phase sessions. The researcher observed each participant during the identified activities and collected data using a frequency counting method to gather information on the occurrence of undesired behaviors (see Appendix E). The frequency of undesired behaviors was converted to a rate of undesired behaviors per minute. This was done to allow for comparison across sessions in which the length of the activity varied slightly from day to day.

Social Validity

Data to assess the acceptability, perceived effectiveness, and perceived efficiency of the intervention strategies was collected via goal attainment scaling, video ratings, and teacher completed surveys.

Goal Attainment Scaling

Progress made toward each participant's desired behaviors was documented, quantified, and compared using goal attainment scaling (GAS), which has been applied to previous mental health, medical, and educational studies (see Appendix F; Kiresuk, Smith, & Cardillo, 1994; Roach & Elliot, 2005). The process of GAS uses interviews during goal-setting and posttreatment sessions to help determine indicators of a person's progress that can be challenging to assess using available standardized measures. GAS

also provides a way to identify intervention outcomes that are specifically relevant to individuals, their families and educators (Mailloux et al., 2007).

The results obtained from GAS ratings were used to determine whether the lead teacher observed measurable changes in the participant's behaviors. The system for developing the goal attainment scales for this study followed the recommendations in the literature (Kiresuk et al., 1994). However, as this study focused on two target activities/behaviors for each participant, only two goals were written rather than the recommended three. In creating the GAS for each participant, the researcher translated the identified desired behaviors into two separate goals. Each goal was written as a measurable objective, with an expected outcome. Then, the researcher specified goal levels that were considered *better than*, *much better than*, *less than*, or *much less than* the expected outcome levels (see Appendix F; Kiresuk et al., 1994; Mailloux et al., 2007).

Each lead teacher used the GAS to rate their participant's progress toward the specified goals following the final week of the study (see Appendix F). The lead teachers did not view data or graphs related to the intervention outcomes, but they did observe at least one session of the baseline, comparison, most effective/flipped intervention, and maintenance phases of the study before providing ratings on the GAS.

Video Ratings

Video clips of the participants engaging in the identified activities were collected during the baseline and comparison phases of the study. These clips were used to help assess whether or not the intervention resulted in the socially important change that was noticeable to individuals who were not associated with the participants. Video segments were collected during both the baseline and the comparison phases of each target activity

for Adan, Brad and Ethan. The researcher only collected baseline and comparison phase video clips for one of Daniel's target activities, due to the fact that the bathroom area was the setting for one of Daniel's target activities.

Once all video segments were collected, the researcher selected representative video segments from the baseline and comparison phases for each participant. In order to select video clips that were representative of the participants' behaviors during the baseline and comparison phase sessions, the researcher determined the rate per minute of undesired behaviors for each video clip and then compared that rate to the actual rate per minute of undesired behaviors for the entire observation session. Video clips for which the rates of undesired behaviors were comparable to the rates of undesired behaviors for the entire observation session were selected for use.

One baseline phase and one comparison phase video clip for each target activity was selected for Adan, Brad and Ethan. One baseline phase and one comparison phase video was selected for one target activity for Daniel. These selections resulted in four video clips for each participant, with the exception of Daniel who was featured in only two video clips. The representative video segments ranged in length from 49 seconds to 1 minute and 53 seconds, with an average length of 1 minute and 22 seconds.

Once the representative video clips were selected, they were organized into a presentation format. The researcher organized the selected video clips into a PowerPoint presentation format by inserting them into PowerPoint slides in a random order, with a blank slide between each video clip. The PowerPoint presentation was then delivered to 14 university students who were special education majors and who were participating in a graduate level class in The Department of Special Education. The university students

were blind to the purpose of the study, and did not know the participants.

Prior to viewing the PowerPoint presentation, the university students were given a questionnaire form and instructions regarding how to rate the behaviors that they observed in each video segment (see Appendix G). The questionnaire form was developed by the researcher and utilized adapted semantic differential scales (Osgood, Suci, & Tannebaum, 1957; Salcuni, DiRiso, Mazzeschi, & Lis, 2007) in order to measure the university students' perceptions of the study participants' behaviors. Semantic differential scales are a tool that can be used to measure individual's perceptions of other peoples' actions and behaviors (Salcuni et al., 2007). These scales can be adapted to address different research questions and have been used in previous research studies (Kern, Wacker, Mace, Falk, Dunlap, & Kromrey, 1995; Miyahara & Register, 2000; Salcuni et al., 2007). When using semantic differential scales, scaling procedures are used to judge a behavior based on a set of contrasting adjectives. In order to complete the scale, a rater indicates their perception of a behavior by marking a rating on a 7-point semantic scale that is defined by a pair of contrasting adjectives (Salcuni et al., 2007). For the purposes of this study, the questionnaire included three pairs of adjectives that were used to describe behaviors. These adjective pairs were *well behaved* and *poorly behaved*, *appropriate* and *inappropriate*, and *engaged* and *not engaged*.

After the university students received a copy of the rating form as well as instructions on how to complete the form, the researcher presented the video clips on a large classroom screen to the students. During the presentation, the researcher played a video clip and then paused while students placed an "X" mark on one of seven lines between each set of adjectives before playing the next video clip. Once the university students

viewed and rated all of the video clips, they returned the rating forms to the researcher.

The completed video ratings were analyzed by calculating the mean score and standard deviation for the baseline and comparison phase ratings for each participant, as well as across all participants. One-tailed paired samples t-tests were conducted between the baseline and comparison phase mean scores in order to determine if the means of the baseline scores were significantly less than the means of the comparison phase scores. One-tailed paired samples t-tests test for the possibility of a relationship between the means of two sets of related data in one direction (i.e., either increasing or decreasing, but not both) in a before and after treatment relationship. Testing for the possibility of a relationship in one direction was appropriate given that, prior to the administration and analysis of the video ratings, the researcher had data demonstrating a one-direction change in rates of behavior from the baseline to the comparison phase across all participants (Hays, 1994; Lane, 2014; McDonald, 2014; UCLA: Statistical Consulting Group, 2014a; 2014b).

Survey

A Likert scale survey designed by the researcher was used to examine the lead teachers' and classroom paraprofessionals' perceptions regarding: (a) the importance of the intervention strategies, (b) the usefulness of Social Stories as an instructional strategy, and (c) the format in which the Social Story was presented (see Appendix H; Johnston, Nelson, Evans, & Palazolo, 2003). The survey included general questions related to Social Story interventions, as well as questions that were specific to the paper-based and iPad-based formats. The classroom teachers and paraprofessionals completed the survey for their respective participants during the final week of the study. The classroom teacher

and paraprofessionals did not view data or graphs related to the intervention outcomes prior to completing the survey, but they did observe at least one session of the baseline, comparison, flipped/most effective intervention, and maintenance phases of the study before completing the survey.

Reliability

Interobserver agreement was obtained to evaluate both procedural fidelity and dependent variable reliability across all phases of the investigation. To assess procedural fidelity, an independent observer watched and recorded the interventionist's implementation of a task-analyzed list of procedures (see Appendix I). Procedural fidelity was collected during a minimum of 20% of both the comparison and the most effective/flipped phase sessions for all participants. Procedural fidelity was calculated by dividing the number of correct interventionist behaviors by the number of planned interventionist behaviors and multiplying the quotient by 100. Fidelity data showed that the interventionist correctly performed the planned interventions for 100% of the procedures for all participants.

To assess dependent variable reliability, an independent observer collected data related to the occurrence of the undesired behaviors during at least 20% of each of the baseline, comparison, most effective/flipped, and maintenance phase sessions for all participants (see Appendix E). Next, the total number of target behaviors recorded per observation session across the two observers was compared and a percentage of dependent variable reliability was calculated. In order to obtain a percentage of dependent variable reliability, the lesser or equal total number of target behaviors from one observer was divided by the greater or equal total number of target behaviors from the other observer

and then multiplied by 100. The mean dependent variability across participants for baseline was 98.75% (100% for Adan, 98% for Brad, 100% for Daniel, 97% for Ethan) and the mean dependent variability across participants for the comparison phase was 92.75% (89% for Adan, 94% for Brad, 88% for Daniel, 100% for Ethan). The mean dependent variable reliability for the most effective/flipped phase and the maintenance phase was 100% for all participants.

Data Analysis

Data regarding the frequency of undesired behaviors and the length (in minutes) of activities were used to compute the rate per minute of undesired behaviors for each activity. For each observation session, the frequency of undesired behaviors was divided by the length (in minutes) of the activity. This number was rounded to the third decimal place and was recorded as the participant's rate per minute of undesired behaviors for each session. The rate per minute of undesired behaviors for each session was graphed to provide a visual representation of student behaviors across all phases of the investigation.

Both within-condition and between-condition visual analyses were conducted to examine data patterns related to variability, level, and trend (Gast, 2010; Lane & Gast, 2014). Variability of the data (e.g., the range of the data point values) was analyzed by calculating the mean, median, range, and stability for each condition (Gast, 2010; Lane & Gast, 2014). The absolute level of the data (e.g., the size or extent of the data as measured on an ordinate scale) was analyzed by calculating the amount of level change within a condition and between conditions (Gast, 2010; Lane & Gast, 2014). The trend of the data (e.g., the steepness of the data path across time) was analyzed based upon whether the data was accelerating, decelerating, or zero-celerating in the direction of

improving or deteriorating depending on the intent of the intervention. The stability of the trend data was also calculated in order to examine the variability of the trend data (Gast, 2010; Lane & Gast, 2014).

In addition to within-condition and between-condition visual analysis, the researcher used the conservative dual-criterion method (CDC) to determine whether systematic changes in the behaviors occurred between different phases/conditions of the study (Fisher et al., 2003; Swobada, Kratochwill, & Levin, 2010). The CDC method calculates a statistical-based comparison between sets of data, and has been empirically validated as a method to improve the accuracy of the visual inspection of single-case data (Fisher et al., 2003; Swoboda et al., 2010). When conducting a CDC analysis, data are entered into an Excel based computer program in which a minimum of five data points from one phase/condition (e.g., baseline) is entered into the first data column and is then compared to a minimum of five data points from another phase/condition (e.g., treatment phase) that is entered into the second data column. The CDC method calculates adjusted mean and trend lines based on the baseline data entered into the first data column. These adjusted mean and trend lines are set at 0.25 standard deviations further in the direction of the expected treatment effect, and are used as criterion lines for the treatment phase data entered into the second data column. If a specified number of treatment phase data points fall either above or below the adjusted mean and trend lines (depending on whether the intent of the intervention program is to increase or decrease the behaviors), then it is determined that a systematic change between phases/conditions did exist (Fisher, 2003; Swobada et al., 2010).

In order to determine whether a systematic change existed between the baseline and

comparison phases, the CDC method was used to compare (a) the baseline to comparison phases, and (b) the baseline to the most effective/flipped intervention phases for both the paper and iPad-based conditions for each participant. In order to determine whether a systematic change existed between the paper and iPad-based interventions, the CDC method was used to compare (a) the paper-based comparison condition to the iPad-based comparison condition, and (b) the paper-based most effective/flipped condition to the iPad-based most effective/flipped condition.

It is important to note that when using the CDC method, there is an order effect that influences the outcomes based upon which set of data is entered into the first column (e.g., baseline data) and which set of data is entered into the second column (e.g., intervention data). This order effect is appropriate when comparing baseline data to intervention data. However, this order effect presented a challenge when comparing two different interventions within the same condition (e.g., iPad-based comparison phase to paper-based comparison phase). As a result, when using the CDC method to analyze data within the same condition, the calculations were conducted in both directions (e.g., first with the iPad-based data in the first column and then again with the paper-based data in the first column). Furthermore, an a priori decision was made that a systematic change must be identified in both directions (i.e., paper to iPad and iPad to paper) when comparing interventions within a condition (i.e., comparison or flipped phase) in order to conclude that a systematic change between the two interventions existed.

Finally, in order to determine whether outcomes facilitated changes that were effective, efficient, and meaningful, the researcher summarized the social validity data obtained from (a) the goal attainment scaling, (b) the teacher and paraprofessional rated-

surveys, and (c) the video analysis of the participants' baseline and comparison phase behaviors.

Table 3

Participant Age, Diagnosis, Assessment Data, and Book Interest Average Score

Participant Name	**Age at Start of Study**	**Diagnosis**	**School-based Assessment Data**	**Book Interest Average Score**
Adan	4 years, 7 months (55 months)	School program identified student as a child with characteristics of ASD	**Learning Accomplishment Profile (Revised Edition)** Gross Motor: 38 (approx. 63 months) Fine Motor: 26 (approx. 51 months) Prewriting: 22 (approx. 54 months) Cognitive: 14 (approx. 40 months) Language: 14 (approx. 43 months) Self Help: 35 (approx. 51 months) Personal Social: 19 (approx. 47 months)	**5.25**
Brad	3 years, 8 months (44 months)	School program identified student as a child with characteristics of ASD	**Early Learning Accomplishment Profile** Gross Motor: 85 (approx. 29 months) Fine Motor: 58 (approx. 21 months) Cognitive: 65 (approx. 16 months) Language: 25 (approx. 13 months) Self Help: 37 (approx. 25 months) Personal Social: 32 (approx. 25 months)	**4.75**

Table 3 Continued

Participant Name	Age at Start of Study	Diagnosis	School-based Assessment Data	Book Interest Average Score
Daniel	6 years, 10 months (82 months)	School program identified student as a child with characteristics of ASD	**Comprehensive Assessment of Spoken Language- Percentile rank:** Basic Concepts: 66% Antonyms: 97% Sentence Completion: 13% Paragraph Comprehension: 50% Pragmatic Judgment: 9%	**5.75**

Table 3 Continued

Participant Name	Age at Start of Study	Diagnosis	School-based Assessment Data	Book Interest Average Score
Ethan	4 years, 10 months (58 months)	School program identified student as a child with developmental delays	**Battelle Developmental Inventory (2nd ed.)- Percentile Rank:** Adaptive: 61% Personal-Social: 53% Motor: 50% Cognitive: 73% Communication: not reported **Subdomain Profile-Percentile Rank** Self Care: 98% Personal Responsibility: 9% Adult Interaction: 63% Peer Interaction: 63% Self-Concept and Social Role: 37% Receptive Communication: 50% Expressive communication: 91% Perceptual Motor: 16% Attention and Memory: 75% Reasoning and Academic Skills: 84% Perception and Concepts: 50%	**5.75**

Table 4

Activities, Form and Function of Undesired Behaviors, and Replacement Behaviors for Each Participant

Participant	Target Activity	Behavior Forms	Behavior Function	Replacement Behaviors
Adan	Circle Time	Hitting, biting, pinching, shoving others Screaming	Escape undesired tasks and/or activities	Engaging in activity (i.e., watching teacher/peers, singing songs, listening to stories/poems, participating in yoga activities) Asking to sit away from group or peers
	Small Group	Leaning on or rubbing hands on staff/peer Falling off of chair, scooting chair out of area while seated	Obtain attention from staff and peers	Keeping hands and feet next to own body Raising hand or tapping arm/shoulder of staff/peer Asking teacher to talk and/or take a turn

Table 4 Continued

Participant	Target Activity	Behavior Forms	Behavior Function	Replacement Behaviors
Brad	Small Group A	Falling off of chair Leaving group Hitting, kicking or biting teacher	Escape undesired tasks and/or activities	Engaging in activity (i.e., watching teacher/peer, participating in activity) Asking to hold a preferred or desired object
	Small Group B	Taking shoes off Hitting, touching, kicking others Using materials inappropriately (i.e., grabbing, throwing teaching materials)	Obtain attention from staff and peers	Raising hand or tapping arm/shoulder of teacher/peer Asking teacher/peer to talk and/or play

Table 4 Continued

Participant	Target Activity	Behavior Forms	Behavior Function	Replacement Behaviors
Daniel	Lunch-time	Leaving seat, turning around in seat, laying down in seat Inappropriately manipulating shoes, food, drink (i.e., placing noodles around table, picking sandwich into small pieces)	Obtain attention from staff	Eating food in socially appropriate ways (i.e., eat food without playing with it on the table) Raising hand to obtain attention of staff
	Bath-room	Inappropriately manipulating bathroom objects (i.e., playing with toilet paper) Opening stall doors and looking inside stalls Looking between the cracks of the stall doors	Obtain access to desired items/ activity	Completing toileting tasks in a socially acceptable way (i.e., complete toileting/ hand washing tasks and then leave bathroom) Completing toileting tasks in a timely manner in order to obtain other highly desired objects or activities within the classroom environment

Table 4 Continued

Participant	Target Activity	Behavior Forms	Behavior Function	Replacement Behaviors
Ethan	Circle Time	Yelling and/or using silly voice at peer/teacher Leaning on/touching peers	Obtain attention from staff and peers	Raising hand and waiting for teacher's attention Using quiet voice Keeping hands and feet to self
	Small Group	Grabbing staff/peer materials Blocking peers from access to materials	Obtain access to desired object or activity	Waiting for teacher to distribute materials Sharing materials and/or toys with peers Asking for desired materials Taking one object at a time

Table 5

Characteristics of Paper-based and Tablet Computer-based Social Story Interventions

Feature	Paper-based Social Story	iPad-based Social Story
Use of Gray's Criteria (2010)	Yes	Yes
Social Story Criteria Verified by Three Professionals	Yes	Yes
Same Font Size	Yes	Yes
Same Number of Sentences (+/- two sentences)	Yes	Yes
Flesch Reading Ease score Between 80-100	Yes	Yes
Same Font Style	Yes	Yes
Same Font Color	Yes	Yes
Use of Clip Art	Yes	Yes
Same Number of Clip Art Illustrations Used per Story	Yes	Yes
Use of Photos	Yes	Yes
Same Number of Photo Illustrations Used per story	Yes	Yes
Two Video Modeling Clips Embedded into the Social Story	No	Yes

CHAPTER 4

RESULTS

Results revealed that Social Stories presented in paper-based and iPad-based formats are effective in decreasing undesired behaviors when compared to baseline conditions. Furthermore, results suggest that a measurable difference did not exist between the efficiency and the effectiveness of the paper-based and iPad-based formats. Social validity assessment data suggest that both paper-based and iPad-based Social Story interventions are appropriate and effective interventions to decrease undesired behaviors. The following sections summarize individual participant outcomes as well as provide a summary of social validity data.

Participant Outcomes

Figures 1-4 illustrate the rate per minute of undesired behaviors per session across conditions for each participant and Table 6 summarizes the mean and range of the rate per minute of undesired behaviors during target activities for each phase of the study (i.e., baseline, comparison, most effective/flipped, maintenance) for each participant. Data were examined for variability, level, and trend (Gast, 2010; Lane & Gast, 2014). The conservative dual-criterion method (CDC) was used to determine whether systematic changes in behaviors occurred between different phases of the study, and to compare the two different interventions within the same study phases (Fisher et al., 2003; Swobada et

al., 2010).

Adan

Effectiveness and Efficiency of the Paper-based Social Story Intervention

Baseline

As illustrated in Figure 1 and Table 6, Adan demonstrated a baseline mean rate per minute of undesired behaviors of 0.527 (*range* = 0.133-1.210) during circle time activities. Within-condition visual analysis and the linear trend line method of trend estimation (which included stability envelope analysis) revealed that there was an increasing and variable trend of undesired behaviors in a contra-therapeutic direction during baseline.

Comparison Phase

As shown in Figure 1 and Table 6, during the comparison phase, Adan's mean rate per minute of undesired behaviors decreased to 0.093 (*range* = 0-0.529) resulting in an 82% decrease in rate per minute of undesired behaviors from baseline to comparison phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction.

Between-conditions visual analysis was used to compare the baseline phase to the comparison phase of the study in which the paper-based Social Story intervention was introduced (see Figure 1). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in level, and the rate of undesired

behaviors went from an increasing/accelerating trend in baseline to a decreasing/decelerating trend in the comparison phase.

The conservative dual-criterion (CDC) analysis was conducted to determine whether systematic changes in the behaviors occurred between the baseline and comparison phases. As illustrated by Table 7, all of the comparison phase data points fell below the baseline mean and trend lines indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the paper-based and iPad-based interventions during the comparison phase, a flipped intervention phase (rather than a best intervention phase) was initiated. During this phase, the paper-based Social Story intervention was implemented in the small group activity. During the flipped intervention phase, Adan demonstrated a mean rate per minute of undesired behaviors of 0.018 (*range* = 0-0.053) resulting in a 97% decrease in rate per minute of undesired behaviors from small group baseline to the flipped intervention phase. Within-condition visual analysis and linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction. An absolute level change analysis indicated that the rates of undesired behaviors were stable (see Figure 1).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention phase data points fell below the baseline mean and trend lines indicating that systematic change occurred between baseline and flipped intervention phases.

Maintenance Phase

During the maintenance phase of the study (a time in which Adan had been exposed to both the paper-based and iPad-based interventions in circle time), Adan's mean rate per minute of undesired behaviors was 0.119 (*range* = 0-0.258; see Figure 1 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Effectiveness and Efficiency of the iPad-based Social Story Intervention

Baseline

As illustrated in Figure 1 and Table 6, Adan demonstrated a baseline mean rate per minute of undesired behaviors of 0.622 (*range* = 0.313-1.290) during small group activities. Within-condition visual analysis and the linear trend line method of trend estimation revealed that there was an increasing and variable trend of undesired behaviors in a contra-therapeutic direction during baseline.

Comparison Phase

As shown in Figure 1 and Table 6, during the comparison phase, Adan's mean rate per minute of undesired behaviors decreased to 0.051 (*range* = 0-0.143) resulting in a 92% decrease in rate per minute of undesired behaviors from baseline to comparison phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction.

Between-conditions visual analysis was also used to compare the baseline phase to the

comparison phase of the study in which the iPad-based Social Story intervention was introduced (see Figure 1). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in level, and the rate of undesired behaviors went from an increasing/accelerating trend in baseline to a decreasing/decelerating trend in the comparison phase.

As illustrated by Table 7, the CDC analysis revealed that all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the iPad-based and paper-based interventions during the comparison phase, a flipped intervention phase was initiated. During this phase, the iPad-based Social Story intervention was implemented in the circle time activity. During the flipped intervention phase, Adan demonstrated a mean rate per minute of undesired behaviors of 0.108 (*range* = 0.050-0.240) resulting in an 80% decrease in rate per minute of undesired behaviors from circle time baseline to the flipped intervention phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction (see Figure 1).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention phase data points fell below the baseline mean and trend lines indicating that systematic change occurred between baseline and flipped intervention phases.

Maintenance Phase

During the maintenance phase of the study (a time in which Adan had been exposed to both the paper-based and iPad-based interventions in small group), Adan's mean rate per minute of undesired behaviors during small group was 0.013 (*range* = 0-0.067; see Figure 1 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Comparing the Efficiency and Effectiveness of the Paper-based and iPad-based Social Story Interventions

Baseline

During baseline, Adan demonstrated a mean rate per minute of 0.527 (*range* = 0.133-1.210) undesired behaviors during circle time and 0.622 (*range* = 0.313-1.290) undesired behaviors during small group. The difference in the mean rates of undesired behaviors between the two activities in baseline was 0.095 (see Figure 1 and Table 6).

The baseline within-condition visual analysis, absolute level change analysis, and trend line method of estimation for both circle time and small group activities were compared. This comparison revealed that data for both circle time and small group were variable but increasing in a contra-therapeutic direction.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points did not fall below the calculated mean and trend line when comparing (a) circle to small group, or (b) small group to circle, indicating that systematic change did not exist between the two baseline conditions.

Comparison Phase

Adan demonstrated a mean rate per minute of undesired behaviors of 0.093 (*range* = 0-0.529) during the paper-based/circle comparison phase, and a mean rate per minute of undesired behaviors of 0.051 (*range* = 0-0.143) during the iPad-based/small group comparison phase. The difference in the mean rates of undesired behaviors between the paper-based comparison phase and the iPad-based comparison phase was 0.042 (see Figure 1 and Table 6), which is less than the difference between the two mean rates in the baseline phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction for both interventions.

The CDC analysis was conducted to determine whether a systematic change in rates of behaviors existed between the paper-based and iPad-based interventions in the comparison phase. As illustrated by Table 8, the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the comparison phase.

Flipped Intervention Phase

During the flipped intervention phase of the investigation, Adan demonstrated a mean rate of 0.018 (*range* = 0-0.053) undesired behaviors per minute during the paper-based/small group intervention and a mean rate of 0.108 (*range* = 0.050-0.240) undesired behaviors per minute during the iPad-based/circle intervention. The difference in the mean rates of undesired behaviors between the paper-based and the iPad-based interventions in the flipped intervention phase was 0.090 (see Figure 1 and Table 6),

which is comparable to the difference between the two interventions in both the baseline and the comparison phases. Within-condition visual analysis and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction for both the paper-based and iPad-based interventions. An absolute level change analysis indicated that the rates of undesired behaviors were stable for the paper-based intervention, and decreasing for the iPad-based intervention.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the flipped intervention phase.

Maintenance Phase

During the maintenance phase of the study, Adan had been exposed to both the paper-based and iPad-based interventions in both small group and circle time. Adan demonstrated a mean rate per minute of undesired behaviors during maintenance phase circle time activities of 0.119 (*range* = 0-0.258), and a mean rate per minute of undesired behaviors during small group activities of 0.013 (*range* = 0-0.067; see Figure 1 and Table 6). The difference in mean rates was 0.106, which was comparable to the differences in mean rates in the baseline, comparison, and flipped intervention phases.

Brad

Effectiveness and Efficiency of the Paper-based Social Story Intervention

Baseline

As illustrated in Figure 2 and Table 6, Brad demonstrated a baseline mean rate per minute of undesired behaviors of 0.508 (*range* = 0.273-0.677) during small group B activities. Within-condition visual analysis and the linear trend line method of trend estimation (which included stability envelope analysis) revealed that there was an increasing and variable trend of undesired behaviors in a contra-therapeutic direction during baseline.

Comparison Phase

As shown in Figure 2 and Table 6, during the comparison phase, Brad's mean rate per minute of undesired behaviors decreased to 0.148 (*range* = 0-0.5) resulting in an 71% decrease in rate per minute of undesired behaviors from baseline to comparison phase. Within-condition visual analysis and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction. It is noted that absolute level change analysis showed an increase of 0.167 rate per minute of undesired behaviors between the first data point value and the last data point value.

Between-conditions visual analysis was used to compare the baseline phase to the comparison phase of the study in which the paper-based Social Story intervention was introduced (see Figure 2). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in level, and the rate of undesired behaviors went from an increasing/accelerating trend in baseline to a

decreasing/decelerating trend in the comparison phase.

The CDC analysis was conducted to determine whether systematic changes in the behaviors occurred between the baseline and comparison phases. As illustrated by Table 7, all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the paper-based and iPad-based interventions during the comparison phase, a flipped intervention phase (rather than a best intervention phase) was initiated. During this phase, the paper-based Social Story intervention was implemented in the small group A activity. During the flipped intervention phase, Brad demonstrated a mean rate per minute of undesired behaviors of 0.127 (*range* = 0.053-0.2) resulting in a 77% decrease in rate per minute of undesired behaviors from small group A baseline to the flipped intervention phase. Within-condition visual analysis and absolute level change analysis showed a decreasing and variable level of undesired behaviors in a therapeutic direction. It is noted that the linear trend line method of trend estimation showed a slightly accelerating trend (*slope* = 0.0021) in a contra-therapeutic direction for this phase (see Figure 2).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between baseline and flipped intervention phases.

Maintenance Phase

During the maintenance phase of the study (a time in which Brad had been exposed to both the paper-based and iPad-based interventions in small group B), Brad's mean rate per minute of undesired behaviors was 0.184 (*range* = 0-0.294; see Figure 2 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Effectiveness and Efficiency of the iPad-based Social Story Intervention

Baseline

As illustrated in Figure 2 and Table 6, Brad demonstrated a baseline mean rate per minute of undesired behaviors of 0.553 (*range* = 0.25-0.7) during small group A activities. Within-condition visual analysis and the linear trend line method of trend estimation revealed that there was an increasing and variable trend of undesired behaviors in a contra-therapeutic direction during baseline.

Comparison Phase

As shown in Figure 2 and Table 6, during the comparison phase, Brad's mean rate per minute of undesired behaviors decreased to 0.171 (*range* = 0-0.643) resulting in a 69% decrease in rate per minute of undesired behaviors from baseline to comparison phase. Within-condition visual analysis and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction. Absolute level change analysis showed a stable/zero celeration change in the comparison phase.

Between-conditions visual analysis was also used to compare the baseline phase to the comparison phase of the study in which the iPad-based Social Story intervention was introduced (see Figure 2). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in level, and the rate of undesired behaviors went from an increasing/accelerating trend in baseline to a decreasing/decelerating trend in the comparison phase.

As illustrated by Table 7, the CDC analysis revealed that all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the iPad-based and paper-based interventions during the comparison phase, a flipped intervention phase was initiated. During this phase, the iPad-based Social Story intervention was implemented in the small group B activity. During the flipped intervention phase, Brad demonstrated a mean rate per minute of undesired behaviors of 0.159 (*range* = 0-0.333) resulting in a 69% decrease in rate per minute of undesired behaviors from small group B baseline to the flipped intervention phase. Within-condition visual analysis and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction. An absolute level change analysis indicated that the rates of undesired behaviors were stable (see Figure 2).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between baseline and flipped intervention phases.

Maintenance Phase

During the maintenance phase of the study (a time in which Brad had been exposed to both the paper-based and iPad-based interventions in small group A), Brad's mean rate per minute of undesired behaviors for small group A was 0.14 (*range* = 0.048-0.286; see Figure 2 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Comparing the Efficiency and Effectiveness of the Paper-based and iPad-based Social Story Interventions

Baseline

During baseline, Brad demonstrated a mean rate per minute of 0.553 (*range* = 0.25-0.7) undesired behaviors during small group A and 0.508 (*range* = 0.273-0.677) undesired behaviors during small group B. The difference in the mean rates of undesired behaviors between the two activities in baseline was 0.045 (see Figure 2 and Table 6).

The baseline within-condition visual analysis, absolute level change analysis, and linear trend line method of trend estimation for both small group A and small group B activities were compared. This comparison revealed that data for both small group A and small group B were variable but increasing in a contra-therapeutic direction.

As illustrated by Table 8, CDC analysis revealed that the required number of data points did not fall below the calculated mean and trend line when comparing (a) small group A to small group B, or (b) small group B to small group A, indicating that systematic change did not exist between the two baseline conditions.

Comparison Phase

Brad demonstrated a mean rate per minute of undesired behaviors of 0.148 (*range* = 0-0.5) during the paper-based/small group B comparison phase, and a mean rate per minute of undesired behaviors of 0.171 (*range* = 0-0.643) during the iPad-based/small group A comparison phase. The difference in the mean rates of undesired behaviors between the paper-based comparison phase and the iPad-based comparison phase was 0.023 (see Figure 2 and Table 6), which is less than the difference between the two mean rates in the baseline phase. Within-condition visual analysis revealed a variable trend with the absolute level change analysis for the paper-based intervention showing a slight increase of 0.167 rate per minute of undesired behavior between the first data point value and the last data point value, while the absolute level change analysis for the iPad-based intervention showed a stable/zero-celeration change in the comparison phase. The linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction for both interventions.

The CDC analysis was conducted to determine whether a systematic change in rates of behaviors existed between the paper-based and iPad-based interventions in the comparison phase. As illustrated by Table 8, the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the comparison phase.

Flipped Intervention Phase

During the flipped intervention phase of the investigation, Brad demonstrated a mean rate of 0.127 (*range* = 0.053-0.2) undesired behaviors per minute during the paper-

based/small group A intervention and a mean rate of 0.159 (*range* = 0-0.333) undesired behaviors per minute during the iPad-based/small group B intervention. The difference in the mean rates of undesired behaviors between the paper-based and the iPad-based interventions in the flipped intervention phase was 0.032 (see Figure 2 and Table 6), which is comparable to the differences between both the baseline and the comparison phases. Within-condition visual analysis and absolute level change analysis indicated a decreasing and variable trend of undesired behaviors in a therapeutic direction for both the paper-based and iPad-based interventions. A linear trend line method of trend estimation showed a slightly increasing (*slope* = 0.0021) and variable trend of undesired behaviors in a contra-therapeutic for the paper-based intervention, and a decreasing and variable trend of undesired behaviors in a therapeutic direction for the iPad-based intervention.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the flipped intervention phase.

Maintenance Phase

During the maintenance phase of the study, Brad had been exposed to both the paper-based and iPad-based interventions in both small group B and small group A activities. Brad demonstrated a mean rate per minute of undesired behaviors during maintenance phase small group B activities of 0.184 (*range* = 0-0.294) and a mean rate per minute of undesired behaviors during small group A activities of 0.14 (*range* = 0.048-0.286; see Figure 2 and Table 6). The difference in mean rates was 0.044, which was comparable to

the differences in mean rates in the baseline, comparison, and flipped intervention phases.

Daniel

Effectiveness and Efficiency of the Paper-based Social Story Intervention

Baseline

As illustrated in Figure 3 and Table 6, Daniel demonstrated a baseline mean rate per minute of undesired behaviors of 0.762 (range = 0.609-0.9) during lunchtime activities. Within-condition visual analysis and absolute level change analysis revealed that there was an increasing and stable trend of undesired behaviors in a contra-therapeutic direction during baseline. The linear trend line method of trend estimation (which included stability envelope analysis) revealed that there was a slightly decreasing (*slope* = -0.0039) but variable trend of undesired behaviors.

Comparison Phase

As shown in Figure 3 and Table 6, during the comparison phase, Daniel's mean rate per minute of undesired behaviors decreased to 0.27 (*range* = 0.118-0.462) resulting in an 65% decrease in rate per minute of undesired behaviors from baseline to comparison phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a slightly increasing (*slope* = 0.0073) but variable trend of undesired behaviors in a contra-therapeutic direction.

Between-conditions visual analysis was used to compare the baseline phase to the comparison phase of the study in which the paper-based Social Story intervention was introduced (see Figure 3). Evaluations of behavior change from the baseline phase to the

comparison phase revealed an immediate change in level and rate of undesired behaviors. It is noted that the trend of undesired behaviors went from a slightly decreasing (*slope* = -0.0039) trend in baseline to a slightly increasing (*slope* = 0.0073) trend in the comparison phase. However, the absolute level change between both conditions revealed a decreasing trend of undesired behaviors between the two conditions.

The CDC analysis was conducted to determine whether systematic changes in the behaviors occurred between the baseline and comparison phases. As illustrated by Table 7, all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the paper-based and iPad-based interventions during the comparison phase, a flipped intervention phase (rather than a best intervention phase) was initiated. During this phase, the paper-based Social Story intervention was implemented in the bathroom activity. During the flipped intervention phase, Daniel demonstrated a mean rate per minute of undesired behaviors of 0.18 (*range* = 0-0.333) resulting in a 78% decrease in rate per minute of undesired behaviors from bathroom baseline to the flipped intervention phase. Within-condition visual analysis, absolute level change analysis, and linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction (see Figure 3).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between baseline and flipped intervention phases. Maintenance Phase

During the maintenance phase of the study (a time in which Daniel had been exposed to both the paper-based and iPad-based interventions in lunchtime), Daniel's mean rate per minute of undesired behaviors was 0.074 (*range* = 0-0.133; see Figure 3 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Effectiveness and Efficiency of the iPad-based Social Story Intervention

Baseline

As illustrated in Figure 3 and Table 6, Daniel demonstrated a baseline mean rate per minute of undesired behaviors of 0.831 (*range* = 0.6-1) during bathroom activities. Within-condition visual analysis revealed a stable level with the absolute level change analysis for the iPad-based intervention showing zero-celeration between the first data point value and the last data point value. The linear trend line method of trend estimation revealed a slightly decreasing (*slope* = -0.0184) and variable trend of undesired behaviors.

Comparison Phase

As shown in Figure 3 and Table 6, during the comparison phase, Daniel's mean rate per minute of undesired behaviors decreased to 0.227 (*range* = 0-0.5), resulting in a 73% decrease in rate per minute of undesired behaviors from baseline to comparison phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction.

Between-conditions visual analysis was also used to compare the baseline phase to the comparison phase of the study in which the iPad-based Social Story intervention was introduced (see Figure 3). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in the level and rate of undesired behaviors. It is noted that the trend of undesired behaviors went from a slightly decreasing (*slope* = -0.0184) trend in baseline to a decreasing trend in the comparison phase. The absolute level change between both conditions revealed a decreasing trend of undesired behaviors between the two conditions.

As illustrated by Table 7, the CDC analysis revealed that all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the iPad-based and paper-based interventions during the comparison phase, a flipped intervention phase was initiated. During this phase, the iPad-based Social Story intervention was implemented for the lunchtime activity. During the flipped intervention phase, Daniel demonstrated a mean rate per minute of undesired behaviors of 0.094 (*range* = 0-0.15), resulting in an 88% decrease in rate per minute of undesired behaviors from lunchtime baseline to the flipped intervention phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction (see Figure 3).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention

phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between baseline and flipped intervention phases.

Maintenance Phase

During the maintenance phase of the study (a time in which Daniel had been exposed to both the paper-based and iPad-based interventions for the bathroom activity), Daniel's mean rate per minute of undesired behaviors during bathroom activities was 0.1 (*range* = 0-0.2; see Figure 3 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Comparing the Efficiency and Effectiveness of the Paper-based and iPad-based Social Story Interventions

Baseline

During baseline, Daniel demonstrated a mean rate per minute of 0.762 (*range* = 0.609-0.9) undesired behaviors during lunchtime and 0.831 (*range* = 0.6-1.0) undesired behaviors during bathroom activities. The difference in the mean rates of undesired behaviors between the two activities in baseline was 0.069 (see Figure 3 and Table 6).

The baseline within-condition visual analysis, absolute level change analysis, and linear trend line method of trend estimation for both lunchtime and bathroom activities were compared. This comparison revealed that data for both lunchtime and bathroom activities levels were stable with a slightly decreasing (*slope* = -0.0039 for lunchtime, *slope* = -0.0184 for bathroom) linear trend. Absolute level change analysis showed an increasing level change of undesired behaviors for lunchtime and a zero-celeration level change for bathroom activities.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points did not fall below the calculated mean and trend line when comparing (a) lunchtime to bathroom, or (b) bathroom to lunchtime, indicating that systematic change did not exist between the two baseline conditions.

Comparison Phase

Daniel demonstrated a mean rate per minute of undesired behaviors of 0.27 (*range* = 0.118-0.462) during the paper-based/lunchtime comparison phase, and a mean rate per minute of undesired behaviors of 0.227 (*range* = 0-0.5) during the iPad-based/bathroom comparison phase. The difference in the mean rates of undesired behaviors between the paper-based comparison phase and the iPad-based comparison phase was 0.043 (see Figure 3 and Table 6), which is less than the difference between the mean rates of the two activities in the baseline phase. Within-condition visual analysis revealed a variable and increasing trend of undesired behavior for the paper-based/lunchtime comparison phase, and variable and decreasing trend for the iPad-based/bathroom comparison phase.

The CDC analysis was conducted to determine whether a systematic change in rates of behaviors existed between the paper-based and iPad-based interventions in the comparison phase. As illustrated by Table 8, the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the comparison phase.

Flipped Intervention Phase

During the flipped intervention phase of the investigation, Daniel demonstrated a mean rate of 0.18 (*range* = 0-0.333) undesired behaviors per minute during the paper-based/bathroom intervention and a mean rate of 0.094 (*range* = 0-0.15) undesired behaviors per minute during the iPad-based/lunchtime intervention. The difference in the mean rates of undesired behaviors between the paper-based and the iPad-based interventions in the flipped intervention phase was 0.086 (see Figure 3 and Table 6), which is comparable to the difference between both the baseline and the comparison phases. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction for both the paper-based and iPad-based flipped interventions.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points fell below the baseline mean and trend lines when comparing paper to iPad. However, the required number of data points did not fall below the baseline mean and trend lines when comparing iPad to paper. As discussed previously, there is an order effect that influences the outcomes based upon which set of data is entered into the first column (e.g., baseline data) and which set of data is entered into the second column (e.g, intervention data). Due to this order effect, an a priori decision was made that a systematic change must be identified in both directions when comparing interventions within a condition (i.e., paper to iPad and iPad to paper). Given that a systematic change was not identified in both directions, these results indicate that systematic change did not exist between the two interventions in the flipped intervention condition.

Maintenance Phase

During the maintenance phase of the study, Daniel had been exposed to both the paper-based and iPad-based interventions in both lunchtime and bathroom activities. Daniel demonstrated a mean rate per minute of undesired behaviors during maintenance phase lunchtime activities of 0.074 (*range* = 0-0.133), and a mean rate per minute of undesired behaviors during bathroom activities of 0.1 (*range* = 0-0.2; see Figure 3 and Table 6). The difference in mean rates was 0.026, which was comparable to the differences in mean rates in the baseline, comparison, and flipped intervention phases.

Ethan

Effectiveness and Efficiency of the Paper-based Social Story Intervention

Baseline

As illustrated in Figure 4 and Table 6, Ethan demonstrated a baseline mean rate per minute of undesired behaviors of 0.642 (*range* = 0.472-0.8) during small group activities. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation (which included stability envelope analysis) revealed that there was an increasing and variable trend of undesired behaviors in a contra-therapeutic direction during baseline.

Comparison Phase

As shown in Figure 4 and Table 6, during the comparison phase, Ethan's mean rate per minute of undesired behaviors decreased to 0.193 (*range* = 0.053-0.467), resulting in a 70% decrease in rate per minute of undesired behaviors from baseline to comparison

phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction.

Between-conditions visual analysis was used to compare the baseline phase to the comparison phase of the study in which the paper-based Social Story intervention was introduced (see Figure 4). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in level, and the rate of undesired behaviors went from an increasing/accelerating trend in baseline to a decreasing/decelerating trend in the comparison phase.

The CDC analysis was conducted to determine whether systematic changes in the behaviors occurred between the baseline and comparison phases. As illustrated by Table 7, all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phase.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the paper-based and iPad-based interventions during the comparison phase, a flipped intervention phase (rather than a best intervention phase) was initiated. During this phase, the paper-based Social Story intervention was implemented in the circle time activity. During the flipped intervention phase, Ethan demonstrated a mean rate per minute of undesired behaviors of 0.195 (*range* = 0.111-0.286), resulting in a 73% decrease in rate per minute of undesired behaviors from circle time baseline to the flipped intervention phase. Within-condition visual analysis, absolute level change analysis, and linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic

direction (see Figure 4).

As illustrated by Table 7, the CDC analysis revealed that all of the flipped intervention phase data points fell below the baseline mean and trend lines indicating that systematic change occurred between baseline and flipped intervention phases.

Maintenance Phase

During the maintenance phase of the study (a time in which Ethan had been exposed to both the paper-based and iPad-based interventions in small group), Ethan's mean rate per minute of undesired behaviors was 0.102 (*range* = 0.038-0.188; see Figure 4 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Effectiveness and Efficiency of the iPad-based Social Story Intervention

Baseline

As illustrated in Figure 4 and Table 6, Ethan demonstrated a baseline mean rate per minute of undesired behaviors of 0.731 (*range* = 0.529-0.91) during circle time activities. Within-condition visual analysis, absolute level change analysis and the linear trend line method of trend estimation revealed that there was an increasing and variable trend of undesired behaviors in a contra-therapeutic direction during baseline.

Comparison Phase

As shown in Figure 4 and Table 6, during the comparison phase, Ethan's mean rate per minute of undesired behaviors decreased to 0.258 (*range* = 0.063-0.474) resulting in a 65% decrease in rate per minute of undesired behaviors from baseline to comparison

phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction.

Between-conditions visual analysis was also used to compare the baseline phase to the comparison phase of the study in which the iPad-based Social Story intervention was introduced (see Figure 4). Evaluations of behavior change from the baseline phase to the comparison phase revealed an immediate change in level, and the rate of undesired behaviors went from an increasing/accelerating trend in baseline to a decreasing/decelerating trend in the comparison phase.

As illustrated by Table 7, the CDC analysis revealed that all of the comparison phase data points fell below the baseline mean and trend lines, indicating that systematic change occurred between the baseline and comparison phases.

Flipped Intervention Phase

Given that a comparable level of performance was observed between the iPad-based and paper-based interventions during the comparison phase, a flipped intervention phase was initiated. During this phase, the iPad-based Social Story intervention was implemented in the small group activity. During the flipped intervention phase, Ethan demonstrated a mean rate per minute of undesired behaviors of 0.099 (*range* = 0.048-0.238), resulting in an 85% decrease in rate per minute of undesired behaviors from small group baseline to the flipped intervention phase. Within-condition visual analysis, absolute level change analysis and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction (see Figure 4).

The outcomes of the visual analysis were supported by the CDC analysis. As illustrated by Table 7, all of the flipped intervention phase data points fell below the baseline mean and trend lines. These results suggest that systematic change occurred between baseline and flipped intervention phases, thus supporting the effectiveness of the iPad-based Social Story intervention.

Maintenance Phase

During the maintenance phase of the study (a time in which Ethan had been exposed to both the paper-based and iPad-based interventions in circle time), Ethan's mean rate per minute of undesired behaviors during circle time was 0.138 (*range* = 0.033-0.25; see Figure 4 and Table 6), which was comparable to the mean/range of undesired behaviors per minute during both the comparison and flipped intervention phases.

Comparing the Efficiency and Effectiveness of the Paper-based and iPad-based Social Story Interventions

Baseline

During baseline, Ethan demonstrated a mean rate per minute of 0.642 (*range* = 0.472-0.8) undesired behaviors during small group and 0.731 (*range* = 0.529-0.91) undesired behaviors during circle time. The difference in the mean rates of undesired behaviors between the two activities in baseline was 0.089 (see Figure 4 and Table 6).

The baseline within-condition visual analysis, absolute level change analysis, and linear trend line method of trend estimation for both circle time and small group activities were compared. This comparison revealed that data for both circle time and small group were variable but increasing in a contra-therapeutic direction.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points did not fall below the mean and trend line when comparing (a) circle to small group, or (b) small group to circle, indicating that systematic change did not exist between the two baseline conditions.

Comparison Phase

Ethan demonstrated a mean rate per minute of undesired behaviors of 0.193 (*range* = 0.053-0.467) during the paper-based/small group comparison phase, and a mean rate per minute of undesired behaviors of 0.258 (*range* = 0.063-0.474) during the iPad-based/circle time comparison phase. The difference in the mean rates of undesired behaviors between the paper-based comparison phase and the iPad-based comparison phase was 0.065 (see Figure 4 and Table 6), which is less than the difference between the two mean rates in the baseline phase. Within-condition visual analysis, absolute level change analysis, and the linear trend line method of trend estimation revealed a decreasing and variable trend of undesired behaviors in a therapeutic direction for both interventions.

The CDC analysis was conducted to determine whether a systematic change in rates of behaviors existed between the paper-based and iPad-based interventions in the comparison phase. As illustrated by Table 8, the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the comparison phase.

Flipped Intervention Phase

During the flipped intervention phase of the investigation, Ethan demonstrated a mean rate of 0.195 (*range* = 0.111-0.286) undesired behaviors per minute during the paper-based/circle time intervention and a mean rate of 0.099 (*range* = 0.048-0.238) undesired behaviors per minute during the iPad-based/small group intervention. The difference in the mean rates of undesired behaviors between the paper-based and the iPad-based interventions in the flipped intervention phase was 0.096 (see Figure 4 and Table 6), which is comparable to the differences between mean rates of the baseline and the comparison phases. Within-condition visual analysis, absolute level change analysis and the linear trend line method of trend estimation showed a decreasing and variable trend of undesired behaviors in a therapeutic direction for both the paper-based and iPad-based interventions.

As illustrated by Table 8, the CDC analysis revealed that the required number of data points did not fall below the baseline mean and trend lines when comparing (a) paper to iPad, or (b) iPad to paper, indicating that systematic change did not exist between the paper-based and iPad-based interventions in the flipped intervention phase.

Maintenance Phase

During the maintenance phase of the study, Ethan had been exposed to both the paper-based and iPad-based interventions in both small group and circle time. Ethan demonstrated a mean rate per minute of undesired behaviors during maintenance phase small group activities of 0.102 (*range* = 0.038-0.188), and a mean rate per minute of undesired behaviors during circle time activities of 0.138 (*range* = 0.033-0.25; see Figure 4 and Table 6). The difference in mean rates was 0.036, which was comparable to the

differences in mean rates in the baseline, comparison, and flipped intervention phases.

Social Validity

Social validity data were obtained through goal attainment scaling (GAS), video ratings, and a survey. The following sections will summarize results.

Goal Attainment Scaling

At the conclusion of the study, the lead teacher for each participant evaluated the participants' progress towards identified goals using goal attainment scaling (GAS; see Appendix F). The teachers' GAS ratings for each goal are provided in Table 9, and were analyzed using the GAS rating scale (Kiresuk et al., 1994). As noted in Table 9, Adan achieved an expected level of performance (i.e., projected level of performance from the initiation of treatment and the behavior measurement period until the end of the behavior measurement period) for circle time activities and a better than expected level of performance (i.e., somewhat more progress than expected during the treatment period) for small group activities. Brad achieved an expected level of performance for both small group B and small group A. Daniel achieved a better than expected level of performance for both lunchtime and bathroom activities. Finally, Ethan received an expected level of performance for both circle time and small group activities.

Video Ratings

Based upon the responses of the 14 university students who completed the semantic differential scales for each of 14 video segments (1 baseline and 1 comparison video segment for both activities for Adan, Brad, and Ethan; 1 baseline and 1 comparison video segment for the lunchtime activity for Daniel since the second activity for Daniel

occurred in the bathroom and therefore video was not collected), mean scores and standard deviations were calculated. One-tailed paired samples t-tests were used to determine if the means of the comparison phase scores were significantly greater than the means of the baseline phase scores. Table 10 summarizes the results of the video ratings for each participant as well as across all participants. As noted by Table 10, a significant difference was detected between the mean baseline scores and the mean comparison phase scores for all individual participants. Additionally, a significant difference was detected between the mean baseline scores and the mean comparison phase scores when the raw scores for all activities across all participants were combined.

Survey

At the conclusion of the study for each participant, the classroom lead teachers and paraprofessionals completed a survey regarding their perception of (a) the importance of the intervention strategies, (b) the usefulness of Social Stories as an instructional tool for students, and (c) the format in which the Social Story was presented (see Appendix H). The results of the survey are shown in Tables 11 and 12. In order to analyze the data, assigned point values for survey questions 1-13 were tallied and then calculated into a mean score for each participant and across all participants. Survey questions 14-15 were yes/no questions and were analyzed by tallying the total number of *yes* and *no* responses for each participant and across all participants. Survey question 16 asked survey respondents to indicate a preference for Social Story format, and was analyzed by tallying the total number of responses in favor of a particular Social Story format. Specific survey results are summarized in Tables 11 and 12. As noted by Table 11, the mean result for the combined questions 1-13 across all participants for the paper-based Social Story

interventions was 5.7 (range = 1-7). The mean result for the combined questions 1-13 across all participants for the iPad-based Social Story interventions was 5.6 (range= 1-7). Table 12 illustrates that the majority of respondents (12 out of 16) felt that it would be easy to use the paper-based Social Story intervention and still meet the needs of the other children in the classroom. Similarly, the majority of respondents (14 out of 16) felt that it would be easy to use the iPad-based Social Story intervention and still meet the needs of the other children in the classroom. Finally, Table 12 shows that, of the 16 survey respondents, 7 indicated that they did not have a preference between the two interventions. Of the respondents who had a preference between the paper-based and iPad-based interventions, 6 preferred the iPad and 3 preferred the paper.

Table 6

Average and Range of the Rate Per Minute of Undesired Behaviors During Target Activities

Participant	Baseline			Comparison			Flipped Intervention			Maintenance		
Adan	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**
	Circle	0.527	0.133-1.210	Paper /Circle	0.093	0-0.529	iPad /Circle	0.108	0.050-0.240	Circle	0.119	0-0.258
	Small Group	0.622	0.313-1.290	iPad /Small Group	0.051	0-0.143	Paper /Small Group	0.018	0-0.053	Small Group	0.013	0-0.067
Brad	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**
	Small Group B	0.508	0.273-0.677	Paper/Small Group B	0.148	0-0.5	iPad/Small Group B	0.159	0-0.333	Small Group B	0.184	0-0.294
	Small Group A	0.553	0.25-0.7	iPad/Small Group A	0.171	0-0.643	Paper/Small Group A	0.127	0.053-0.2	Small Group A	0.14	0.048-0.286
Daniel	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**
	Lunch-time	0.762	0.609-0.9	Paper/ Lunchtime	0.27	0.118-0.462	iPad/ Lunchtime	0.094	0-0.15	Lunch-time	0.074	0-0.133
	Bath-room	0.831	0.6-1	iPad/ Bathroom	0.227	0-0.5	Paper/ Bathroom	0.18	0-0.333	Bath-room	0.1	0-0.2
Ethan	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**	**Activity**	**Mean**	**Range**
	Small Group	0.642	0.472-0.8	Paper/Small Group	0.193	0.053-0.467	iPad/Small Group	0.099	0.048-0.238	Small Group	0.102	0.038-0.188
	Circle	0.731	0.529-0.91	iPad/Circle	0.258	0.063-0.474	Paper /Circle	0.195	0.111-0.286	Circle	0.138	0.033-0.25

Table 7

Conservative Dual-Criterion Calculations: Baseline to Comparison and Baseline to Flipped Intervention Phases

Name	Comparisons Between Intervention Phases		Number of Data Points	Number of Data Points Needed Below Mean and Trend Lines	Actual Number of Data Points below Both Mean and Trend Lines	Systematic Change Between Phases
Adan	Baseline to Comparison	iPad/Small Group	12	9	12	Yes
		Paper/Circle	12	9	12	Yes
	Baseline to Flipped Intervention	iPad/Circle	5	5	5	Yes
		Paper/Small Group	5	5	5	Yes
Brad	Baseline to Comparison	iPad/Small Group A	12	9	11	Yes
		Paper/Small Group B	12	9	12	Yes
	Baseline to Flipped Intervention	iPad/Small Group B	5	5	5	Yes
		Paper/Small Group A	5	5	5	Yes
Daniel	Baseline to Comparison	iPad/ Bathroom	8	7	8	Yes
		Paper/ Lunchtime	8	7	8	Yes
	Baseline to Flipped Intervention	iPad/ Lunchtime	8	7	8	Yes
		Paper/ Bathroom	8	7	8	Yes
Ethan	Baseline to Comparison	iPad/Circle	12	9	12	Yes
		Paper/Small Group	12	9	12	Yes
	Baseline to Flipped Intervention	iPad/Small Group	5	5	5	Yes
		Paper/Circle	5	5	5	Yes

Table 8

Conservative Dual-Criterion Calculations: Comparisons of Paper and iPad Interventions

Name	**Phase/Comparisons**		**Number of Data Points**	**Number of Data Points Needed Below Mean and Trend Lines**	**Actual Number of Data Points below Both Mean and Trend Lines**	**Systematic Change Between Phases**
Adan	Baseline	Circle to Small Group	9	8	6	No
		Small Group to Circle	9	8	7	No
	Comparison	Paper to iPad	12	9	8	No
		iPad to Paper	12	9	1	No
	Flipped Intervention	Paper to iPad	5	5	0	No
		iPad to Paper	5	5	2	No
Brad	Baseline	Small Group B to Small Group A	8	7	3	No
		Small Group A to Small Group B	8	7	4	No
	Comparison	Paper to iPad	12	9	6	No
		iPad to Paper	12	9	3	No
	Flipped Intervention	Paper to iPad	5	5	2	No
		iPad to Paper	5	5	0	No

Table 8 Continued

Name	Phase/Comparisons		Number of Data Points	Number of Data Points Needed Below Mean and Trend Lines	Actual Number of Data Points below Both Mean and Trend Lines	Systematic Change Between Phases
Daniel	Baseline	Lunchtime to Bathroom	7	6	3	No
		Bathroom to Lunchtime	7	6	3	No
	Comparison	Paper to iPad	8	7	5	No
		iPad to Paper	8	7	1	No
	Flipped Intervention	Paper to iPad	8	7	8	Yes
		iPad to Paper	8	7	2	No
Ethan	Baseline	Circle to Small Group	5	5	4	No
		Small Group to Circle	5	5	2	No
	Comparison	Paper to iPad	12	9	0	No
		iPad to Paper	12	9	1	No
	Flipped Intervention	Paper to iPad	5	5	4	No
		iPad to Paper	5	5	0	No

Table 9

Goal Attainment Scaling Outcomes

Participant	Activity	Rating
Adan	Circle Time	0*
	Small Group	+1**
Brad	Small Group A	0
	Small Group B	0
Daniel	Lunchtime	+1
	Bathroom	+1
Ethan	Circle Time	0
	Small Group	0

Note. Adapted from "Goal Attainment Scaling: Applications, Theory and Measurement" by T.J. Kiresuk, A. Smith, and J.E. Cardillo, 1994, *Goal Attainment Scaling: Applications, Theory and Measurement.* Copyright 1994 by Erlbaum.

*0 = Projected/ expected level of performance

**+1= Better than expected level of performance

Table 10

Social Validity Video Ratings

Participant	Activity	Baseline		Comparison		Significance (1-tailed)
		Mean	Standard Deviation	Mean	Standard Deviation	
Adan	Circle	37.333	6.506	81.333	6.658	0.01227*
	Small Group	28.333	1.528	72.0	13.0	0.01385*
Brad	Small Group A	25.0	4.583	88.0	3.606	0.00029*
	Small Group B	29.333	7.638	56.0	9.540	0.00217*
Daniel	Lunch-time	62.667	10.970	91.333	2.081	0.03133*
Ethan	Circle	56.333	5.132	86.667	4.933	0.00611*
	Small Group	63.0	14.799	80.667	8.144	0.02489*
All Participants	All Activities Combined	129.429	50.829	283.286	36.266	0.00035*

Note. *$p<.05$

Table 11

Social Validity Survey Outcomes

Survey Statement	Intervention	Adan n=5	Brad n=4	Daniel n=4	Ethan n=3	All Surveys n=16
1. This is an appropriate instructional procedure for teaching desired behaviors.	Paper					
	Mean	6	5.5	6.8	5.7	6
	Range	(4-7)	(5-6)	(6-7)	(5-6)	(4-7)
	iPad					
	Mean	4.8	5	6.5	5.7	5.4
	Range	(1-7)	(4-6)	(6-7)	(5-6)	(1-7)
2. This is an appropriate instructional procedure to help decrease the participant's undesired behaviors.	Paper					
	Mean	5.6	5.5	6.5	5.7	5.8
	Range	(3-7)	(4-7)	(6-7)	(5-6)	(3-7)
	iPad					
	Mean	5.4	5	6	5.3	5.4
	Range	(3-7)	(4-6)	(4-7)	(5-6)	(3-7)
3. This was effective in teaching the child the desired behavior.	Paper					
	Mean	4.6	4.3	5.5	5.3	4.9
	Range	(1-6)	(4-5)	(4-6)	(5-6)	(1-6)
	iPad					
	Mean	5.2	4.3	5.8	5	5.1
	Range	(5-7)	(4-5)	(5-7)	(5)	(4-7)
4. It is important to help the participant learn about the target situation/behaviors in order to effectively teach the desired behavior to the child.	Paper					
	Mean	6	6	6.8	6	6.2
	Range	(3-7)	(5-7)	(6-7)	(6)	(3-7)
	iPad					
	Mean	6.4	6.3	6.5	5.7	6.3
	Range	(5-7)	(5-7)	(6-7)	(5-6)	(5-7)

Table 11 Continued

Survey Statement	Intervention	Adan n=5	Brad n=4	Daniel n=4	Ethan n=3	All Surveys n=16
5. It did not appear difficult to help the child learn about the target situation/ behaviors within the context of preschool activities.	Paper					
	Mean	5.4	5	4.5	3.3	4.7
	Range	(4-7)	(4-7)	(3-6)	(3-4)	(3-7)
	iPad					
	Mean	3.6	6	5	3.3	4.5
	Range	(1-5)	(3-7)	(4-6)	(2-4)	(1-7)
6. It did not appear difficult to implement the intervention strategy in the classroom setting.	Paper					
	Mean	5.8	4.8	4.8	4.3	5.0
	Range	(5-7)	(3-7)	(2-7)	(3-6)	(2-7)
	iPad					
	Mean	6	5.5	5.5	4.3	5.4
	Range	(5-7)	(3-7)	(4-7)	(3-6)	(3-7)
7. The intervention was not disruptive to classroom routines and activities.	Paper					
	Mean	6.2	5.3	6.5	5.7	5.9
	Range	(5-7)	(2-7)	(6-7)	(5-6)	(2-7)
	iPad					
	Mean	4.8	4.5	6.3	5.7	5.3
	Range	(5-7)	(2-7)	(5-7)	(5-6)	(2-7)
8. The intervention did not make the child stand out from the rest of the class.	Paper					
	Mean	4.4	3.0	5.3	4	4.2
	Range	(1-6)	(1-5)	(3-7)	(3-5)	(1-7)
	iPad					
	Mean	4.4	4.8	5.8	4.3	4.8
	Range	(3-6)	(3-7)	(4-7)	(4-5)	(3-7)
9. I did not observe the child verbally or nonverbally express dislike of the intervention.	Paper					
	Mean	6	6.8	7	2.3	5.7
	Range	(5-7)	(6-7)	(7)	(2-3)	(2-7)
	iPad					
	Mean	6.2	7	6.7	2.3	5.8
	Range	(5-7)	(7)	(6-7)	(2-3)	(2-7)

Table 11 Continued

Survey Statement	Intervention	Adan n=5	Brad n=4	Daniel n=4	Ethan n=3	All Surveys n=16
10. The child seemed to enjoy the intervention.	Paper					
	Mean	6.2	6	6.7	3.7	5.7
	Range	(5-7)	(5-7)	(6-7)	(3-4)	(3-7)
	iPad					
	Mean	6.2	7	6.3	3.3	5.9
	Range	(5-7)	(7)	(4-7)	(3-4)	(3-7)
11. The time required to implement the intervention was worth the observed benefits to the child.	Paper					
	Mean	6	5	6	5.7	5.7
	Range	(4-7)	(4-7)	(5-7)	(5-6)	(4-7)
	iPad					
	Mean	5.8	5.5	6	5.7	5.8
	Range	(5-7)	(4-7)	(5-7)	(5-7)	(4-7)
12. I would feel confident implementing the intervention, if given training and support.	Paper					
	Mean	6.6	6	6.3	6	6.3
	Range	(6-7)	(5-7)	(6-7)	(5-7)	(5-7)
	iPad					
	Mean	6.6	6.8	6	5.7	6.3
	Range	(6-7)	(6-7)	(5-7)	(5-7)	(5-7)
13. I would be willing to implement the intervention in my classroom, if given training and support.	Paper					
	Mean	6.4	6.5	6.3	6	6.3
	Range	(6-7)	(5-7)	(6-7)	(5-7)	(5-7)
	iPad					
	Mean	6.4	6.8	6.3	5.7	6.3
	Range	(5-7)	(6-7)	(5-7)	(5-7)	(5-7)
Mean Results:	Paper	5.8	5.3	6.0	4.9	5.7
	iPad	5.5	5.7	6.0	4.8	5.6

Note. n=the number of participants who completed the survey questions; 1= strongly disagree, 7=strongly agree.

Table 12

Social Validity Survey Outcomes: Yes/No Responses and Format Preferences

Survey Statement	Intervention	Adan n=5	Brad n=4	Daniel n=4	Ethan n=3	All Surveys n=16
14. It would be easy to use the intervention and still meet the needs of the other children in the classroom.	Paper					
	Yes	4	3	3	2	12
	No	1	1	1	1	4
	iPad					
	Yes	4	4	3	3	14
	No	1	0	1	0	2
15. Child will continue to demonstrate the desired behaviors taught in the intervention after completion of the study.	Paper					
	Yes	4	3	3	1	11
	No	1	1	1	2	5
	iPad					
	Yes	5	4	4	1	14
	No	0	0	0	2	2
Format Preference	**Intervention**	**Adan n=5**	**Brad n=4**	**Daniel n=4**	**Ethan n=3**	**All Surveys n=16**
16. Preference for one format versus another.	Paper	3	0	0	0	3
	iPad	0	3	3	0	6
	No Preference	2	1	1	3	7

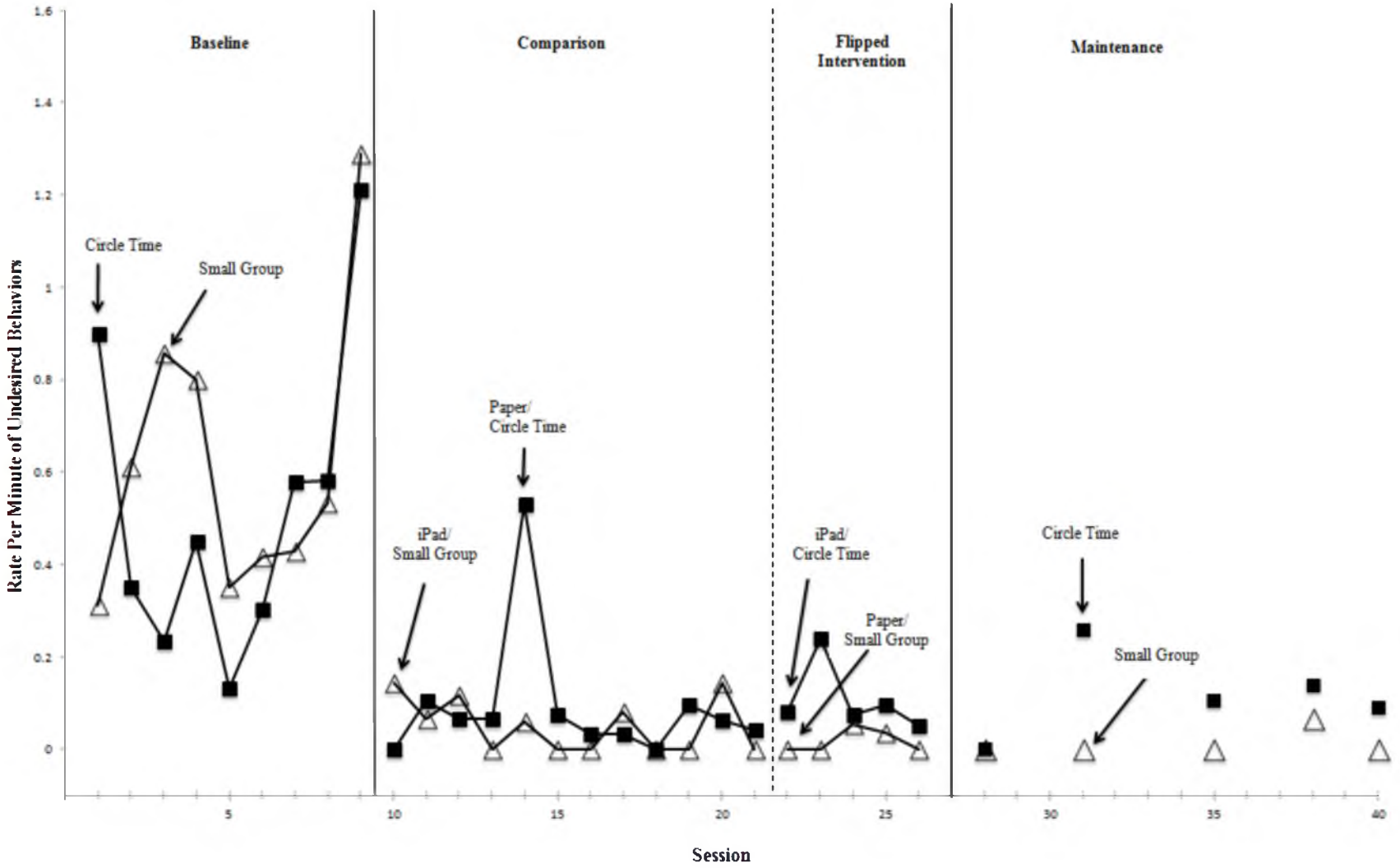


Figure 1. Line graph showing rates per minute of undesired behaviors during circle time and small group activities for Adan in baseline, comparison, flipped intervention, and maintenance phases.

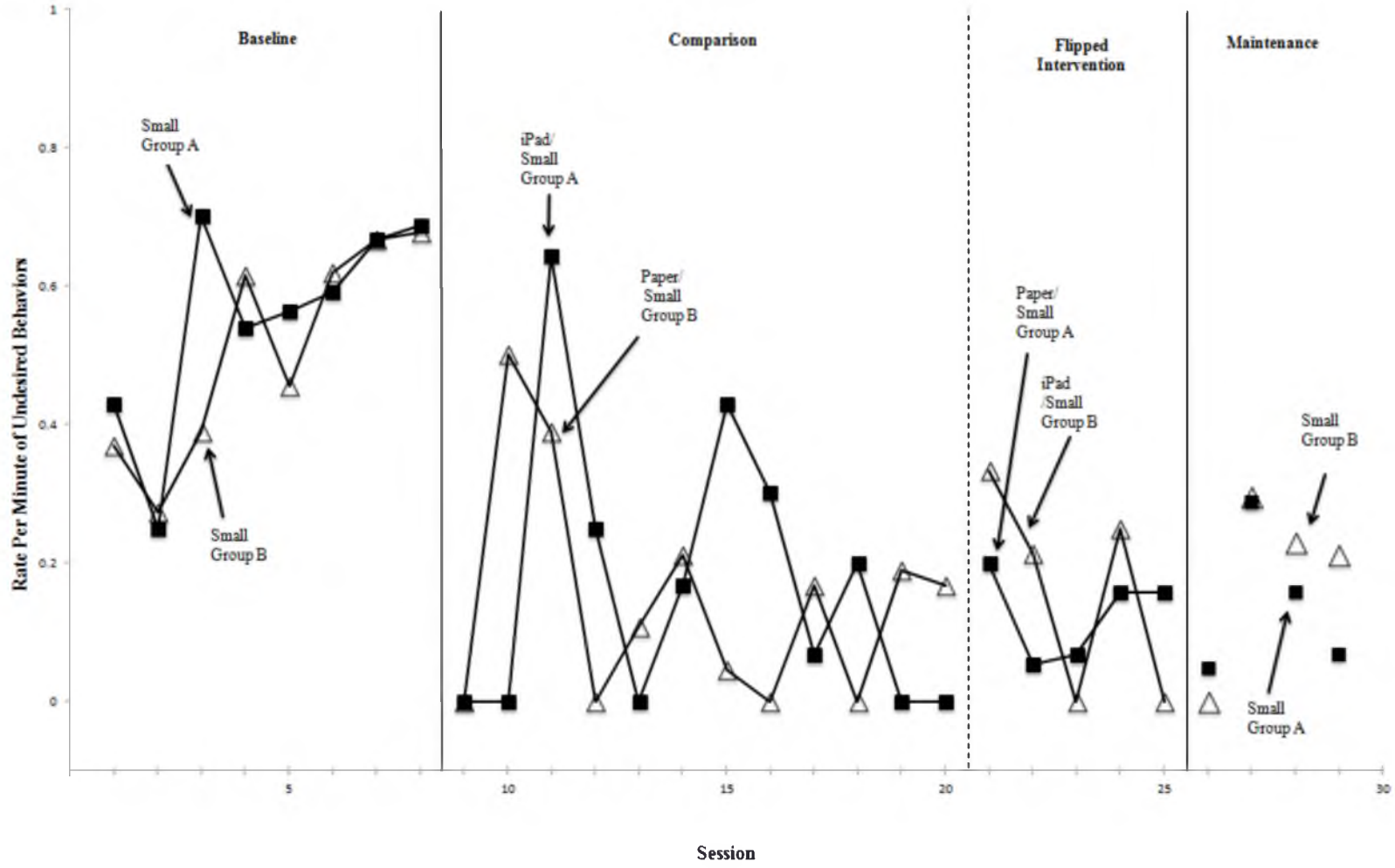


Figure 2. Line graph showing rates per minute of undesired behaviors during small group A and small group B activities for Brad in baseline, comparison, flipped intervention, and maintenance phases.

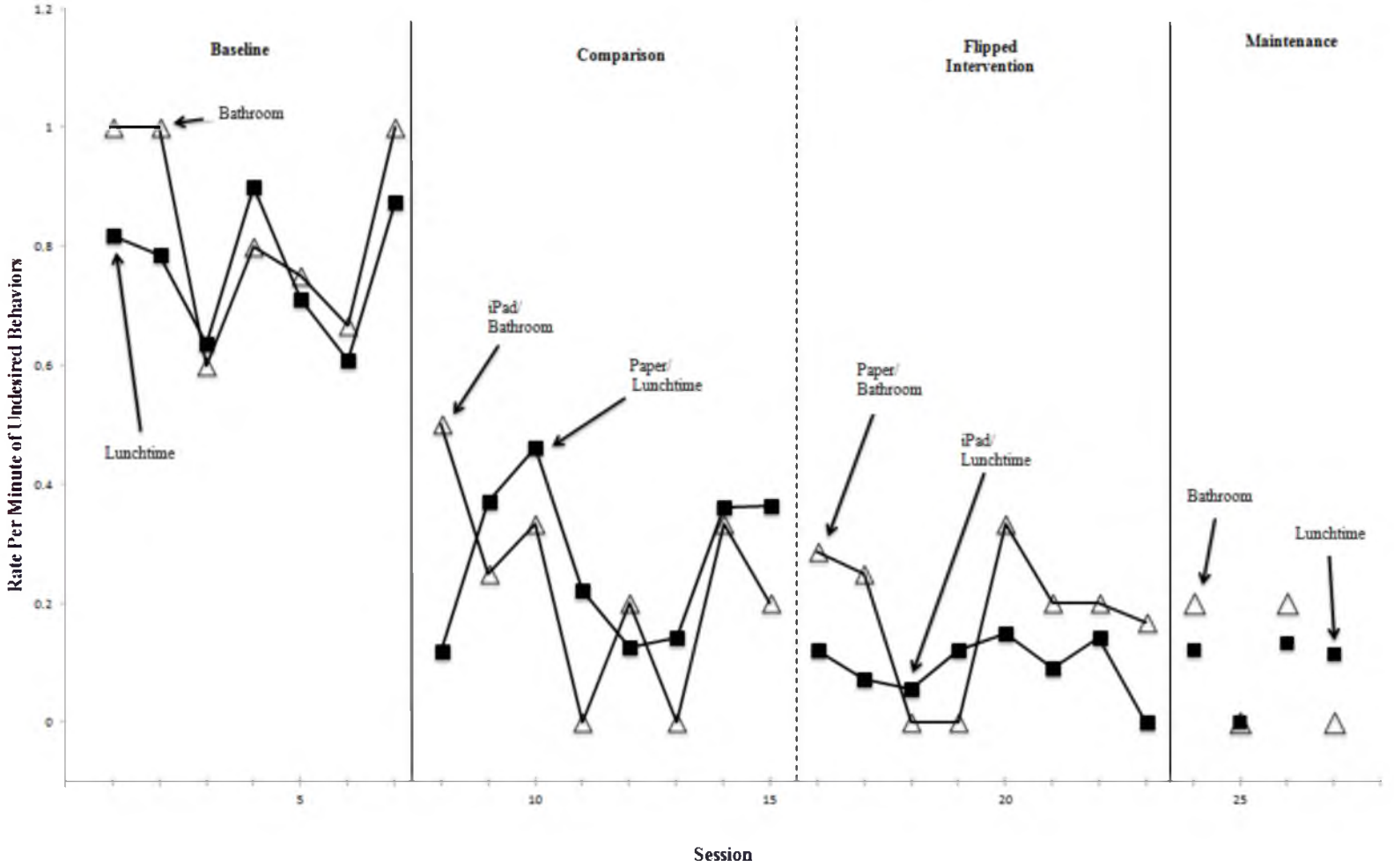


Figure 3. Line graph showing rates per minute of undesired behaviors during bathroom and lunchtime activities for Daniel in baseline, comparison, flipped intervention, and maintenance phases.

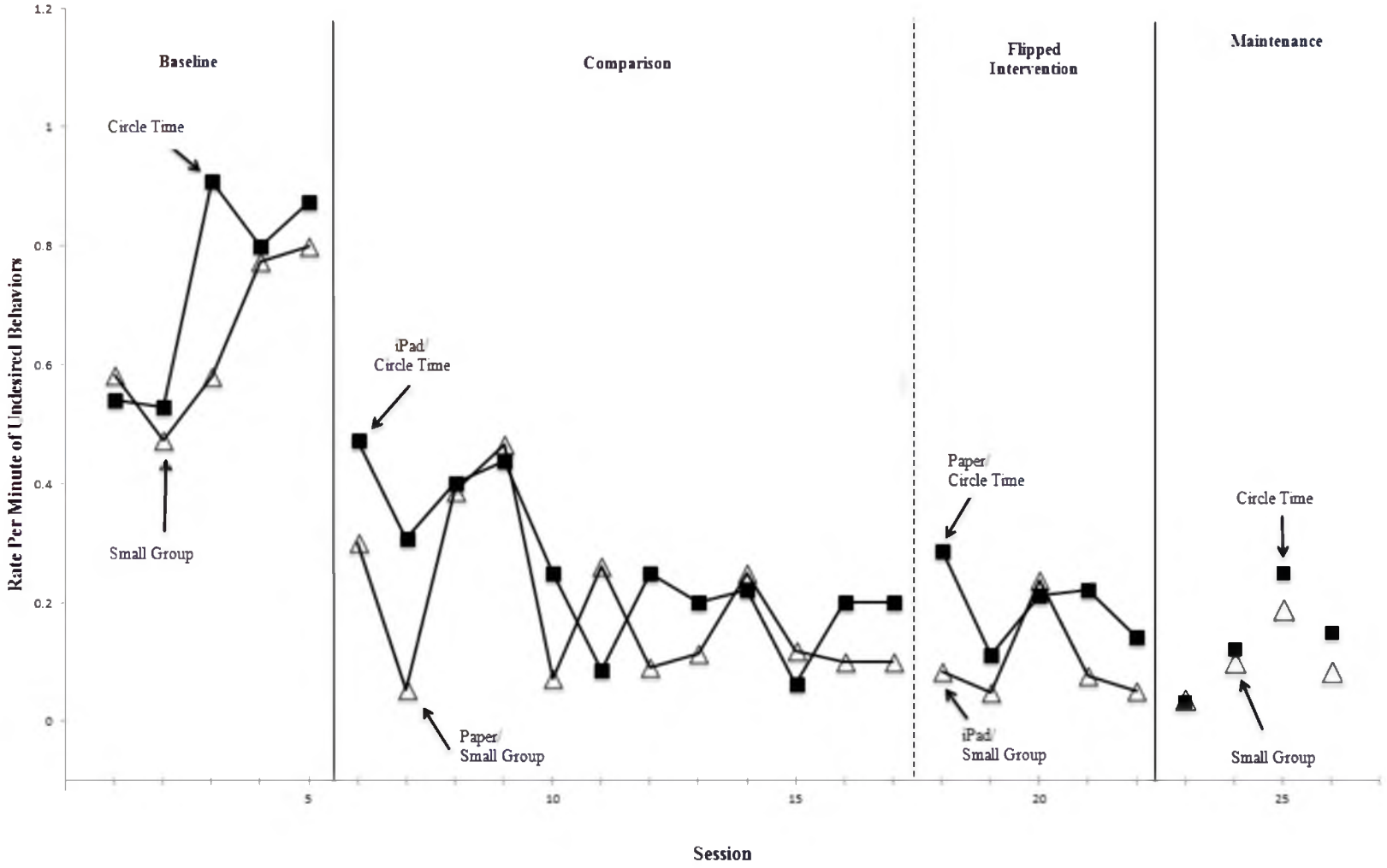


Figure 4. Line graph showing rates per minute of undesired behaviors during circle time and small group activities for Ethan in baseline, comparison, flipped intervention, and maintenance phases.

CHAPTER 5

DISCUSSION

The purpose of this study was to investigate whether (a) Social Stories presented in a paper-based format were effective in decreasing undesired behaviors when compared to a no-intervention baseline condition, (b) Social Stories presented in a tablet computer-based format were effective in decreasing undesired behaviors when compared to a no-intervention baseline condition, and (c) a difference existed between the efficiency and the effectiveness of paper-based format and tablet computer-based (i.e., iPad-based) format Social Story interventions. Results revealed that Social Stories presented in both paper-based and iPad-based formats were effective in decreasing undesired behaviors when compared to baseline conditions, and that a notable difference did not exist between the efficiency and the effectiveness of the paper-based and iPad-based formats. The following sections will discuss the significance of the results as well as implications for future research and practice.

Effectiveness of Paper-based Social Stories

Results revealed a decrease in rate per minute of undesired behaviors across all four participants following implementation of the paper-based Social Story intervention. The average rate per minute of undesired behaviors across all participants decreased by 72% (*range*=65%-82%) between the baseline and comparison phases, and by 81% (*range*=73%-97%) between the baseline and flipped intervention phases. Moreover,

results demonstrated that the decreased rates of undesired behaviors continued during the maintenance phase of the study.

The decrease in rates of undesired behaviors following the implementation of the paper-based Social Story interventions was supported by CDC and visual analyses. Specifically, (a) CDC analysis revealed that systematic change occurred between the baseline/comparison and baseline/flipped intervention phases for all participants, (b) between conditions analysis between the baseline and comparison phases revealed an immediate change in the level and rate of undesired behaviors for all participants, (c) within-condition analysis of the comparison phases revealed decreasing trends of undesired behaviors for Adan, Brad and Ethan, but a slightly increasing trend for Daniel, and (d) within condition visual analysis of the flipped intervention phases showed decreasing trends of undesired behaviors for Adan, Daniel, and Ethan, but a slightly increasing trend for Brad. It is noted that although the trend of undesired behaviors for Daniel in the comparison phase and Brad in the flipped intervention phase were slightly increasing, the overall rate of undesired behaviors decreased for both participants in each of these phases. In future studies, the researcher could avoid this mixed outcome by extending the number of data collection sessions until a more predicable trend is observed.

The positive outcomes related to the impact of the paper-based Social Story intervention on rates of undesired behaviors add to the literature on the efficacy of paper-based Social Stories as a tool to increase students' awareness and understanding of specific situations, thus helping to decrease undesired behaviors during those situations (e.g., Chan & O'Reilly, 2008; Crozier & Tincani, 2005; Kuoch & Mirenda, 2003; Wright

& McCathren, 2012).

Effectiveness of iPad-based Social Stories

Results revealed a decrease in rate per minute of undesired behaviors across all 4 participants following the implementation of the iPad-based Social Story intervention. The average rate per minute of undesired behaviors across all participants decreased by 75% (*range*=65%-92%) between the baseline and comparison phases, and by 81% (*range*=69%-88%) between the baseline and flipped intervention phases. Moreover, results demonstrated that the decreased rates of undesired behaviors continued during the maintenance phase of the study.

The decrease in rates of undesired behaviors following the implementation of the iPad-based Social Story interventions was supported by CDC and visual analyses. Specifically, (a) CDC analysis results revealed that systematic change occurred between the baseline/comparison and baseline/flipped intervention phases for all participants, (b) between-conditions analysis between the baseline and comparison phases revealed an immediate change in the level and rate of undesired behaviors for all participants, and (c) within-condition visual analysis of the flipped and comparison intervention phases for all participants showed decreasing trends of undesired behaviors.

The positive outcomes related to the impact of the iPad-based Social Story intervention on decreasing rates of undesired behaviors adds to the literature base examining the efficacy of computer-based Social Stories (e.g., Chan et al., 2011; Hagiwara & Myles, 1999; Mancil et al., 2009; Sansosti & Powell-Smith, 2008), as well as the literature base examining the use of iPad-based Social Stories for early childhood aged children with disabilities (Vandermeer et al., 2013).

Differences in the Efficiency and Effectiveness of Paper-based and iPad-based Social Stories

For each participant, results of CDC and visual analysis suggest that notable differences did not exist between the effectiveness and efficiency of the paper-based and iPad-based interventions. Although notable differences were not detected, one systematic change was identified (but only in one direction) when comparing the two interventions in the flipped phase for Daniel.

In order to understand why this change was detected in only one direction, and why a change in only one direction was not deemed notable, it is important to understand how a CDC analysis is calculated. In the CDC method, two criterion lines (one adjusted trend line and one adjusted mean line, set at 0.25 standard deviations further in the direction of the expected treatment effect) are calculated based on the data points entered into column 1 (typically baseline data). Then, the prespecified number of treatment points that are needed to fall below both the adjusted mean and trend lines in order to demonstrate systematic change between two conditions is calculated. Data are then entered into column 2 (typically intervention data) and analyzed to determine whether or not the required number of data points fall below the two criterion lines (Fisher et al., 2003; Swoboda et al., 2010). The outcomes of the CDC analysis can vary based upon which set of data is entered into column 1 and which set of data is entered into column 2. As discussed in the method section, given this order effect, an a priori decision was made that a systematic change must be identified in both directions (i.e., paper to iPad and iPad to paper) when comparing interventions within a condition (i.e., within the comparison phase or within the flipped phase) in order to conclude that a systematic change between

the two interventions existed. Thus, given that a difference was not identified in both directions for Daniel, a systematic change did not exist between the two interventions in the flipped intervention condition.

The results of this study do not support prior research suggesting that the effectiveness of Social Stories varies based on the story format (Brownell, 2002; Mancil et al., 2009). Specifically, in an investigation comparing the effectiveness of paper-based Social Stories and song-based Social Stories on decreasing undesired behaviors with four elementary school-aged individuals with a diagnosis of ASD, Brownell (2002) found that the frequency of undesired behaviors was lower and more stable under the song-based condition. Additionally, in an investigation comparing the effectiveness of paper-based and computer-based formats on decreasing the negative behaviors of three elementary school-aged participants with ASD, Mancil et al. (2009) found that the frequency of undesired behaviors was lower when the Social Stories were presented in the computer-based format. Plausible explanations for the difference in the results of the present study and previous studies may be due to issues related to the independent variables and/or the experimental designs that were used across studies.

Differences in the independent variables may have contributed to the differences in outcomes between the present study and the previous Social Story investigations that compared different Social Story formats. In the present study, the independent variables were paper-based and iPad-based Social Stories with video models. The independent variables in Brownell (2002) were paper-based and song-based Social Stories. It is plausible to consider that, if a song-based format had been included as a third intervention in the present study, the song-based format may have resulted in better

outcomes than both the paper-based and iPad-based interventions. The independent variables in Mancil et al. (2009) were paper-based and computer-based Social Stories with interactive text (i.e., when the space bar was pressed, the text changed colors to serve as a visual cue to attend to the text). It is possible that if interactive text rather than video models had been used in the present study that a difference between the paper-based and iPad-based formats might have been observed.

Differences in the experimental designs that were used across the different studies might have also influenced the outcomes. Specifically, the current study used an adapted alternating treatment design (AATD) to examine the effects of two different treatments on two functionally independent, but equally difficult behaviors for each participant. This design is used to compare the effects of two treatments on two functionally independent, but equally difficult behaviors, and is primarily used to compare the efficiency of instructional teaching methods (Gast & Wolery, 1988; McDonnell et al., 2011; Sindelar et al., 1985; Wolery, Gast, & Ledford, 2014). In comparison, (a) Brownell (2002) employed an ABAC/ACAB counterbalanced multiple-treatment design to examine the effects of two different treatments on one behavior, and (b) Mancil et al. (2009) used an ABABCBC multicomponent reversal design to study the effects of two different treatments on one behavior.

It is important to note that Brownell (2002) counterbalanced the presentation of the Social Story interventions across participants, and both Brownell (2002) and Mancil et al. (2009) alternated the presentation of the interventions within participants. These methods likely helped control for sequence effects. While controlling for sequence effects is important, another threat to internal validity exists when using alternating treatment

designs. Specifically, McDonnell et al. (2011) suggest that carryover effects may occur when alternating two or more interventions for one behavior, even with counterbalancing and alternating the presentation of the interventions. Given that the designs utilized by Brownell (2002) and Mancil et al. (2009) are susceptible to carry over effects it is possible that (a) one intervention could have lead to a decrease in the efficacy of the other intervention, or (b) one intervention could have lead to an increase in the efficacy of the other intervention. It is plausible that some element of one intervention could have either enhanced or reduced the effectiveness of the other intervention. Although AATD, the design used in the present study, may also be susceptible to carry over effects, the use of two interventions on two separate target behaviors that are equally difficult but functionally independent from one another helps control for this variable (McDonnell et al., 2011). In summary, it is possible that the experimental designs that were used across the different studies might have influenced the outcomes.

Similarities and Differences Across Participants

The results of this study are significant given the range of similarities and differences across participants with regard to: (a) target activities, (b) functions of behavior, (c) age of participants, and (d) standardized assessment data.

Target Activities

A number of different activities have been targeted in the context of previous Social Story studies including mealtime activities (e.g., Bledsoe, Myles, & Simpson, 2003; Hagiwara & Myles, 1999; Norris & Dattilo, 1999), self-care activities (e.g., Hagiwara & Myles, 1999), playtime activities (e.g., Kuoch & Mirenda, 2003; Swaggart et al., 1995),

classroom work time (e.g., Kuttler, Myles, & Carlson, 1998), specific classroom activities (e.g., Okada et al., 2008; Rogers & Myles, 2001; Scattone et al., 2002, 2006; Wright & McCathren, 2012), and transition activities (e.g., Mancil et al., 2009; see Table 1). The target activities for the 4 participants in the present study included circle time, small groups, lunchtime, and bathroom activities and, similar to prior research, a measurable decrease in rates of undesired behaviors was noted across all participants regardless of the activity (Reynhout & Carter, 2006, 2011).

Function of Undesired Behaviors

Some of the previous Social Story research has utilized FBAs when developing Social Story interventions (e.g., Cihak et al., 2012a; Crozier & Tincani, 2005; Iskander & Rosales, 2013; Kokina & Kern, 2010; Lorimer et al., 2002; Okada et al., 2008). Findings from these studies has revealed that Social Story interventions can be effective across a range of functions, including: (a) escaping undesired tasks/and or activities (e.g., Adams et al., 2004; Cihak et al., 2012a), (b) obtaining attention from staff (e.g., Iskander & Rosales, 2013; Lorimer et al., 2002), and (c) obtaining access to desired items/activities (e.g., Lorimer et al., 2002; Moore, 2004; Okada et al., 2008).

In the present study, the functions of the undesired behaviors varied across participants and included: (a) escaping undesired tasks and/or activities, (b) obtaining attention from staff and peers, and (c) obtaining access to desired items/activities. As was the case with prior research, the Social Stories interventions resulted in lower rates of undesired behaviors for all 4 participants regardless of the functions of their behaviors.

Participant Age

The participants in this study ranged in age from 3 to 6 years. Age of participant did not appear to influence the effectiveness of the Social Story interventions. This is illustrated by data in the comparison phase where (a) the rates of undesired behaviors for the youngest participant (Brad), decreased by 71% for the paper-based format and by 69% for the iPad-based format in the comparison phase, and (b) the rates of undesired behaviors for the oldest participant (Daniel), decreased by 65% for the paper-based format and by 73% for the iPad-based format in the comparison phase. This was further illustrated in the flipped intervention phase where (a) the rates of undesired behaviors for the youngest participant decreased by 77% for the paper-based format and by 68% for the iPad-based format, and (b) the rates of undesired behaviors for the oldest participant decreased by 78% for the paper-based format and by 88% for the iPad-based format in the flipped intervention phase. These findings support results reported in a meta-analysis of 62 published and unpublished Social Story studies, in which the researchers found minimal differences in the effectiveness of Social Story interventions across age groups (Reynhout & Carter, 2011).

Standardized Assessment Data

Standardized assessment data identifying varied levels of skills/abilities across participants are noteworthy to consider in relation to outcomes of the study. Specifically, as illustrated in Table 3, participants' skills and abilities ranged from below the skill level expected for their age to above the skill level expected for their age, and from below average to above average across participants. Despite this variability, the Social Stories were effective across all participants. The effectiveness of Social Story interventions

across this range of skills/abilities supports prior research summarized in a meta-analysis of Social Story interventions (Reynhout & Carter, 2011) suggesting that Social Stories were as effective with participants with mild to moderate disabilities (e.g., Crozier & Tincani, 2007; Kuttler, Myles, & Carlson, 1998; Kuoch & Mirenda, 2003; Reynhout & Carter, 2007; Schneider & Goldstein, 2009; Swaggart et al., 1995) as they were with participants with normal or above normal cognitive abilities (e.g., Bernad-Ripoll, 2007; Burke et al., 2004; Scattone et al., 2006).

Social Validity

This study used Goal Attainment Scaling (GAS), video ratings, and surveys to obtain social validity data. Obtaining data from more than one source and using more than one system of measurement was important in order to convincingly examine the social value of the intervention and its outcome (Horner et al., 2005; McDonnell & Tuesday Heathfield, 2011). The outcomes of the GAS, video ratings, and teacher/paraprofessional completed surveys provided strong support for the use of both paper-based and iPad-based Social Story interventions in early childhood classrooms. These results are similar to results from previous studies that have reported high social validity among educators with regard to Social Story interventions (e.g., Chan & O'Reilly, 2008; Crozier & Tincani, 2007; Ozdemir, 2008; Reynout & Carter, 2009). The following sections discuss the outcomes of each of the methods used to obtain social validity data.

Goal Attainment Scaling

The lead teacher for each participant indicated that, as a result of the Social Story interventions, at least the expected level of performance was achieved. Furthermore,

Adan received a rating of better than expected level of performance for one activity, and Daniel received a rating of better than expected level of performance for both activities. This outcome is notable. However, these results should be interpreted with caution given that the individuals who completed the GAS did not actually implement the Social Story interventions. In addition to providing strong support with regard to social validity, these data represent the first Social Story investigation to include GAS as a measure of social validity. This is important given literature suggesting that GAS can be an efficient, effective, and personalized method for assessing perceptions of student progress (Oren & Ogletree, 2000; Roach & Elliott, 2006).

Video Ratings

The video ratings analysis revealed that independent raters observed significant differences between baseline and comparison phases for all participants with regard to their perceptions of the study participants' behaviors. These outcomes are significant given that the raters had no prior knowledge of the research study or prior relationship with the participants. These data are noteworthy given the importance of collecting social validity data from persons who have not directly received or implemented the intervention (McDonnell & Tuesday Healthfield, 2011). Furthermore, these outcomes add to the relatively few studies that use video ratings as a tool for assessing social validity (e.g., Charlop, Dennis, Carpenter, & Greenberg, 2010; Charlop & Milstein, 1989; Hastings, Boulton, Monzani, & Tombs, 2004; Kern et al., 1995).

Survey

The results of the teacher and paraprofessional completed surveys indicated that respondents felt that both the paper-based and iPad-based Social Story interventions were important, appropriate, effective, and efficient. Furthermore, a strong preference for one Social Story format over another was not revealed. Survey results also indicated that the respondents would be willing to implement Social Story interventions if given training and support. These results are important given that Horner et al. (2005) suggest that high quality social validity is indicated when respondents report a willingness to continue the intervention procedures after formal supports have been discontinued. However, as was the case with the GAS, these results should be interpreted with caution given that the individuals who completed the surveys did not actually implement the Social Story interventions.

Survey results also revealed that respondents felt that the Social Story interventions (both paper-based and iPad-based) were appropriate instructional procedures to help decrease the participants' undesired behaviors. The respondents' perceptions were supported by data demonstrating that rates of undesired behaviors decreased following the implementation of the Social Story interventions and maintained at rates similar to rates observed in the comparison and flipped intervention phases for all participants. It is interesting to compare the maintenance results of the current investigation with prior research. Specifically, data from a survey study conducted by Reynhout and Carter (2009) examining educators' perceptions of Social Stories revealed that only 53% of the respondents agreed that Social Story effects maintain after the intervention is discontinued. This is an area worthy of further research. It is plausible to consider that

maintenance may differ based on participant characteristics, target activities, implementation procedures, and use of comprehension checks (Kokina & Kern, 2010, Reynhout & Carter, 2006, 2011; Test et al., 2011).

Limitations

Given the wide range of abilities among young children who exhibit characteristics of ASD, as well as variability among early childhood classroom settings, it cannot be assumed that the results of this study would be replicated across other students and settings. Furthermore, data related to the rates of undesired behaviors were specific to each of the participant's target activities, and information related to the generalization of behaviors to other settings was not collected. The application and generalizability of the current investigation could be increased through replications that utilize the present study methods with a wider range of participants, situations, interventionists, and settings.

Variability was noted in all phases of the investigation, and is a limitation of this study. Specifically, within-condition visual analysis revealed variability in: (a) baseline stability for Adan, Brad, and Ethan, (b) the comparison and flipped intervention phases for all participants, (c) trend stability in baseline phase for Adan and Brad, and (d) trend stability for all participants in the comparison and flipped phases. The researcher controlled for several extraneous variables in order to decrease variability. However, future researchers may control for additional variables such as (a) ensuring that the same teacher is present for the target activities across time, and (b) ensuring that the sub-activities within activities (e.g., small group and circle) are consistent across time.

Another limitation of this study is that the investigator served as both the interventionist and data collector, and was aware of the purposes of the study. The

investigator was used as the interventionist rather than a classroom teacher or paraprofessional in order to ensure consistency in the delivery of the intervention across participants. Although procedural fidelity and interobserver agreement measures helped control for potential researcher biases in this investigation, future studies could utilize different interventionists and/or independent data collectors who are blind to the purposes of the study.

Implications for Further Research

Recent systematic reviews and meta-analyses of Social Story research have revealed that variability exists with regard to the effectiveness of Social Story interventions (Kokina & Kern, 2010; Reynhout & Carter, 2006, 2011; Test et al., 2011). Given that Social Stories can be viewed as an intervention package that incorporates the use of several different strategies, it is likely that the varied effectiveness noted among Social Stories interventions will continue to persist if researchers do not investigate which strategy (or strategies) are contributing to positive outcomes. The following sections will discuss several strategies that are often embedded into a Social Story intervention package. For each strategy, the outcomes of published empirical Social Story investigations will be summarized in order to illustrate the use, and potential influence of that strategy. The authors of these Social Story investigations did not directly demonstrate the impact of the strategy being discussed because it was not the focus of their investigation. As a result, these summaries provide inferred, rather than direct evidence of the operation of the strategy.

Priming

Priming is an intervention strategy in which modeling and exploration of the desired skill is conducted in a high-reinforcement, low-demand condition prior to the activity where the skill is expected to be demonstrated (Kamps et al., 1992; Wilde, Koegel, & Koegel, 1992; Zanolli, Daggett, & Adams, 1996). The purpose of priming is to help prepare a child for an upcoming activity in which the child experiences difficulty. Priming intervention strategies typically occur prior to a target activity, involve familiarizing a student with learning materials and situations before use, are short in length, and are designed to help a student become familiar with the predictability of a specific activity or information (Myles, 2007; Wilde et al., 1992). With regard to children with autism, priming has been used to decrease challenging behaviors (e.g., Koegel, Koegel, Frea, & Green-Hopkins, 2003; Schreibman, Whalen, & Stahmer, 2000), increase academic responding (e.g., Koegel et al., 2003), increase initiations with peers (e.g., Gengoux, 2009; Kamps et al., 1992; Zanolli et al., 1996), increase toy sharing with peers (e.g., Sawyer, Luiselli, Ricciardi, & Gower, 2005), introduce toilet training (e.g., Bainbridge & Myles, 1999), and increase play related statements toward siblings (e.g., Taylor, Kevin, & Jasper, 1999).

It is interesting to note that Social Story intervention packages include many of the same strategies that are used in priming. Specifically, Social Story interventions: (a) prepare a student for a situation that may be challenging by reading a specially prepared story prior to a target activity, (b) are short in duration, (c) are individualized for a specific student, (d) are designed to help familiarize a student with learning materials, activity expectations, and appropriate behavioral options and/or strategies to employ

during a target activity, and (e) provide opportunities for a student to practice desired behaviors in a high-reinforcement, low-demand setting during comprehension checks. To illustrate the role that priming might play in Social Story interventions, consider Thompson and Johnston's (2013) research that investigated the use of a Social Story intervention package to increase the rate of desired behaviors in three preschool-aged children with characteristics of autism. One feature of priming included in their methods involved preparing the children for an upcoming activity by reading Social Stories that explained the target situation as well as appropriate behavioral options to employ during that situation. Other features of priming included in their methods were that the Social Story interventions were short in duration and were implemented immediately prior to the target activity. A final feature of priming that was included in their methods was that the comprehension checks included opportunities for participants to practice the suggested strategies in a high-reinforcement, low-demand setting (i.e., one-on-one learning opportunity). In summary, given that Social Story intervention packages include many strategies that are used when implementing priming interventions, it seems plausible that priming might be an active ingredient in Social Story interventions.

Behavioral Momentum

Behavioral momentum (also referred to as high probability requests) is an intervention strategy that involves providing a student with the opportunity to participate in and be successful at tasks that have a high probability of compliance and achievement before asking that the same participant to participate in tasks that have a lower probability of compliance and achievement (Lee et al., 2006; Nevin, Mandell, & Atak, 1983). Behavioral momentum is designed to help increase a student's engagement in tasks that

have a lower probability of compliance. Implementation of a behavioral momentum intervention strategy includes presenting a student with a series of requests that have a high probability of compliance just prior to a request that has a low probability of compliance (Belfiore, Basile, & Lee, 2008; Lee et al., 2006). With regard to children with autism, behavioral momentum has been used to increase the acceptance of non-preferred foods (e.g., Meier, Fryling, & Wallace, 2012), decrease repetitive or scripted vocal behavior (e.g., Silla-Zaleski & Vesloski, 2010), increase social interactions (e.g., Davis, Brady, Hamilton, McEvoy, & Williams, 1994), and increase compliance to requests and decrease disruptive behaviors (e.g., Killu, Sainato, Davis, Ospelt, & Paul, 1998).

Prior research investigating the effectiveness of Social Story intervention packages incorporates many aspects of behavioral momentum. Specifically, Social Story interventions involve: providing opportunities for students to participate in tasks that have a high probability of compliance and achievement (i.e., listening to a story, answering comprehension questions, role playing desired behaviors) before asking the student to participate in tasks that have a lower probability of compliance and achievement (i.e., demonstrating a desired or appropriate behavior during a target activity). To illustrate the role that behavioral momentum might play in Social Story intervention research, consider Chan and O'Reilly's (2008) study that investigated the use of a Social Story intervention package to increase appropriate social behaviors and decrease inappropriate behaviors for two kindergarten-aged boys with autism. Aspects of behavioral momentum incorporated into their methods included asking participants to engage in several high probability activities (e.g., reading a story, responding to three

questions, role-playing) prior to engaging in lower probability target activities (i.e., participating in classroom activities while maintaining appropriate distances from peers, hand-raising, and using appropriate vocalizations). It is important to note that Chan and O'Reilly (2008) did not provide data regarding engagement in the activities of reading the story, responding to questions, and role-playing. Consequently, it is not possible to verify that these were high probability activities. However, given that the researchers did not identify any issues related to participant willingness to engage in the Social Story intervention, it seems plausible to infer that these activities were, in fact, high probability tasks. In summary, Social Story intervention packages include many strategies that are similar to those used when implementing behavioral momentum interventions. Thus, it seems plausible that behavioral momentum might be an active ingredient in Social Story interventions.

Prompting Teacher/interventionist to Focus on Target Behaviors

Prompts are techniques used to assist in the acquisition and shaping of a new behavior (Gold, 1972; Gold & Barclay, 1973; McCormick et al., 2003; Mosk & Bucher, 1984). Prompts are designed to cue a learner about a desired skill or expectation, and therefore increase the probability that a skill will be acquired. Specific prompt strategies include response prompts (i.e., verbal instructions, modeling, physical guidance), and stimulus prompts (i.e., cues used in combination with task materials to help elicit a correct response; McCormick et al., 2003). Prompting can be used with students, as well as caregivers/interventionists. With regard to caregivers/interventionists, prompts have been used to teach caregivers/interventionists to use incidental teaching methods (e.g., Hsieh,

Wilder, & Abellon, 2011), promote correct implementation of guided compliance techniques (e.g., Miles & Wilder, 2009), and conduct discrete-trial training (e.g., Sarokoff & Sturmey, 2004).

It is interesting to note that, as a result of reading Social Stories to students, the teachers themselves receive prompts because Social Stories include information about focusing on and responding to desired behaviors (Gray, 2004, 2010). To illustrate the role that prompting the teacher may have played in Social Story research, consider Kuoch and Mirenda's (2003) use of Social Stories as a tool to help decrease the occurrence of inappropriate behaviors for three early childhood aged participants with ASDs. During the implementation of the Social Story intervention, the interventionist read the Social Stories to participants on a daily basis and then summarized and reviewed the concepts and behaviors taught in the story. The examples of each participant's Social Story provided by Kuoch and Mirenda (2003) revealed that each of the Social Stories included specific information regarding the desired behaviors and the consequences delivered contingent on desired behaviors. Thus, while reading the stories to the participants the interventionist received daily prompts immediately prior to the activity regarding the target behavior and how they should respond to that behavior. In summary, although the Social Story intervention research to date has not explicitly investigated the effects of Social Stories on teacher/interventionist behavior, it seems plausible that prompting teachers/interventionists to focus on and respond to desired behaviors might be an active ingredient in Social Story interventions.

Prompting Student to Focus on Target Behaviors

As discussed in the previous section, prompts are techniques used to assist in the acquisition and shaping of new behavior, and are designed to cue an individual about a desired skill or expectation. In addition to considering how prompts can be used with teachers/interventionists, it is also important to consider how prompts can be used with students. Modeling is one prompting strategy that has been used with students and involves providing a demonstration of a desired behavior (Charlop, Schreibman, &Tryon, 1983; McCormick et al., 2003). Modeling has been used to teach play behaviors (e.g., Stahmer, Ingersoll & Carter, 2003), affective behavioral skills (e.g., Gena, Coulora, & Kymissis, 2005), written communication skills (e.g., Delano, 2007), and communicative initiations (e.g., Cihak, Smith, Cornett, & Coleman, 2012b).

It is interesting to note that Social Story intervention packages incorporate the use of modeling when they include demonstrations of desired behaviors (i.e., role playing desired behaviors during or after comprehension checks). To illustrate the role that modeling might play in Social Story interventions, consider Wright and McCathren's (2012) study that investigated the use of a Social Story intervention package to increase rates of prosocial behaviors and decrease negative social interactions with four early childhood aged students with autism. Modeling was included in their methods when the interventionists demonstrated the desired behaviors in the context of role-playing activities following the reading of the Social Story.

Another prompting strategy is the use of verbal prompts, which involves telling a student what to do or providing verbal assistance to facilitate a response (Bellovin, 2011; Odom & Strain, 1986). With regard to children with autism, verbal prompts have been

used to increase the rate of intraverbal responding (e.g., Goldsmith, LeBlanc, & Sautter, 2007; Ingvarsson, Tiger, Hanley & Stephenson, 2007), improve independent writing skills (e.g., Pennington, Stenhoff, Gibson, & Ballou, 2012), teach spontaneous responses to environmental events (e.g., Jones, Feeley, & Takacs, 2007), teach reciprocal social interaction skills (e.g., Odom & Strain, 1986), teach communication skills (e.g., Charlop & Trasowech, 1991), and increase independence in self care tasks (e.g., Mays & Heflin, 2011).

It is interesting to note that Social Story intervention packages incorporate the use of verbal prompts. Specifically, Social Story interventions include verbal prompts when students are told to use or demonstrate the desired behaviors discussed in the story during comprehension checks. To illustrate the role that verbal prompts might play in Social Story interventions, consider Crozier and Tincani's (2005) study that investigated the use of a Social Story intervention package to decrease the occurrence of undesired talking out of turn behaviors for an 8-year-old boy with autism. Verbal prompts were included in their methods when the interventionist asked comprehension questions (e.g., "What's the rule for talking in school?") immediately prior to the target activity, and when the interventionist provided verbal reminders (e.g., "Remember to raise your hand when you talk to your teacher.") during the target activity. In summary, Social Story interventions prompt participants to engage in the target behaviors through the use of modeling and verbal prompts. Thus, it seems plausible that modeling and/or verbal prompts might be an active ingredient in Social Story interventions.

Visual Supports

Visual supports are picto-graphic symbols, words or pictures that are used to (a) support the receptive and expressive communication needs of individuals with disabilities (Jolly, Test, & Spooner, 1993; Mirenda, & Santogrossi, 1985; Nelson, McDonnell, Johnston, Crompton, & Nelson, 2007), and/or (b) help individuals organize their thoughts, as well as the on-going activities within their environment (Dettmer, Simpson, Myles, & Ganz, 2000). With regard to children with autism, visual supports have been used to help students communicate a desire to enter play situations (e.g., Ganz & Flores, 2008; Nelson et al., 2007), aid in transitions from one activity to another (e.g., Dettmer et al., 2000), support implementation and completion of specific tasks (e.g., Carnahan, Harte, Schumacher Dyke, Hume, & Borders, 2011), and enhance participation, learning, and social skills (e.g., Arthur-Kelly, Sigafoos, Green, Mathisen, & Authur-Kelly, 2009).

Social Story intervention packages incorporate the use of visual supports. Specifically, embedding pictures/graphics into the Social Stories visually supports students' receptive communication, and helps students to organize their thoughts and understand the on-going activities within their environment. The use of visual supports corresponds with one of Gray's (2004) assumptions that pairing picto-graphic symbols or illustrations with text helps improve a child's comprehension of the concepts discussed in a Social Story. To illustrate the role that visual supports might play in Social Story interventions, consider Reynhout and Carter's (2007) study that investigated the use of a Social Story intervention package to help decrease the occurrence of hand tapping during classroom reading activities with an 8-year-old boy with autism. During the intervention, the interventionist read a Social Story to the participant, which included pictures related to

the desired behavior (e.g., keeping hands still) and the target activity (e.g., reading activities at the student's desk). Following the reading of the story, the storybook was placed on the student's desk for the student to look at and review independently, which may also have served as a visual support. Finally, during the target activity, the student's teacher used the Social Story as a visual support by pointing to pictures from the story and pairing the pictures with verbal prompts related to the target activity and related expectations. In summary, it is plausible to consider that Social Stories provide children with visual supports that help them to visually organize their thoughts and understand environmental expectations. Thus, it is possible that visual supports might be an active ingredient in Social Story interventions.

Differential Reinforcement

Differential reinforcement of alternative, other, and/or lower rates of behavior is designed to strengthen a desired behavior while weakening an undesired behavior that is functionally similar. Differential reinforcement includes delivering reinforcers contingent upon desired behaviors, while withholding or decreasing reinforcers contingent upon undesired behaviors (Hanley & Tiger, 2011; Repp, Deitz & Deitz, 1976). With regard to children with autism, differential reinforcement has been used to reduce stereotypic vocalizations (e.g., Rozenblat, Brown, Brown, Reeve, & Reeve, 2009), teach rejection communication strategies (e.g., Martin, Drasgow, Brucker, & Halle, 2005), address food selectivity (e.g., Allison et al., 2012), and reduce prompt dependency (e.g., Cividini-Motta & Ahearn, 2013).

Prior research investigating the impact of Social Story intervention packages often incorporates the use of differential reinforcement. Specifically, Social Story

interventions involve: delivering reinforcers for desired behaviors (i.e., providing verbal praise contingent on engagement in desired behaviors during comprehension checks), while simultaneously decreasing reinforcers delivered contingent on engagement in undesired behaviors (i.e., ignoring undesired behaviors and/or providing corrective feedback for undesired behaviors during comprehension checks). To demonstrate the role that differential reinforcement might play in Social Story intervention research, consider Barry and Burlew's (2004) study that investigated the use of a Social Story intervention package to teach two school-aged students with autism to make activity choices and to play appropriately during free-play time. Aspects of differential reinforcement were incorporated into their methods. Specifically, after the daily reading of the Social Story, the teacher arranged the environment so that the participants could practice the desired behaviors. During this practice time, the teacher provided verbal praise when the participants demonstrated the desired behaviors, and provided corrective feedback when mistakes were made (e.g., participants were asked to look back at their story in order to recall the appropriate behavior). Although specific data regarding consequences delivered contingent on behaviors were not collected by Barry and Burlew (2004), it seems plausible that differential reinforcement of desired and undesired behaviors may have contributed to the outcomes. In summary, Social Story intervention packages provide opportunities for participants to engage in learning situations that reinforce desired behaviors, while simultaneously decreasing the reinforcement provided for undesired behaviors. Thus, it seems plausible that differential reinforcement might be an active ingredient in Social Story interventions.

Shared Book Reading

Shared book reading is an intervention strategy that involves an adult reading a book to one child or a small group of children (Button & Johnson, 1997; Holdaway 1979; Institute of Education Sciences, 2008), and is often used as a tool for increasing the language and literacy skills of young children (Institute of Education Sciences, 2008; Morgan, 2005; Richards, 2010). Implementation of intervention strategies that utilize shared book reading often include: (a) reading a book to a child, (b) interacting with the child during the book reading by encouraging the child to offer opinions, provide reactions, ask questions, and express feelings about the story, (c) prompting the child to verbally participate by having a child complete a phrase or recall information, and (d) providing adult-led expansions of child responses (Button & Johnson, 1997; Fleury, Miramontez, Hudson, & Schwartz, 2014; Institute of Education Sciences, 2008; Richards, 2010). Research involving young children, including those with autism, has demonstrated that shared book reading can facilitate emergent literacy skills (e.g, Whitehurst et al., 1994), increase verbal participation (e.g., Fleury et al., 2014; McGinty et al., 2012), increase language skills (e.g., Arnold, Lonigan, Whitehurst, & Epstein, 1994), improve story comprehension (e.g., Mucchetti, 2013), and increase engagement with printed materials (e.g., Fleury et al., 2014; Mucchetti, 2013).

Social Story intervention packages incorporate many of the same strategies that are used in shared book reading. Specifically, Social Story interventions typically include: (a) reading a story to a child, (b) providing opportunities for interaction between the interventionist and participant in relation to the content of the story during comprehension checks, and (c) providing opportunities for adult-led expansions of the

child's response during comprehension checks and discussions following the reading of the story. To illustrate the role that shared book reading might play in Social Story interventions, consider Iskander and Rosales's (2013) research that investigated the effects of a Social Story intervention package designed to decrease the occurrences of undesired behaviors (e.g., interrupting others, getting out of seat, and off-task behaviors) for two school-aged boys with the diagnosis of pervasive developmental disorder not otherwise specified (PDD-NOS) and attention hyperactivity disorder (ADHD). Features of shared book reading included in their methods involved: (a) reading the stories to the participants, (b) interacting with the participants through comprehension questions following the story, (c) providing adult-led expansions of participant responses during the comprehension checks, and (d) providing opportunities for the participant to ask questions and express feelings about the story during the reading and/or comprehension checks. In summary, Social Story intervention packages include many of the same strategies that are used when implementing shared book reading. Thus, it seems plausible that shared book reading might be an active ingredient in Social Story interventions.

In conclusion, to date, Social Story interventions have been implemented with varied levels of effectiveness (Kokina & Kern, 2010; Reynhout & Carter, 2011; Test et al., 2011). Given that Social Story interventions can be conceptualized as an intervention "package" consisting of many components, this varied effectiveness may be due, in part, to a lack of clarity with regard to which component(s) of the package are the active ingredients. As discussed in the prior sections, specific strategies embedded within Social Story intervention packages may include; priming, behavioral momentum, prompting

teachers/interventionists to focus on target behaviors, prompting students to focus on desired behaviors, visual supports, differential reinforcement, and shared book reading. In order to ascertain whether one (or more) of these strategies is the active ingredient in Social Story interventions, future research should consider utilizing alternating treatment designs (ATD) or adapted alternating treatment designs (AATD) in order to compare the effects of each of these strategies to the effects of Social Story intervention packages (McDonnell et al., 2011).

Implications for Practice

Recent reviews of Social Story research suggest that, due to variability in methodology and implementation procedures, the overall effectiveness of Social Story interventions is questionable (Kokina & Kern, 2010; Reynhout & Carter, 2011; Test et al., 2011). It is interesting to note that, despite their questionable effectiveness, the social validity of Social Stories among educators is high. Specifically, a survey study conducted among 45 educators indicated that 93% of the respondents agreed that Social Stories were an effective intervention, and that 98% of the respondents would recommend the use of Social Stories to other teachers (Reynhout & Carter, 2009). Given the high social validity among educators, it is likely that practitioners will continue to utilize Social Story interventions. As a result, it is important for practitioners to increase the likelihood of effective and efficient results by considering issues related to: (a) patterns of change, (b) format, (c) use of FBA data, and (d) use of evidence-based teaching strategies.

Patterns of Change

The present study demonstrates that Social Stories can be an effective intervention for decreasing rates of undesired behaviors. Specifically, between-conditions analysis of the baseline and comparison phases revealed an immediate change in the rate of undesired behaviors in an improving direction for all participants, regardless of the intervention type (i.e., paper-based or iPad-based). These results are similar to the patterns of change observed in previous Social Story research (e.g., Lorimer et al., 2002; Ozdemir, 2008;) and are in agreement with results from a meta-analysis conducted by Kokina and Kern (2010), suggesting that, if a Social Story is going to have an effect, the effect will likely occur rapidly following the introduction of the intervention. Thus, based on the results of this study and prior research, if an effect does not occur relatively quickly following the implementation of a Social Story intervention, a practitioner should consider an alternative intervention.

Format

Results of the present study suggest that Social Story format (paper-based vs. iPad-based) does not have a measureable influence on behavioral outcomes. However, results of the present study's social validity survey questionnaire revealed that out of the 16 respondents, 7 respondents did not have a preference for one format over another, 3 respondents preferred the paper-based format, and 6 respondents preferred the iPad-based format. These results suggest that, although behavioral outcomes may not vary across formats, practitioner preference may vary. Given this, practitioners should consider interventionist preference when choosing the Social Story format. Specifically, practitioners should utilize the Social Story format that the interventionist perceives as

most efficient in relation to their effort and the reinforcement received as a result of that effort (Mace & Roberts, 1993; Johnston & Evans, 2005).

Use of FBA

Although Gray (2010) does not recommend a specific method for collecting information related to target situations and related behaviors, she does describe processes that are similar to the procedures of a functional behavioral assessment (FBA). The current study effectively utilized FBA strategies developed by O'Neill et al. (1997). Given the evidence provided in the present study, as well as existing evidence that supports the use of FBA in developing behavioral interventions (e.g., Dufrene et al., 2007; Horner & Carr, 1997; Horner et al., 2002), practitioners should utilize FBA data when developing Social Story interventions.

Use of Evidence-based Strategies

Social Stories interventions can be conceptualized as a package consisting of several strategies. Many of the strategies that are incorporated into Social Story intervention packages (e.g., priming, behavioral momentum, prompting, visual supports, etc.) have a strong evidence base. Given the importance of evidence-based practice in special education settings (Odom et al., 2005; Simpson, 2005; Simpson, LaCava, & Graner, 2004), practitioners should (a) consider conceptualizing Social Stories as a package comprised of several evidence-based strategies, and (b) monitor which strategy, or combination of strategies, is influencing child behavior.

Conclusion

In conclusion, the results of this investigation revealed that both paper-based and iPad-based Social Story interventions were effective in decreasing rates of undesired behaviors. Furthermore, evidence suggested that the format of a Social Story did not make a significant difference in behavioral outcomes for the participants. In light of the fact that Social Story interventions are best conceptualized as an intervention package, future research should investigate which component(s) of Social Story interventions are contributing to their effectiveness. This, in turn, will inform the practices of interventionists who endeavor to utilize evidence-based practices.

APPENDIX A

PRESCHOOL BOOK INTEREST SCALE

1. The child usually looks at books right side up.

Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never
6	5	4	3	2	1

2. The child turns pages, starting from the beginning of the book to the end.

Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never
6	5	4	3	2	1

3. The child enjoys looking at pictures in books.

Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never
6	5	4	3	2	1

4. The child can pay attention to a story for 3-5 minutes with an adult.

Always	Very Frequently	Occasionally	Rarely	Very Rarely	Never
6	5	4	3	2	1

Note. Preschool Book Interest Scale adapted from " Social Story Interventions for Young Children With Autism Spectrum Disorders" by H. Kuoch and P. Mirenda, 2003, *Focus on Autism and Other Developmental Disorders, 18,* p. 223.

APPENDIX B

SOCIAL STORY TASK ANALYSIS

Checklist: The Story meets the criteria that define each Social Story:

Instructions: Review the Social Story and then complete the following checklist. Following the checklist, determine the number of each type of sentence in the story. Next, use the Social Story Formula to calculate the ratio of descriptive to coaching sentences.

____shares accurate information with the reader (e.g., The story is literally accurate. There should be no difference between the intended and stated meaning of a phrase.)

____uses a format, voice and content that is descriptive, meaningful, and physically, socially, and emotionally safe for the reader (e.g., Uses positive descriptions and coaching sentence such as, "I will try to talk quietly in the hallway," instead of "I will try not to talk loudly in the hallway," or "Sometimes children make mistakes," instead of " When I am angry, I sometimes hurt other children.")

____the story has a *title* and introduction that clearly identifies the topic

____the story has a *body* that adds details to the topic of the story

____the story has a *conclusion* that reinforces and summarizes the information

____the presentation of the text and illustrations clarifies the content and meaning of the story for the reader (e.g., The types of sentences along with the illustrations on each page help to enhance the content and meaning of the story.)

____the story has a patient and supportive "voice," and vocabulary (e.g., At least half of the sentences in a story should support and reinforce student abilities and/or achievements.)

____the story uses first and third person perspectives (e.g., First Person: "My name is Tommy. I have two brothers and one sister", or Third Person: "Many kids go to the cafeteria for lunch.")

____the story uses past, present and future tenses (e.g., Past Tense: "My family went to the beach for a vacation", or Present Tense: "At the beach there is a lot of sand", or Future Tense: "My family is going to the beach tomorrow."

____answers "wh" questions: where, when, who, what, how, and why (e.g., "My class (who) is going on a fieldtrip (what) to the zoo (where) today (when).")

2- Determine the number of each type of sentence in the story:

Sentences in a Social Story That Describe:

#_____ Descriptive Sentences, #_____ Perspective Sentences, #_____ Affirmative Sentence

Sentences in a Social Story That Direct:
#_____ Coaching Sentences

Sentence Definitions:
Descriptive Sentences: factual statements that are free of opinions and/or assumptions.
Perspective Sentences: statements that refer to, or describe, a person's internal state, their knowledge/thoughts, feelings, opinions, motivation, physical condition/health.
Affirmative Sentences: enhances the meaning of surrounding statements and often express a commonly shared value or opinion within a given culture.
Coaching Sentences: gently guide the behavior of the reader or individuals involved with the reader (i.e., teacher, parent); describe a suggested response, a choice of responses, or describe self-coaching strategies.

3-Calculate the ratio of descriptive to coaching sentences using the Social Story Formula:

# of Descriptive + # of Perspective + # of Affirmative = # of sentences that DESCRIBE

Example:

$$\frac{\text{\# of sentences that DESCRIBE}}{\text{\# of sentences that COACH}} \geq 2$$

Actual Story:

$$\frac{\text{\# of sentences that DESCRIBE (insert number\_\_\_\_\_)}}{\text{\# of sentences that COACH (insert number\_\_\_\_\_)}} \geq \text{\_\_\_\_\_ (record quotient)}$$

*If there are no coaching sentences, use 1 instead of 0 as the denominator

Note. Adapted from " Social Stories 10.1 Tutorials," by C. Gray, 2010 *The New Social Story Book.* Copyright 2010 by Future Horizons.

APPENDIX C

FUNCTIONAL ASSESMENT FORMS: FUNCTIONAL ASSESSMENT INTERVIEW FORM (FAI) AND FUNCTIONAL OBSERVATION FORM (FAO)

FUNCTIONAL ASSESSMENT INTERVIEW (FAI)

'son of concern _____ Age _____ Sex M F

:e of interview _____ Interviewer _____

'pondents _____

DESCRIBE THE BEHAVIORS.

1. For each of the behaviors of concern, define the topography (how it is performed), frequency (how often it occurs per day, week, or month), duration (how long it lasts when it occurs), and intensity (how damaging or destructive the behaviors are when they occur).

Behavior	*Topography*	*Frequency*	*Duration*	*Intensity*

2. Which of the behaviors described above are likely to occur together in some way? Do they occur about the same time? In some kind of predictable sequence or "chain"? In response to the same type of situation?

_____

_____

B. DEFINE ECOLOGICAL EVENTS (SETTING EVENTS) THAT PREDICT OR SET UP THE PROBLEM BEHAVIORS.

1. What *medications* is the person taking (if any), and how do you believe these may affect his or her behavior?

2. What *medical* or *physical conditions (if any)* does the person experience that may affect his or her behavior (e.g., asthma, allergies, rashes, sinus infections, seizures, problems related to menstruation)?

3. Describe the *sleep patterns* of the individual and the extent to which these patterns may affect his or her behavior.

4. Describe the *eating routines and diet* of the person and the extent to which these may affect his or her behavior.

5a. Briefly list below the person's typical daily schedule of activities. (Check the boxes by those activities the person enjoys and those activities most associated with problems.)

Enjoys	*Problems*			*Enjoys*	*Problems*		
☐	☐	6:00		☐	☐	2:00	
☐	☐	7:00		☐	☐	3:00	
☐	☐	8:00		☐	☐	4:00	
☐	☐	9:00		☐	☐	5:00	
☐	☐	10:00		☐	☐	6:00	
☐	☐	11:00		☐	☐	7:00	
☐	☐	12:00		☐	☐	8:00	
☐	☐	1:00		☐	☐	9:00	

5b. To what extent are the activities on the daily schedule *predictable* for the person, with regard to what will be happening, when it will occur, with whom, and for how long?

5c. To what extent does the person have the opportunity during the day to *make choices* about his or her activities and reinforcing events? (e.g., food, clothing, social companions, leisure activities)

6. How many other persons are typically around the individual at home, school, or work (including staff, classmates, and housemates)? Does the person typically seem bothered in situations that are more *crowded and noisy?*

7. What is the pattern of *staffing support* that the person receives in home, school, work, and other settings (e.g., 1:1, 2:1)? Do you believe that the *number* of staff, the *training* of staff, or their *social interactions with the person* affect the problem behaviors?

C. DEFINE SPECIFIC IMMEDIATE ANTECEDENT EVENTS THAT PREDICT WHEN THE BEHAVIORS ARE *LIKELY* AND *NOT LIKELY* TO OCCUR.

1. *Times of Day: When* are the behaviors most and least likely to happen?

Most likely: _____

Least likely: _____

2. *Settings: Where* are the behaviors most and least likely to happen?

   Most likely: _____

   _____

   Least likely: _____

   _____

3. *People: With whom* are the behaviors most and least likely to happen?

   Most likely: _____

   _____

   Least likely: _____

   _____

4. *Activity: What activities* are most and least likely to produce the behaviors?

   Most likely: _____

   _____

   Least likely: _____

   _____

5. Are there particular or idiosyncratic situations or events not listed above that sometimes seem to "set off" the behaviors, such as particular demands, noises, lights, clothing?

   _____

   _____

6. What *one thing* could you do that would most likely make the undesirable behaviors occur?

   _____

   _____

7. Briefly describe how the person's behavior would be affected if . . .

   a. You asked him or her to perform a difficult task.

      _____

      _____

   b. You interrupted a desired activity, such as eating ice cream or watching TV.

      _____

      _____

   c. You unexpectedly changed his or her typical routine or schedule of activities.

      _____

      _____

d. She or he wanted something but wasn't able to get it (e.g., a food item up on a shelf).

_____

_____

e. You didn't pay attention to the person or left her or him alone for a while (e.g., 15 minutes).

_____

_____

D. IDENTIFY THE CONSEQUENCES OR OUTCOMES OF THE PROBLEM BEHAVIORS THAT MAY BE MAINTAINING THEM (I.E., THE FUNCTIONS THEY SERVE FOR THE PERSON IN PARTICULAR SITUATIONS).

1. Think of each of the behaviors listed in Section A, and try to identify the *specific* consequences or outcomes the person gets when the behaviors occur in different situations.

	Behavior	*Particular situations*	*What exactly does he or she get?*	*What exactly does she or he avoid?*
a.				
b.				
c.				
d.				
e.				
f.				
g.				
h.				
i.				
j.				

E. CONSIDER THE OVERALL *EFFICIENCY* OF THE PROBLEM BEHAVIORS. EFFICIENCY IS THE COMBINED RESULT OF (A) HOW MUCH *PHYSICAL EFFORT* IS REQUIRED, (B) *HOW OFTEN* THE BEHAVIOR IS PERFORMED BEFORE IT IS REWARDED, AND (C) *HOW LONG* THE PERSON MUST WAIT TO GET THE REWARD.

	Low Efficiency				High Efficiency
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5
_____	1	2	3	4	5

F. WHAT *FUNCTIONAL ALTERNATIVE* BEHAVIORS DOES THE PERSON ALREADY KNOW HOW TO DO?

1. What socially appropriate behaviors or skills can the person already perform that may generate the same outcomes or reinforcers produced by the problem behaviors?

_____

_____

_____

G. WHAT ARE THE PRIMARY WAYS THE PERSON COMMUNICATES WITH OTHER PEOPLE?

1. What are the general expressive communication strategies used by or available to the person? These might include vocal speech, signs/gestures, communication boards/books, or electronic devices. How consistently are the strategies used?

_____

_____

_____

2. On the following chart, indicate the behaviors the person uses to achieve the communicative outcomes listed:

Communicative Functions	Complex speech (sentences)	Multiple-word phrases	One-word utterances	Echolalia	Other vocalizing	Complex signing	Single signs	Pointing	Leading	Shakes head	Grabs/reaches	Gives objects	Increased movement	Moves close to you	Moves away or leaves	Fixed gaze	Facial expression	Aggression	Self-injury	Other
Request attention																				
Request help																				
Request preferred food/objects/activities																				
Request break																				
Show you something or some place																				
Indicate physical pain (headache, illness)																				
Indicate confusion or unhappiness																				
Protest or reject a situation or activity																				

3. With regard to the person's receptive communication, or ability to understand other persons . . .
   a. Does the person follow spoken requests or instructions? If so, approximately how many? (List if only a few.)

   _____

   _____

   b. Does the person respond to signed or gestural requests or instructions? If so, approximately how many? (List if only a few.)

   _____

   _____

   c. Is the person able to imitate if you provide physical models for various tasks or activities? (List if only a few.)

   _____

   _____

   d. How does the person typically indicate *yes or no* when asked if she or he wants something, wants to go somewhere, and so on?

   _____

   _____

H. WHAT ARE THINGS YOU *SHOULD DO* AND THINGS YOU *SHOULD AVOID* IN WORKING WITH AND SUPPORTING THIS PERSON?

1. What things can you do to improve the likelihood that a teaching session or other activity will go well with this person?

   _____

   _____

   _____

2. What things should you avoid that might interfere with or disrupt a teaching session or activity with this person?

   _____

   _____

   _____

I. WHAT ARE THINGS THE PERSON LIKES AND ARE REINFORCING FOR HIM OR HER?

1. *Food items:* _____

   _____

   _____

2. *Toys and objects:* _____

_____

_____

3. *Activities at home:* _____

_____

_____

4. *Activities/outings in the community:* _____

_____

_____

5. *Other:* _____

_____

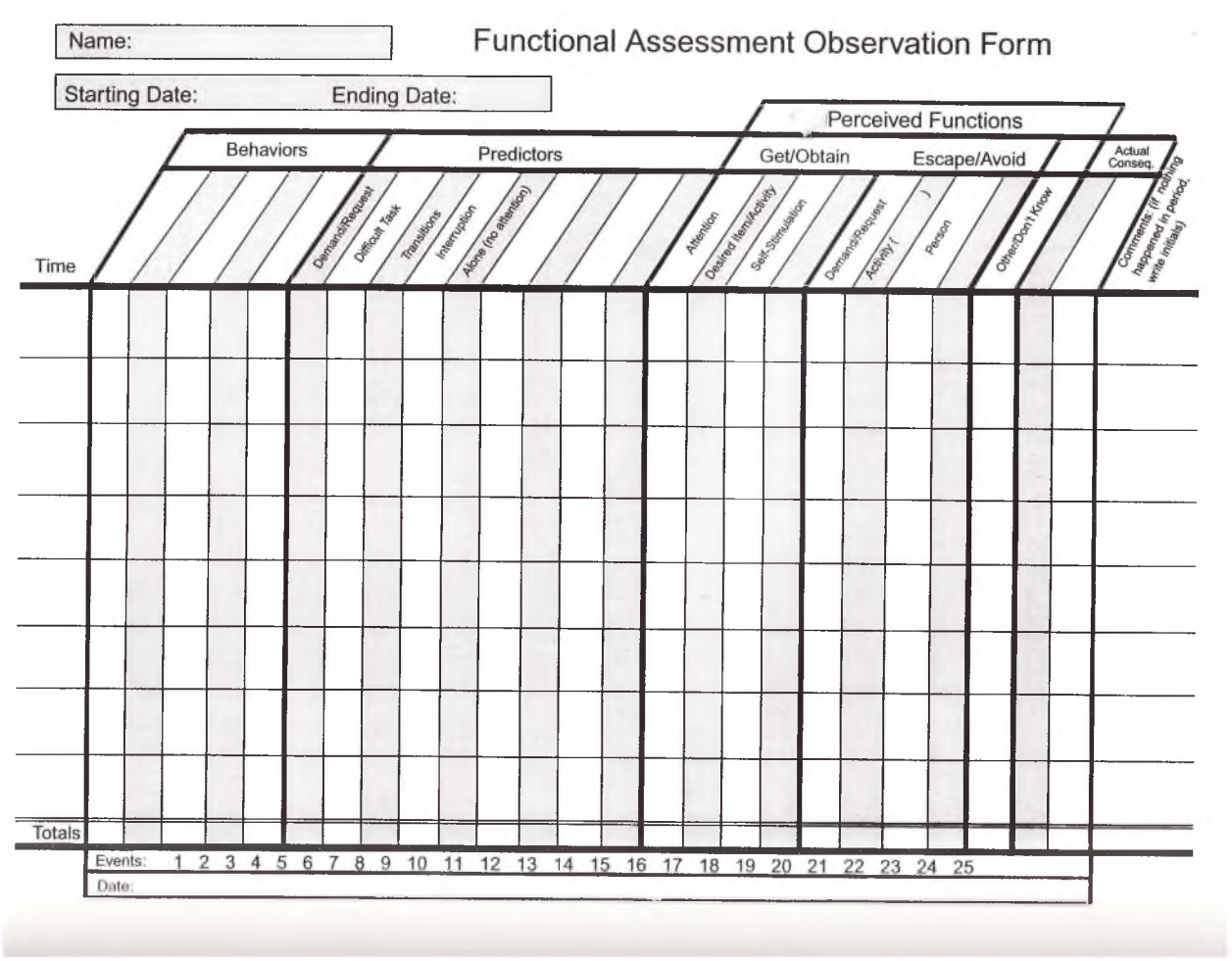
_____

J. WHAT DO YOU KNOW ABOUT THE HISTORY OF THE UNDESIRABLE BEHAVIORS, THE PROGRAMS THAT HAVE BEEN ATTEMPTED TO DECREASE OR ELIMINATE THEM, AND THE EFFECTS OF THOSE PROGRAMS?

Behavior	*How long has this been a problem?*	*Programs*	*Effects*
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

K. DEVELOP SUMMARY STATEMENTS FOR EACH MAJOR PREDICTOR AND/OR CONSEQUENCE.

Distant Setting Event	*Immediate Antecedent (Predictor)*	*Problem Behavior*	*Maintaining Consequence*



Note. Reproducible FAI and FAO forms. From "Functional Assessment and Program Development for Problem Behavior. A Practical Handbook," by R. O'Neill, R.H. Horner, R.W. Albin, J.R. Sprague, K. Storey, and J.S. Newton. Copyright 1997 by Brooks/Cole Publishing Company. Reprinted with permission.

APPENDIX D

FUNCTIONAL EQUIVALENCE WORKSHEET

Instructions: Step 1: Record the identified target classroom situations numbers one and two. Step 2: Record the undesired behavior(s) that are related to target classroom situations numbers one and two. Step 3: Record the function(s) of undesired behavior(s). Step 4: Record desired behaviors numbers one and two (The desired behaviors will serve as replacement behaviors for the undesired behaviors). Step 5: Record the functions(s) of desired behaviors one and two. Step 6: Circle whether the function(s) of undesired behavior(s) number one and the function(s) of desired behavior number one are the same or different. Step 7: Circle whether the function(s) of undesired behavior(s) number two and the function(s) of desired behavior number two are the same or different.

NOTE: The functions of undesired behavior(s) number one and desired behavior number one must be the same. The functions of undesired behavior(s) number two and desired behavior number two must be the same.

Participant:_____

Target Classroom Situation #1:		**Target Classroom Situation #2:**	
Behavior(s) related to Target Classroom Situation #1 (Undesired Behavior(s) #1):		Behavior(s) related to Target Classroom Situation #2 (Undesired Behavior(s) #2):	
Function(s) of Undesired Behavior(s) #1:		Function(s) of Undesired Behavior(s) #1:	

Desired Behavior #1:		Desired Behavior #2:	
Function(s) of Desired Behavior #1:		Function(s) of Desired Behavior #2:	
	Functional Equivalence (circle) Same Different Target: Same		Functional Equivalence (circle) Same Different Target: Same

Functional and Procedural Equivalence Worksheet

Part I- Functional Equivalence of Desired Behaviors

Instructions: Step 1: Record the identified target classroom situations numbers one and two. Next, record desired behaviors numbers one and two. Step 2: Record the functions(s) of desired behaviors one and two. Step 3: Circle whether the function(s) of desired behavior number one and the function(s) of desired behavior number two are the same or different.

NOTE: The functions of desired behavior number one and desired behavior number two must not be the same.

Part II-Procedural Equivalence of Desired behaviors

Instructions: Step 1: Record the rate of reinforcement (how often the behavior will be reinforced) for desired behaviors one and two.

NOTE: The rate of reinforcement for desired behaviors numbers one and two must be the same.

Step 2: Record the quality of reinforcement for desired behaviors one and two. Describe the results of the desired behaviors (i.e., pleasant interaction with teacher/paraprofessional, access to desired object, etc.) for desired behaviors one and two. Circle whether the preference level of the reinforcement of the desired behavior (i.e., highly preferred, preferred, not preferred) for desired behaviors one and two.

NOTE: The quality of reinforcement for desired behaviors one and two must be the same.

Step 3: Record the response effort (effort required to engage in a behavior) for desired behaviors one and two. Describe the effort required to engage in desired behaviors one and two. Circle the effort level for desired behaviors one and two (i.e., high, moderate, low).

NOTE: The level of task effort for desired behaviors one and two must be the same.

Step 4: Record the immediacy of reinforcement (immediate or delayed reinforcement) for desired behaviors one and two. Describe the rate in which the reinforcement is given. Circle whether the immediacy of reinforcement of desired behaviors one and two is immediate or delayed.

NOTE: The immediacy of reinforcement for desired behaviors one and two must be the same.

Part III-Functional Equivalence of Undesired Behaviors

Instructions: Step 1: Record the identified target classroom situations numbers one and two. Next, record undesired behaviors numbers one and two.

Step 2: Record the functions(s) of undesired behaviors one and two.

Step 3: Circle whether the function(s) of undesired behavior number one and the function(s) of undesired behavior number two are the same or different.

NOTE: The functions of undesired behavior number one and undesired behavior number two must not be the same.

Part IV-Procedural Equivalence of Undesired Behaviors

Instructions: Step 1: Record the rate of reinforcement (how often the behavior will be reinforced) for undesired behaviors one and two.

NOTE: The rate of reinforcement for undesired behaviors numbers one and two must be the same.

Step 2: Record the quality of reinforcement for undesired behaviors one and two. Describe the results of the undesired behaviors (i.e., pleasant interaction with teacher/paraprofessional, access to desired object, etc.) for undesired behaviors one and two. Circle whether the preference level of the reinforcement of the undesired behavior (i.e., highly preferred, preferred, not preferred) for undesired behaviors one and two.

NOTE: The quality of reinforcement for undesired behaviors one and two must be the same.

Step 3: Record the response effort (effort required to engage in a behavior) for undesired behaviors one and two. Describe the effort required to engage in undesired behaviors one and two. Circle the effort level for undesired behaviors one and two (i.e., high, moderate, low).

NOTE: The level of task effort for undesired behaviors one and two must be the same.

Step 4: Record the immediacy of reinforcement (immediate or delayed reinforcement) for undesired behaviors one and two. Describe the rate in which the reinforcement is given. Circle whether the immediacy of reinforcement of undesired behaviors one and two is immediate or delayed.

NOTE: The immediacy of reinforcement for undesired behaviors one and two must be the same.

Step 5: Record the equivalence of the situation and/or activity type for undesired behaviors one and two. Circle the type of situation and/or activity (i.e., teacher directed, student directed, free play), or describe the type or situation and/or activity. Circle whether the situation and/or activity type is the same or different.

NOTE: The equivalence of the situation and/or activity type for undesired behaviors one and two must be the same.

Step 6: Record the equivalence of the student engagement expected for undesired behaviors one and two. Circle the type of student engagement expected (i.e., active student engagement, passive student engagement), or describe the type of student engagement expected for undesired behaviors one and two. Circle whether the student engagement is the same or different.

NOTE: The equivalence of the student engagement for desired behaviors one and two must be the same.

Target Classroom Situation #1:		**Target Classroom Situation #2:**		[redacted]
Desired Behavior #1		**Desired Behavior #2**		
Function(s) of Desired Behavior #1		Function(s) of Desired Behavior #2		Equivalence (circle) Same Different Target: Different
Rate of Reinforcement (how often behavior reinforced)	Rate:	Rate of Reinforcement (how often behavior reinforced)	Rate:	Equivalence (circle) Same Different Target: Same
Quality of Reinforcement (preferred, not preferred; i.e., behavior results in reprimand, behavior results in pleasant interaction)	Reinforcement Quality-Describe: Preference level: Highly Preferred Preferred Not Preferred	Quality of Reinforcement (preferred, not preferred; i.e., behavior results in reprimand, behavior results in pleasant interaction)	Reinforcement Quality-Describe: Preference level: Highly Preferred Preferred Not Preferred	Equivalence (circle) Same Different Target: Same
Response Effort (effort required to engage in a behavior)	Level of Task Effort-Describe: Effort level: High Moderate Low	Response Effort (effort required to engage in a behavior)	Level of Task Effort-Describe: Effort level: High Moderate Low	Equivalence (circle) Same Different Target: Same
Immediacy of Reinforcement (rate in which reinforcement given)	Rate of Reinforcement Describe: Rate: Immediate Delayed	Immediacy of Reinforcement (rate in which reinforcement given)	Rate of Reinforcement-Describe: Rate: Immediate Delayed	Equivalence (circle) Same Different Target: Same

Equivalence of Situation and/or Activity	Activity Type: Teacher Directed Student Directed Free Play Other: (describe)	Equivalence of Situation and/or Activity	Activity Type: Teacher Directed Student Directed Free Play Other: (describe)	Equivalence (circle) Same Different Target: Same

Target Classroom Situation #1:		**Target Classroom Situation #2:**		
Undesired Behavior #1		**Undesired Behavior #2**		
Function(s) of Undesired Behavior #1		Function(s) of Undesired Behavior #2		Equivalence (circle) Same Different Target: Different
Rate of Reinforcement (how often behavior reinforced)	Rate:	Rate of Reinforcement (how often behavior reinforced)	Rate:	Equivalence (circle) Same Different Target: Same
Quality of Reinforcement (preferred, not preferred; i.e., behavior results in reprimand, behavior results in pleasant interaction)	Reinforcement Quality-Describe: Preference level: Highly Preferred Preferred Not Preferred	Quality of Reinforcement (preferred, not preferred; i.e., behavior results in reprimand, behavior results in pleasant interaction)	Reinforcement Quality-Describe: Preference level: Highly Preferred Preferred Not Preferred	Equivalence (circle) Same Different Target: Same
Response Effort (effort required to engage in a behavior)	Level of Task Effort-Describe: Effort level: High Moderate Low	Response Effort (effort required to engage in a behavior)	Level of Task Effort-Describe: Effort level: High Moderate Low	Equivalence (circle) Same Different Target: Same

APPENDIX E

STUDENT DATA SHEET

Student:_____ **Date:**_____

Intervention (circle): 1=Paper-based Social Story 2=Tablet computer-based Social Story

Target Classroom Activity/Behavior #____: (description of target classroom activity and undesired behavior)

Desired Behavior #___: (description of desired behavior)

Data check sheets to record daily observations

Intervention Start Time:_____

Intervention End Time:_____

Observation Start Time:_____

Observation End Time:_____

Instructions: Using frequency counting, cross off a number each time that you observe the undesired behavior(s).

Current/Undesired Behavior(s)	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

APPENDIX F

GOAL ATTAINMENT SCALING

Guide to Developing and Scaling Goals

1-Identify the issues that will be the focus of treatment.

2-Translate the two selected problems into two goals.

3-Choose a brief title for each goal.

4-Select an indicator for each goal.

5-Specify the expected level of outcome for the goal.

6-Review the expected level of outcome.

7-Specify the somewhat more and somewhat less than expected levels of outcome for the goal.

8-Specify the much more and much less than expected levels of outcome.

9-Repeat these scaling steps for each goal.

Goal Attainment Scaling Goal Form

Student: Adan

Concern: When Adan is given a request to participate in circle time activities, he engages in aggressive behaviors towards staff/peers (i.e., hit, bite, pinch, or shove others, scream) to escape undesired tasks and/or activities.

Desired Behavior #1: Decrease current level of aggressive behaviors towards staff and peers during circle time. Desired behaviors include keeping hands to self, engage in activity, use communication strategies to request a break from demanding task.

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level

-2	-1	**0**	+1	+2
-Always demonstrates incidences of aggressive behaviors towards staff and peers during circle time. -Never uses communication strategies to request breaks from demanding tasks.	-Often demonstrates incidences of aggressive behaviors towards staff and peers during circle time. -Rarely uses communication strategies to request breaks from demanding tasks.	**-Decreased current (baseline) level of aggressive behaviors towards staff and peers during circle time.** **-Increased current (baseline) level of communication strategies to request breaks from demanding tasks.**	-Few to none incidences of aggressive behaviors towards staff and peers during circle time. - Almost always uses communication strategies to request breaks from demanding tasks.	-No incidences of aggressive behaviors towards staff and peers during circle time. -Always uses communication strategies to request breaks from demanding tasks.

Goal Attainment Scaling Goal Form

Student: Adan

Concern: When Adan is not receiving direct attention from a staff member or peer, he will inappropriately touch staff or peers (i.e., lean on staff /peers, rub hands on staff's/peer's body, put his head in staff's lap, fall off chair, scoot chair out of area while seated) to obtain attention from staff or peers.

Desired Behavior #2: Decrease current (baseline) rate of inappropriate touching of staff and peers. Increase use of appropriate communication (i.e., raise hand, tap arm or shoulder of communication partner, raise hand).

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	0	**+1**	+2
-Always inappropriately touches staff and peers. -Never uses desired strategies to obtain attention from staff/peers.	-Often inappropriately touches staff and peers. -Rarely uses desired strategies to obtain attention from staff/peers.	-Decreased current (baseline) rate of inappropriate touching of staff and peers. -Increased use of appropriate communication (i.e., tap shoulder or arm of staff, raise hand) to obtain attention of staff and/or peers.	**-Few to no incidences of inappropriate touching of staff and peers.** **-Almost always uses desired strategies to obtain attention from staff and/or peers.**	-Never any incidences of inappropriate touching of staff and peers. -Always uses desired strategies to obtain attention from staff/peers.

Goal Attainment Scaling Goal Form

Student: Brad

Concern: When Brad is given an undesired demand or request during small group activities, he will get out of chair, leave group, or hit, kick, or bite teacher to escape the demands of the task.

Desired Behavior #1: Increase time seated during small group activities from current (baseline) levels. Reduce aggressive behaviors towards staff from current (baseline) levels. Increase use of strategies to wait until activity is completed before leaving activity (i.e., watch teacher, watch peer, participate in activity, ask to hold a preferred object).

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	**0**	+1	+2

-Never participates in small group activities, and always leave group activities. -Always uses aggressive behaviors toward staff. Never uses strategies to wait until activity is completed before leaving the activity.	-Sometimes participates in small group activities, and often leave group activities. -Often uses aggressive behaviors towards staff. Rarely uses strategies to wait until activity is completed before leaving the activity.	**-Increased time seated during small group activities from current (baseline) levels.** **-Reduced aggressive behaviors towards staff from current (baseline) levels.** **-Increased use of strategies to wait until activity is completed before leaving activity (i.e., watch peer/teacher, participate in activity, ask to hold preferred objects).**	-Participates in small group activities with few to no incidences of leaving the group and few to no incidences of aggressive behavior toward staff. -Almost always uses strategies to wait until activity is completed before leaving the activity.	-Participates in small group activities with no incidences of leaving the group and no incidences of aggressive behavior toward staff. -Always uses strategies to wait until activity is completed before leaving the activity.

Student: Brad

Concern: When Brad is asked to participate in non-preferred activities and/or is not receiving direct attention from a staff member or peer, he will take shoes off, hit, touch or kick peers/teachers, and will touch, grab, or throw teaching materials to obtain attention.

Desired Behavior #1: Actively participate in small group activities. Reduce inappropriate touching of staff and peers and teaching materials. Use desired strategies to obtain attention from staff/peers (i.e., raise hand, tap peer or teacher on shoulder or leg, ask for teacher's attention).

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	**0**	+1	+2

-Never participates in small group activities, and always inappropriately touches staff and peers. -Always inappropriately touches teaching materials or toys. -Never uses appropriate ways to obtain attention.	-Sometimes participates in small group activities. -Often inappropriately touches staff and peers. - Often inappropriately touches teaching materials or toys. -Rarely uses appropriate ways to obtain attention.	**-Actively participated in small group activities.** **-Reduced inappropriate touching of staff and peers and teaching materials from current (baseline) levels.** **-Used desired strategies to obtain attention from staff/peers.**	-Participates in small group activities, with few to none inappropriate touching of staff and peers. -Few to none inappropriate touching of teaching materials or toys. -Almost always uses desired strategies to obtain attention from staff/peers.	-Participates in small group activities, never inappropriately touches peers or staff. -Never inappropriately touches teaching materials. -Always uses desired strategies to obtain attention from staff/peers.

Goal Attainment Scaling Goal Form

Student: Daniel

Concern: When Daniel is left alone to eat lunch, he will leave his seat, turn around in seat, lie down on seat, and/or inappropriately manipulate shoes, food, or drink in order to obtain attention.

Desired Behavior #1: Increase on-task lunchtime behaviors from current (baseline) levels. Increase time seated forward. Eat food in socially appropriate ways. Increase incidences of eating lunch within the time allotted classroom peers without constant attention from staff including verbal and visual cues.

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	0	**+1**	+2

-Is always off-task with lunch-time behaviors. Always has incidences of leaving seat, turning around in seat, or lying down on seat. -Always has incidences of picking apart or playing with food. -Never eats lunch within the time allotted classroom peers. Always requires constant attention from staff including verbal and visual cues.	-Is often off-task with lunch-time behaviors. Often has incidences of leaving seat, turning around in seat, or lying down on seat. -Often has incidences of picking apart or playing with food. Rarely eats lunch within the time allotted classroom peers. -Often requires constant attention from staff including verbal and visual cues.	-Increased on-task lunchtime behaviors from current (baseline) levels. -Increased time seated forward, and decreased incidences of picking apart or playing with food. -Increased incidences of eating lunch within the time allotted classroom peers without constant attention from staff including verbal and visual cues.	**-Is on-task with lunch-time behaviors with few to no incidences of leaving seat, turning around in seat, or lying down on seat.** **-Few to no incidences of picking apart or playing with food.** **-Almost always eats lunch within the time allotted classroom peers without constant attention from staff including verbal and visual cues.**	-Is on-task with lunch-time behaviors with no incidences of leaving seat, turning around in seat, or lying down on seat. -No incidences of picking apart or playing with food. -Always eats lunch within the time allotted classroom peers without constant attention from staff including verbal and visual cues.

Goal Attainment Scaling Goal Form

Student: Daniel

Concern: When Daniel is left alone to complete bathroom tasks, he will inappropriately manipulate bathroom objects (i.e., play with toilet paper), open and look behind the stall doors, and look between the cracks of the stall doors.

Desired Behavior #2: Increase on-task bathroom behaviors from current (baseline) levels. Complete toileting tasks in a socially acceptable way (i.e., enter stall, complete toileting and hand washing tasks then leave bathroom). Decrease the current (baseline) levels of verbal cueing from staff needed to complete bathroom routine.

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	0	**+1**	+2

-Is always off-task with bathroom behaviors and always manipulates bathroom objects (i.e., sink, facets, stall doors, toilet paper, soap dispenser, stool, tiles on wall). -Always checks stall doors or cracks between the stall doors.	-Is often off-task with bathroom behaviors with frequent incidences of manipulating bathroom objects (i.e., sink, facets, stall doors, toilet paper, soap dispenser, stool, tiles on wall). -Frequent incidences of visually checking stall doors or cracks between the stall doors.	-Increased on-task bathroom behaviors from current (baseline) levels. -Increased independence from current (baseline) levels in completing bathroom routine (i.e., toileting, hand washing). -Decreased the current (baseline) levels of verbal cueing from staff needed to complete bathroom routine.	**-Is on-task with bathroom behaviors with few to no incidences of manipulating bathroom objects (i.e., sink, facets, stall doors, toilet paper, soap dispenser, stool, tiles on wall).** **-Few to no incidences of visually checking stall doors or cracks between the stall doors.**	-Is on-task with bathroom behaviors with no incidences of manipulating bathroom objects (i.e., sink, facets, stall doors, toilet paper, soap dispenser, stool, tiles on wall). -No incidences of visually checking stall doors or cracks between the stall doors.

Goal Attainment Scaling Goal Form

Student: Ethan

Concern: When student Ethan is participating in large group activities (i.e., circle time), and is not receiving attention, he will yell out of turn and/or use a silly voice at a peer or teacher, and will lean on or touch peers, in order to obtain attention from teacher or peers.

Desired Behavior #1: Participate in large group activities with teacher and staff while using appropriate methods to obtain attention (i.e., raise hand, use a quiet voice, keep hands to self).

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	**0**	+1	+2

-Never participates in circle time activities and always yells or uses a silly voice at peers/teachers. -Always leans on or touches peers. -Never uses appropriate methods to obtain attention from teachers or peers.	-Sometimes participates in circle time activities and often yells or uses a silly voice at peers/teachers. -Often leans on or touches peers. -Rarely uses appropriate methods to obtain attention from teachers or peers.	**-Reduced incidences of yelling and/or using a silly voice at peers/teachers, and leaning on/touching peers from current (baseline) levels.** **-Increased use of appropriate methods to obtain attention (i.e., raise hand, make comments after teacher has called on student) from current (baseline) levels.**	-Participates in circle time activities with few to no incidences of yelling and/or using a silly voice at peers/teachers. -Rarely leans on or touches peers. -Almost always uses appropriate methods to obtain attention from teachers or peers.	-Participates in circle time activities with no incidences of yelling and/or using a silly voice at peers/teachers. -Never leans on or touches peers. -Always uses appropriate methods to obtain attention from teachers or peers.

Student: Ethan

Concern: When Ethan is participating in staff led small group rotations (i.e., art activities, cooperative play, prewriting activities), he will grab or destroy peer/staff materials and block peers from accessing classroom materials in order to obtain access to a desired activity/object.

Desired Behavior #2: Participate in small group activity rotations without grabbing or blocking the learning materials. Implement appropriate ways (i.e., wait for teacher to distribute materials, share toys/materials with peers, take one object at a time) to obtain access of desired objects and to share with classroom peers.

-2	-1	0	+1	+2
Much less than expected level	Less than expected level	Expected level of performance	Better than expected level	Much better than expected level
-2	-1	**0**	+1	+2

-Never participates in small group activities, and always grabs or pushes over peer/staff materials. -Never participates in small group activities, and always blocks peers from accessing materials or grabs materials from staff. -Never implements appropriate ways to obtain access to desired objects /activities.	-Sometimes participates in small group activities, and often grabs or pushes over peer/staff materials. -Sometimes participates in small group activities, and often blocks peers from accessing materials or grabs materials from staff. -Rarely implements appropriate ways to obtain access to desired objects/activities.	**-Decreased incidences of grabbing or pushing over peer/staff materials from current (baseline) levels.** **-Decreased incidences of blocking peers from accessing materials or grabbing from staff from current (baseline) levels.** **-Increased use of appropriate ways to obtain access to desired objects/ activities.**	-Participates in small group activities with few or no incidences of grabbing or pushing over peers/staff materials. -Participates in small group activities with few to no incidences of blocking peers from accessing materials or grabbing materials from staff. -Almost always implements appropriate ways to obtain access to desired objects/ activities.	-Participates in small group activities with no incidences of grabbing or pushing over peer/staff materials. -Participates in small group activities with no incidences of blocking peers from accessing classroom materials or grabbing materials from staff. -Always implements appropriate ways to obtain access to desired objects/ activities.

Note. Adapted from "Goal Attainment Scaling: Applications, Theory and Measurement" by T.J. Kiresuk, A. Smith, and J.E. Cardillo, 1994, *Goal Attainment Scaling: Applications, Theory and Measurement.*

APPENDIX G

VIDEO RATING SCALE WORKSHEET

Instructions:

You are going to watch 14 video segments. Each video segment is between 49 seconds and1 minute, 53 seconds long. After viewing each segment, I will pause the video and ask you to answer 3 questions related to that segment.

You will note that each question contains a pair of antonyms describing student behavior. Place a check on one of the seven lines between the two adjectives indicating how you perceive the student's behavior during the video segment. Please mark as rapidly as possible. I want your first impression. This is not a test. The right answer is the one that is true for you.

Be sure to make only one check mark for each pair of words and do not skip any pairs of words.

Segment 1:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 2:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engage

Segment 3:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 4:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 5:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 6:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 7:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 8:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 9:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 10:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 11:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 12:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 13:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Segment 14:

Well Behaved	_	_	_	_	_	_	_	Poorly Behaved
Inappropriate	_	_	_	_	_	_	_	Appropriate
Engaged	_	_	_	_	_	_	_	Not Engaged

Demographic Information:

I am a (please circle one)

GRADUATE STUDENT UNDERGRADUATE STUDENT

OTHER:_____

I am majoring in (please circle one)

SPECIAL EDUCATION SPEECH PATHOLOGY

OCCUPATIONAL THERAPY

OTHER: _____

APPENDIX H

SURVEY

Please complete this questionnaire after the participant has completed all phases of the research investigation. All questions, unless otherwise indicated, refer to the target child and his/her identified undesired and desired behaviors. Your ideas are important. Thanks for taking the time to share them.

Paper-based Social Story Intervention

The following set of questions relate to paper-based Social Story interventions:

1) Do you think that the **paper-based Social Story** intervention was an **appropriate** instructional procedure for teaching the participant the **desired behaviors**?

Not Appropriate		Moderately Appropriate			Very Appropriate	
1	2	3	4	5	6	7

2) Do you think that the **paper-based Social Story** intervention was an **appropriate** instructional procedure for helping to decrease the participant's **undesired behaviors**?

Not Appropriate		Moderately Appropriate			Very Appropriate
1	2	3	4	5	6

3) Was the **paper-based Social Story** intervention **effective** in teaching the child the desired behavior?

Not Effective		Moderately Effective			Very Effective	
1	2	3	4	5	6	7

4) Do you feel that it was **important** to help the participant **learn about the target activity and behaviors** in order to **effectively teach** the desired behavior to the child?

Not Important		Moderately Important			Very Important	
1	2	3	4	5	6	7

5) Did it **appear** difficult to help the participant **learn about the target activity and desired behaviors** within the **context** of regular preschool activities?

Not Difficult		Moderately Difficult			Very Difficulty	
1	2	3	4	5	6	7

6) How difficult did it **appear** to implement the **paper-based Social Story** intervention

strategy in the classroom setting?

Not		Moderately			Very	
Difficult		Difficult			Difficult	
1	2	3	4	5	6	7

7) Was the **paper-based Social Story** intervention **disruptive** to the classroom routines and activities?

Not		Moderately			Very	
Disruptive		Disruptive			Disruptive	
1	2	3	4	5	6	7

8) Did the **paper-based Social Story** intervention make the child **stand out** in any way from the rest of the class?

Stood Out		Sometimes			Did not Stand	
A Great Deal		Stood Out			Out at All	
1	2	3	4	5	6	7

9) Did you observe the child verbally or nonverbally **express dislike** of the **paper-based Social Story** intervention?

Strongly Expressed Dislike			Expressed Some Dislike			Expressed No Dislike
1	2	3	4	5	6	7

10) Did the child seem to **enjoy** the **paper-based Social Story** intervention?

Did Not Seem to Enjoy			Enjoyed Some of the Time			Seemed To Enjoy
1	2	3	4	5	6	7

11) Do you feel that the **time required** to implement the **paper-based Social Story** intervention was worth the observed benefits to the child?

Too Much Time			Somewhat Worth The Time			Well Worth The Time
1	2	3	4	5	6	7

12) If given training and support would you **feel confident** implementing the **paper-based Social Story** intervention yourself?

Not at All Confident			Moderately Confident			Very Confident
1	2	3	4	5	6	7

13) If given training and support would you **be willing** to implement the **paper-based Social Story** intervention in your classroom?

Not at all Willing		Moderately Willing			Very Willing	
1	2	3	4	5	6	7

14) Would it be difficult to use the **paper-based Social Story** intervention and still meet the needs of the other children in the classroom?

Yes No

15) Do you think that it is likely that the target child will **continue to demonstrate** the desired behaviors taught in the **paper-based Social Story** in the classroom after completion of the study?

Yes	No
1	2

16) What **changes would you recommend** to improve the implementation or the design of the **paper-based Social Story** intervention?

Comments:

Tablet Computer-based Social Story Intervention

The following set of questions relate to tablet computer-based Social Story interventions:

1) Do you think that the **tablet computer-based Social Story** intervention was an appropriate instructional procedure for teaching the participant the **desired behaviors**?

Not Appropriate		Moderately Appropriate			Very Appropriate	
1	2	3	4	5	6	7

2) Do you think that the **tablet computer-based Social Story** intervention was an appropriate instructional procedure for helping to decrease the participant's **undesired behaviors**?

Not Appropriate		Moderately Appropriate			Very Appropriate	
1	2	3	4	5	6	7

3) Was the **tablet computer-based Social Story** intervention effective in teaching the child the desired behavior?

Not Effective		Moderately Effective			Very Effective	
1	2	3	4	5	6	7

4) Do you feel that it was **important** to help the participant **learn about the target activity and behaviors** in order to **effectively teach** the desired behavior to the child?

Not Important		Moderately Important			Very Important	
1	2	3	4	5	6	7

5) Did it **appear** difficult to help the participant **learn about the target activity and desired behaviors** within the **context** of regular preschool activities?

Not Difficult		Moderately Difficult			Very Difficulty	
1	2	3	4	5	6	7

6) How difficult did it appear to implement the **tablet computer-based Social Story** intervention in the classroom setting?

Not Difficult		Moderately Difficult			Very Difficult	
1	2	3	4	5	6	7

7) Was the **tablet computer-based Social Story** intervention **disruptive** to the classroom routines and activities?

Not Disruptive		Moderately Disruptive			Very Disruptive	
1	2	3	4	5	6	7

8) Did the **tablet computer-based Social Story** intervention make the child **stand out** in any way from the rest of the class?

Stood Out A Great Deal			Sometimes Stood Out			Did not Stand Out at All
1	2	3	4	5	6	7

9) Did you observe the child verbally or nonverbally **express dislike** of the **tablet computer-based Social Story** intervention?

Strongly Expressed Dislike			Expressed Some Dislike			Expressed No Dislike
1	2	3	4	5	6	7

10) Did the child seem to **enjoy** the **tablet computer-based** Social Story intervention?

Did Not Seem to Enjoy			Enjoyed Some of the Time			Seemed To Enjoy
1	2	3	4	5	6	7

11) Do you feel that the **time required** to implement the **tablet computer-based Social Story** intervention was worth the observed benefits to the child?

Too Much Time			Somewhat Worth The Time			Well Worth The Time
1	2	3	4	5	6	7

12) If given training and support would you **feel confident** implementing the **tablet computer-based Social Story** intervention yourself?

Not at All Confident			Moderately Confident			Very Confident
1	2	3	4	5	6	7

13) If given training and support would you **be willing** to implement the **tablet computer-based Social Story** intervention in your classroom?

Not at all Willing		Moderately Willing			Very Willing	
1	2	3	4	5	6	7

14) Would it be difficult to use the **tablet computer-based Social Story** intervention and still meet the needs of the other children in the classroom?

Yes No

15) Do you think it is likely that the target child will **continue to demonstrate** the desired behaviors taught in the **tablet computer-based Social Story** in the classroom after completion of the study?

Yes	No
1	2

16) What **changes would you recommend** to improve the implementation or the design of the **tablet computer-based** Social Story intervention?

Comments:

Conclusion

Thank you for participation with this questionnaire. Your efforts will help guide future interventions used in early childhood special education settings. *Please **complete one final question** regarding your perception of paper-based and tablet-computer based Social Stories.*

1) After observing **both** the **paper-based** and the **tablet-computer based** Social Story interventions, do you **prefer** one format versus another? Why?

Comments:

Note. Survey adapted from "The Use of Visual Supports in Teaching Young Children With Autism Spectrum Disorder to Initiate Interactions" by S. Johnston, C. Nelson, J. Evans, and K. Palazolo, 2003, *Augmentative and Alternative Communication, 19*(2), pp. 100-103.

APPENDIX I

SOCIAL STORY PROCEDURAL RELIABILITY

Participant:_____Date:_____Observer:_____

Intervention # 1: (Paper-Based Story)

Procedures Prior to Story	**Observed**	**Not Observed**	**Not Applicable**
Intervention tools in learning center Intervention 1=paper-based story			
Participant is verbally invited to the learning center to read a story with the interventionist (i.e., "Hi Johnny, let's go read a story!).			
The participant is seated in a chair at a table in the learning center.			
Social Story is in reach of the participant and interventionist.			
Interventionist says, "time to read story"			

Procedures During the Reading of the Social Story	**Observed**	**Not Observed**	**Not Applicable**
Interventionist reads Social Story to participant			
Interventionist responds to participant questions: Possible interventionist responses: 1-3 utterances regarding the question(s)			**(Participant did not ask questions)**

Interventionist responds to participant comments: Possible interventionist responses: 1-3 utterances in response to the comment(s)			**(Participant did not make comments)**

Procedures During Comprehension Checks	**Observed**	**Not Observed**	**Not Applicable**
Interventionist reviews and assesses comprehension of the story: A: Interventionist models desired behaviors			
B: Interventionist provides guided (graded verbal and/or physical cues) practice of the desired behaviors; gives verbal praise for correct demonstration			
C: Interventionist asks participant to independently demonstrate desired behaviors; gives verbal praise for correct demonstration			
D: If participant does not perform C, interventionist repeats B			**(Participant performed "C", above)**
If participant asks more questions, then the interventionist responds Possible interventionist responses: 1-3 utterances to respond to the participant			**(Participant did not ask questions)**
The interventionist tells the participant that they are done reading the story			
The interventionist assists the participant to transition directly to the classroom activity (target activity)			

Participant:_____ **Date:**_____ **Observer:**_____

Intervention # 2: (iPad-Based Story)

Procedures Prior to Story	**Observed**	**Not Observed**	**Not Applicable**
Intervention tools in learning center Intervention 2=tablet computer-based story			
Participant is verbally invited to the learning center to read a story with the interventionist (i.e., "Hi Johnny, let's go read a story!).			
The participant is seated in a chair at a table in the learning center.			
Social Story is in reach of participant and interventionist.			
Interventionist says, "time to read story"			

Procedures During the Reading of the Social Story	**Observed**	**Not Observed**	**Not Applicable**
Interventionist reads Social Story to participant			
The interventionist or the participant activates the video icons on corresponding screen pages.			
Interventionist responds to participant questions: Possible interventionist responses: 1-3 utterances regarding the question(s)			**(Participant did not ask questions)**

Interventionist responds to participant comments: Possible interventionist responses: 1-3 utterances in response to the comment(s)			**(Participant did not make comments)**
Procedures During Comprehension Checks	**Observed**	**Not Observed**	**Not Applicable**
Interventionist reviews and assesses comprehension of the story: A: Interventionist models desired behaviors			
B: Interventionist provides guided (graded verbal and/or physical cues) practice of the desired behaviors; gives verbal praise for correct demonstration			
C: Interventionist asks participant to independently demonstrate desired behaviors; gives verbal praise for correct demonstration			
D: If participant does not perform C, interventionist repeats B			**(Participant performed "C", above)**

Procedures During Comprehension Checks	**Observed**	**Not Observed**	**Not Applicable**
If participant asks more questions, then the interventionist responds Possible interventionist responses: 1-3 utterances to respond to the participant			**(Participant did not ask questions)**
The interventionist tells the participant that they are done reading the story			
The interventionist assists the participant to transition directly to the classroom activity (target activity)			

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