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The Effects of Environmental Modifications and Visual Supports in the Home on Engagement and Challenging Behaviors in Children with Autism

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and Challenging Behaviors in Children with Autism

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ABSTRACT

The Effects of Environmental Modifications and Visual Supports in the Home on Engagement

and Challenging Behaviors in Children with Autism

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The purpose of this study was to determine the impact on engagement and challenging behaviors

in young children with autism spectrum disorder (ASD) under two treatment conditions: 1)

physical modifications to the home environment, and 2) physical modifications plus visual

supports in the home environment. Treatment conditions were implemented in the child's home

environment with parents serving as interventionist.

A single-subject nonconcurrent baseline design was used across three male participants: ages 3

years, 2 months; 4 years, 4 months; and 4 years, 11 months. The study included four to five

baseline sessions, six to nine sessions in Treatment 1, six to nine sessions in Treatment 2 and two

follow-up sessions per participant.

During Treatment 1, modifications were made to each child's environment (e.g., decreasing

clutter, organizing playthings, and/or establishing a defined play space). Parent awareness

training regarding the change was provided, and data was collected using the Individual Child

Engagement Record-Revised (Kishida, Kemp, & Carter, 2008) and the Challenging Behavior

Record (researcher developed) during play and/or daily routines with the child's parent. During

Treatment 2, visual supports were added to the modified environment to add structure and visual

clarity (e.g., choice boards and "how to boards"). Parent awareness training regarding the

change was provided, and data was collected using the Individual Child Engagement Record-Revised (Kishida et al., 2008) and the Challenging Behavior Record during play and/or daily routines with the child's parent.

Based on the findings of the study, active engagement increased and challenging behaviors decreased following modifications in the home for three young children with autism. In regards to engagement across Treatment 1 and Treatment 2, children demonstrated active engagement with a mean of 62%, 76.89%, and 74.41% from a baseline of 1.75%, 15.75%, and 14.6%, respectively. In regards to challenging behaviors, across Treatment 1 and Treatment 2, children had fewer behaviors that interfered with engagement with a mean of 13.3%, 8.15% and 13.32%, from a baseline of 75%, 27.75%, and 49.2%, respectively. The overall results indicated significant positive effects from the use of physical modifications and physical modifications plus visual support in increasing engagement and decreasing challenging behaviors.

DEDICATION

It is with great delight that I dedicate this dissertation to the children in my life. They each have inspired me to learn and have taught me how to love.

To my own children Nolan, Jon-Wesley and Riley, I am beyond blessed to have your love, support and encouragement. You have motivated me to finish by your continued faith, believing in me more than I believe in myself. You are my true inspiration because without you this journey would not have been possible. I love you each deeply.

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Finally and with gratitude, to "My Nave Kids" past and present, I have learned so much from you. I cannot imagine any other profession that could have made me happier and more motivated to understand. My desire is this dissertation can contribute to better recognizing your needs. I count it a privilege to be part of your day, your life and your family.

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TABLE OF CONTENTS

Chapter

9

LIST OF TABLES

LIST OF FIGURES

14

CHAPTER 1

INTRODUCTION

Overview

Autism spectrum disorder (ASD) is a lifelong neurodevelopmental disorder characterized by deficits in social communication and repetitive and restricted patterns of behaviors, interest and activity (American Psychiatric Association, DSM-V, 2013).   Social communication deficits occur across a variety of contexts and include impairment in social-emotional reciprocity, use of nonverbal communication for interaction and deficits in developing, maintaining and the understanding of relationships. Estimated prevalence is one in every 68 children are affected by ASD each year, and the occurrence has risen 30% since 2013 (Center for Disease Control and Prevention, 2014). CDC's Autism and Developmental Disabilities Monitoring (ADDM) Network (2014) further reports that ASD occurs in all racial, ethnic, and socioeconomic groups with greater occurrence in boys (1 in 42) than girls (1 in 189). Given the continuing increase of ASD, research is rapidly expanding to address the needs of children and their families.

Research has focused on various treatment options, including the context for service delivery, as well as the role of families in the intervention process. Treatment options include biomedical treatments, nonmedical interventions and related approaches (autism speaks.org, 2014). Biomedical treatment includes diet modifications, the use of supplements, sulfation and immune system regulation. Additionally, medications to treat behavior or emotional issues that are common for children with autism (e.g., anxiety, attentional issues, hyperactivity, irritability, sleep disturbance, tantrums) are sometimes used. Nonmedical interventions are numerous and provide a wide range of options for improving opportunities for children with autism.

Nonmedical interventions include behavioral, cognitive behavioral, speech language intervention, sensory processing intervention, and educational interventions. Naturalistic teaching strategies, social communication interventions, and social skills interventions are also widely used. These nonmedical interventions may be used concurrently or alone. Many intervention approaches for children with ASD fall on a continuum between evidence-based practice (EBP) and non-EBP depending on the level of evidence. EBP is the integration of best research evidence with both clinical expertise and patient and/or family values (Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000); these include natural teaching strategies, joint attention, modeling, and visual-supports. Non-EBP involves the utilization of assessments and treatments that have little-to-no scientific support to date, such as environmental adaptations and sensory modifications (Sackett et al., 2000).

Related intervention or complimentary approaches may include therapies such as art, music, or animal therapy and may be integrated with educational programs or undertaken on an individual basis. In addition to a variety of treatment options, the service delivery context is varied and may include school-based, center or community-based, and home-based or a combination of settings.

In regards to the involvement of parents in the role of intervention, most practitioners agree that parents should be actively involved in the intervention process (Dunst & Paget, 1991; Kaiser & Hancock, 2003; McConachie & Diggle, 2007; Smith, Buch, & Gamby 2000). However, the treatment option and context of services can either support or limit opportunities for such involvement. The National Research Council (NRC, 2009) recommended that effective interventions for children with ASD should address their communication, social, and behavioral deficits in a naturalistic setting with the goal of facilitating meaningful engagement, and that the

most natural setting for young children was their physical home environment. The finding of

this report, the notion of the home environment as an appropriate context for intervention, is

consistent with previous studies (Dunst & Paget, 1991; Goldstein, 2002; Hancock & Kaiser,

2002; Ozonoff & Cathcart, 1998).

Numerous studies have supported the efficacy of interventions conducted within the

home setting as a positive environment for learning for children with developmental disabilities,

language delay, or at-risk populations (Dunst, Trivette, & Hamby, 1994; Ozonoff & Cathcart,

1998; Sussman, 1999). However, studies on the impact (e.g., change in communication,

engagement, behavior) and structure (e.g., space, accessibility of materials, resources) of the

physical home environment for children with ASD have been significantly limited. In the review

of the literature, no studies were found that determined the role of the child's physical home

environment on engagement and challenging behaviors, both of which are of great concern for

young children with ASD.

Some researchers have found evidence that the physical environment, including

environments that mimic a child's home, has a positive impact on children's learning (Caples,

1996; Inan, 2009). Given the complexity of autism and the communication, behavioral and social

challenges that coexist, it is desirable for interventions to be holistic, looking at not just the child,

but also the environment surrounding the child with autism. In a study conducted by Hwang and

Hughes (2000), the researchers summarized that when children with language impairment were

presented challenges in the physical environment (e.g., being unable to reach preferred toys)

there was an increase in verbalizations and that when a child was presented with a preferred

material, verbalizations increased. Case-Smith and Arbesman (2008) noted that since parents

spend a great deal of time with their children, they are in the best position to implement

interventions. They further emphasized that preventative interventions, defined as strategies that encourage positive and production interactions, are beneficial in preempting challenging behaviors in children with autism. Behavioral and social challenges coexist with communication deficits in children with ASD. Therefore, holistic interventions that integrate the child, his/her environment, and caregivers optimize outcomes.

Statement of Purpose

The purpose of this study was to determine the effects of specific environmental modifications in the home environment on behavior in children with ASD. Specifically, the frequency and types of engagement and the change in challenging behaviors were measured. Engagement and incidents of challenging behavior were selected as dependent variables because these variables are requisite skills for the development of attention, communication and social skills in children with autism. Furthermore, challenging behaviors are a common consequence of disordered language abilities and oftentimes impeded intervention. Results from this investigation will offer professionals evidence to support home environment modifications to reduce undesirable behavior and to improve the overall frequency of high quality interactions for children with ASD.

Rationale of Study

As a speech language pathologist (SLP) serving young children with ASD for approximately 20 years, in clinical and home settings, this researcher has observed the impact of environmental modifications. Providing families with instruction on modifications (e.g., reducing number of toys available, adding visual supports, placing preferred items out of reach) has resulted in positive change (e.g., improved attention to task, better communication, parent positive regard). As the researcher completed doctoral studies on the impact of the classroom

environment on the emotional, physical and academic skills of typically-developing preschoolers, an interest in understanding the impact of the physical environment on children with ASD grew. It was the experience, as an SLP and new researcher, that led to the assertion that the physical home environment has a potential impact on the frequency of engagement and the incidence of challenging behaviors of children with ASD. Thus, modification to the home environment had the potential to optimize the child's opportunities for positive and productive engagement within the child's home and to reduce or eliminate challenging behaviors. Additionally, the lack of research on modification in the home environment was a significant indicator for the need for such a study as well as the growing needs of determining effective intervention for children with ASD.

Theoretical Framework

Theorists including Jean Piaget and Lev Vygotsky emphasized the importance of meaningful interactions between a child and his or her environment. Piaget's theory of cognitive development emphasized the importance of the environment on the child's ability to construct knowledge (Mooney, 2000). The construction of knowledge requires an environment that promotes exploration, interaction and problem-solving. Vygotsky's social development theory lends support to Piaget by emphasizing the role of social interaction during play in a child's development. Vygotsky purports that language and learning takes place during interactions with others (Mooney, 2000). As a young child's social interaction frequently occurs in the home with parents and caregivers, it is essential to view the physical home environment as a primary context for development.

Urie Bronfenbrenner's (1977) ecological developmental systems (EDS) theory provides further support on the importance of the environment on families of children with autism. Based

on the EDS theory, families are an interactional system; thus, the actions and activities of one individual family member influence the action and activities of the other family members. Bronfenbrenner (1977) describes how challenges that affect a family of a child with autism also affect the interaction between the child and the parent and how the family interacts with the community. EDS theory asserts that as young children interact with their environment, learning occurs. As practitioners, we must be acutely aware of the relationship between the child, his or her family, and the environment.

Research Questions

How do modifications to the home environment (independent variable) impact engagement and reduce challenging behaviors (dependent variables) in young children with autism?

1. Do physical modifications to the home environment (e.g., defined learning space, organization of materials, and/or availability of toys and materials) increase engagement and decrease the number of challenging behaviors?

2. Does the use of physical modifications plus visual supports in the home environment increase engagement and decrease the number of challenging behaviors?

Definitions

The following terms are used throughout the study and are defined for the purpose of this research study:

Engagement

Engagement is the amount of time that a child spends interacting appropriately (e.g., looking to, requesting, responding or reciprocally engaging) in his or her physical home

environment with parents, siblings, and/or purposeful and functional time spent with materials (McWilliam & Bailey, 1995).

Active engagement. Active engagement is when the child participates in the activity with the learning environment (e.g., materials, toys and resources) by appropriately manipulating or vocalizing (Kishida & Kemp, 2006). Engagement is active when the child allows, requests or includes the communication partner in the learning environment.

Passive engagement. Passive engagement is when the child participates in the activity with the learning environment (e.g., materials, toys and resources) but is not manipulating or vocalizing (Kishida & Kemp, 2006). Engagement is passive when the child remains in the learning activity but does not seek the partner for communicative purposes.

Calming Place

A calming place is a physical location that is defined as an area in which the child demonstrates positive affect (e.g., smiles, relaxes, and/or focuses). A child may use this calming place to "be alone". A parent may place a child in his/her calming place as a means to assist the child in expressing or controlling emotions (Pengelly, Rogers, & Evans, 2009).

Challenging Behaviors

Challenging behaviors are behaviors that occur as the result of a communication breakdown and serve one or more of the following functions: (a) to communicate a need, (b) to meet a sensory need, (c) to avoid or escape an aversive demand or situation, (d) to seek social attention (Durand & Carr, 1991; National Research Council, 2009; Wheeler & Richey, 2014), or (e) an attempt to communicate, an attempt to control others or avoid, escape or maintain a situation.

Daily Home Routines

Daily home routines are activities that are routinely completed at home by the family. Activities include any of the following: eating, dressing, playing, watching television, playing videogames, and/or other similar routinely performed activities.

Defined Place for Learning

A defined place for learning is an area in which play activities could occur with limited auditory and/or visual distractions. The defined place includes, but is not limited to, a kitchen table, a child-sized desk, and/or a calming place.

Physical Environment

Physical environment is a space layout that includes location of furniture, electronics, interior/exterior rooms, and materials (e.g., toys). Elements of design (e.g., décor, lighting, color, etc.) and the physical design of the room are additional components of the physical environment (Olds, 2000).

Protest

A communication protest is demonstrated when a child indicates verbally or nonverbally a refusal of an action, object or event (Prizant & Whetherby, 1987).

Modifications

Modifications are any changes, additions or adaptations that occur in one or more of the three domains: 1) home arrangement and organization of materials, furniture, space, and visual support, 2) removal or addition of visual supports, 3) addition or modification of child's calming place to include design, space, texture, or color.

Request

A communication request is demonstrated when a child indicates nonverbally and/or verbally that an object, action, or event is desired (Prizant & Whetherby, 1987).

Visual Supports

Visual supports are tools used to increase language comprehension, enhance verbal expression, and to provide understanding of environmental expectations. Visual supports may include a calendar system; visual self-management systems to clarify expectations, time, concepts, ideas and rule; and/or visual stories. These tools are especially beneficial in providing support and structure to children with autism (Janzen, 2003).

Summary

Chapter 1 provides an overview of ASD and the potential impact of the physical environment on engagement and challenging behaviors. The purpose, rationale of the study, theoretical framework and key terms were described. Chapter 2 provides a review of current literature regarding the complexity of ASD, family needs, and the service delivery models. Additionally, the impact of physical environments and visual supports are discussed.

CHAPTER 2

LITERATURE REVIEW

Overview

This chapter provides a discussion of relevant literature involving the diagnostic criteria

and characteristics of young children with autism spectrum disorder (ASD), and the needs of

families of children with ASD. Detailed is the relevance of the physical environment and use of

visual supports in the environment on engagement and behavior in young children with ASD,

and the use of a single-subject design in understanding the behaviors of children with ASD.

Etiology

Autism is a complex neurodevelopmental disability which affects brain functioning and

is present in the early developmental phase. This disorder is characterized by persistent deficits

in social communication and social interaction across multiple contexts. ASD includes three

specific areas of deficits: social-emotional reciprocity, nonverbal communicative behaviors, and

deficits in understanding, developing and maintaining relationships. Social reciprocity includes

back-and-forth conversation, sharing of interest, emotions and affect, and the ability to initiate

and respond in a social interaction. Nonverbal communication behaviors include use of eye

contact, body language and gestures for improved understanding and expression in social

interactions. Deficits in relationships include the ability to adjust behavior to a variety of social

situations, to share in play or to make friends. In addition to social communication impairments,

children diagnosed with ASD demonstrate restricted and/or repetitive patterns of behavior,

activities, and/or interest. Repetitive patterns are manifested by at least two of four noted

features: 1) stereotyped or repetitive motor movements, use of objects, or speech,

2) hyperactivity and/or hyporeactivity to sensory input and/or unusual interests in the environment, 3) inflexible adherence to routines, insistence on sameness, or ritualized patterns of verbal or nonverbal behavior, and/or 4) highly restricted, fixated interests that are abnormal in focus or intensity or focus. The symptoms present during the early developmental period (American Psychiatric Association, DSM-V 2013; Diehl, 2003a, 2003b; Loveland, Landry, Hughes, Hall & McEvoy, 1988). Although signs are often evident during infancy, a diagnosis typically occurs between the ages of three and four, with the first indicators recognized as social communication impairments (Wood & Wetherby, 2003).

There is a wide range of abilities in children with autism as well as three severity levels established by the DSM-V (American Psychiatric Association, 2013), based on social communication impairments, and restricted, repetitive patterns of behavior. A level 3 severity rating indicates a child who requires "very substantial support". This is characterized "by severe deficits in verbal and nonverbal social communication skills, very limited initiation of social interactions, and minimal response to social overtures from others" (p. 52). Additionally, level 3 is characterized by "inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors which markedly interfere with functioning in all spheres as well as great distress/difficulty changing focus or action" (American Psychiatric Association, 2013, p. 52). A level 2 severity rating indicates that a child requires "substantial support" and is characterized by "deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others" (p. 52). Furthermore, the level is marked by "inflexibility of behavior, difficulty coping with change, or other restricted/repetitive behaviors which appear frequently enough to be obvious to the casual observer and interfere with

26

functioning in a variety of contexts and distress and/or difficulty changing focus or action"

(American Psychiatric Association, 2014, p. 52).

A level 1 severity rating indicates a child who requires "supports in place." This is

indicated as "without supports in place, deficits in social communication cause noticeable

impairments specifically; difficulty initiating social interactions, and clear examples of atypical

or unsuccessful response to social overtures of others; may appear to have decreased interest in

social interactions" (American Psychiatric Association, 2014, p. 53).

As the variability in this group of children is significantly heterogeneous, it is essential

for practitioners to examine both the deficits and potential strengths of children with ASD.

Further, the consideration of an interrelation between children with ASD, their family needs, and

the impact of their environments is needed to determine supports and services.

Areas of Deficit

Cognitive Characteristics

Children with ASD have unique patterns of cognitive development that can affect many

aspects of thinking and learning and are interwoven with communication and social difficulties

(National Research Council, 2009). The cognitive challenges typically exhibited by children

with ASD may include deficits in *theory of mind*, (predicting the thoughts and feelings of

others); executive function, and weak central cohesion (Baron-Cohen, Tager-Flusberg, & Cohen,

1993; Schopler & Mesibov, 1995).

As children with ASD tend to be concrete thinkers, deficits in *theory of mind* create

difficulty in comprehending how others feel, relating to other's beliefs, or understanding other's

motives (Quill, 2000). This results in a social-cognitive challenge. The inability to recognize

that others have independent feelings, beliefs and opinions cause significant difficulties in social

situations (Janzen, 2003, Filipek et al., 1999). Weak central cohesion is a theory that suggests that children with ASD tend to be overly focused on the specific details of a situation or conversation and thus lack the ability to process information related to the situation and/or context or to misinterpret the actual meaning (Frith, 1989). Executive functions is the collective term that refers to a range of cognitive processes needed for the ability to process and understand thoughts and behaviors. These include initiating behavior or activity, planning and organizing, switching focus, self-regulation and impulse control (Baron-Cohen et al., 1993).

Additionally, a wide range of intellectual functionality is found in children with ASD with a link between a child's intelligent quotient (IQ) and the perceived severity of symptoms in social-communication and behavior (Willemsen-Swinkels & Buitelaar, 2002). Researchers (Dawson, 1996; DeMyer, Hingtgen & Jackson, 1981, as cited in Paul, 2010) have focused on "splinter skills" in ASD to understand the impact on cognition. They have noted impairment in multiple cognitive domains with some function in every domain spared (i.e., ability to maintain attention on specific stimuli, auditory rote memory and cued recall memory).

Communication Characteristics

Communication impairments are central to the diagnosis of ASD. Children with ASD exhibit wide variability and severity in their communication and demonstrate underperformance in joint attention, expressive and receptive communication and pragmatic language skills (Paul, 2010). Challenges may include nonverbal deficits (i.e., eye gaze, facial expressions and gestures) and verbal communication deficits, unusual and/or unique interests and activities, difficulty playing with peers, and difficulty in understanding social cues needed for appropriate interaction. As early as infancy, parents may notice that their baby is unresponsive or under responsive to people and/or focuses intently on one item to the exclusion of others for an

extended period. From early development children with ASD lack an appropriate range of communication functions (e.g., request, comment, share information and use prosocial statements). Additionally, they demonstrate poor social reciprocity, social engagement deficits, delayed or absent verbal language, limited initiation of language, repetitive use of language or idiosyncratic language and/or limited play development (Filipek et al., 1999; Paul, 2010; Wetherby, Prizant, & Hutchinson, 1998; Wood & Wetherby, 2003).

Additionally, verbal children with ASD often demonstrate intact phonological and syntactical skills with marked impairment in pragmatics, prosody and processing of complex auditory information. Delayed or immediate echolalia, the confusion of personal pronouns and difficulty shifting attention between speakers is a common concern (Philofsky, Fidler, & Hepburn, 2007; Rollins, 1999).

Characteristics of Engagement

Foundational to the child's communication skills is their level of engagement. A child's level of engagement is defined as the amount of time they spent interacting with their own environment (i.e., adults, peers and/or resources and materials) in manner which is developmentally and contextually appropriate (Kishida & Kemp, 2006). Engagement mediates between a child's environment and their achievement and is a vital component of learning (Kishida & Kemp, 2006). Infrequent or limited to no engagement in social interactions is a defining characteristic in children diagnosed with ASD. Children with autism engage for less time, and at lower levels than children without autism do. Additionally, stereotypical behaviors that are associated with autism such as rocking and hand-flapping often stigmatize a child and create social isolation from peers, further impeding engagement with others (Pan, 2009).

Numerous studies conducted allow a better understanding of the role of engagement and ASD (Harte, 2008; Strain, Danko, & Kohler, 1995).

Strain et al. (1995) focused a study on the impact of engagement intervention and social interaction in the classroom environment. Specifically, the study measured children's active involvement with peers and teachers and positive initiations with peers. Five children with autism were the primary focus of the study. Interventions took place during a 45-minute daily free play in which children moved freely between five to seven different stations (i.e., sociodramatic, manipulative, fine and gross motor, art, story, table time and music). Four teachers with one to seven years of experience arranged, conducted, monitored and facilitated the children's play sessions.

The baseline began with asking teachers to conduct play sessions with their usual procedures and to make their own judgments about the need to facilitate children's active engagement with peers. During engagement intervention, children moved freely between activities as in the baseline; however, researchers instructed teachers to facilitate active engagement with play materials and/or props with the target children. The researchers provided teachers with specific feedback after each play session on the children's engagement. Strategies the teachers were trained to use included incidental teaching, following the children's interest and using questions that facilitate social exchanges with typical peers. The study shows evidence that intervention using incidental teaching, supportive questioning and commenting on children's actions and behaviors had positive effects on engagement for young children with autism. The researcher indicated that additional research should include monitoring deviant behavior, identifying specific aspects of the physical environment and employing a wider variety of teaching tactics to improve specific outcomes (Strain et al., 1995).

Harte (2008) proposed that increased engagement decreased the likelihood of less productive behaviors. The researcher conducted a qualitative study to examine parents' perspectives of engagement of their own child with autism in the home setting. Interviews were conducted with five families of children with autism between the ages of four and ten years of age. Guided questioning was used to determine levels of engagement in the home. Questions focused on understanding how the parents defined engagement, in what types of activities their child seemed to be engaged, and how parents facilitated engagement. The findings indicated that children with autism were engaged more frequently with objects (e.g., computers, musical instruments toys,). Parents definition of engagement was based upon the child's focus on the activity, the time spent in interactions and the absence of inappropriate and/or undesirable behaviors. Further, parents indicated that they attempted to use a variety of strategies to increase engagement (e.g., providing physical activity, encouraging play and/or interactions with siblings using their child's current interest, and breaking tasks into small steps). Parents indicated that their primary goal was for their child to be more independent and to be better engaged in a variety of contexts; both inside and outside of the home.

Sensory Processing Deficits

Sensory processing disorder (SPD) is a complex disorder of the brain that appears to affect the way in which children process everyday sensory information including auditory, visual, and tactile processing (Tomcheck & Dunn, 2007). A majority of theories on autism assume that persons with autism process sensory information in a way that is different from others (Iarocci & McDonald, 2006). Documentation of SPDs are in the basic science literature, clinical literature, and first-person accounts of living with autism (Tomcheck & Dunn, 2007). The first theories on the causes of atypical behaviors among individuals with autism were based

on the observations of hypo-arousal or hyper-arousal to sensory stimuli. Many of the current theories of autism state that sensory processing abnormalities are fundamental symptoms of autism and have effects on the development of the perceptual system in children with autism. Specifically, children are easily distressed or preoccupied by innocuous sights, sounds, odors, and textures. In addition, they may be less responsive to other more meaningful sensations such as the sound of their name, and their responses to external sensory stimuli may be unpredictable (Iarocci & McDonald, 2006; Kranowitz, 2005).

Although it is not yet determined whether autism and SPD are causal, a strong correlation exists. Numerous studies have found high occurrence of sensory processing difficulty and autism. Dawson and Watling (2000) estimated that sensory processing difficulties affect 30 to 100 percent of the children diagnosed with autism. Quill (2000) reported that children with ASD oftentimes are unable to regulate the integration of sensory simulation, such as visual, auditory or tactile information. Thus, they use regulatory behaviors in an attempt to manage incoming sensory information. These regulatory behaviors can include hand-flapping, covering ears to block out sound, jumping up and down, panicking, pulling away when touched, avoiding certain textures and smells, and/or flicking their fingers in front of their eyes (Janzen, 2003). Children with ASD can also exhibit behaviors like disorganization, distractibility, and general discomfort, which may be a result of sensory processing issues (Autism Society of America, 2013). It is reasonable to expect that these complex sensory processing challenges pose a threat to how children cope with their environment (Iarocci & McDonald, 2006; Keane, 2004).

Behaviors

Two types of behaviors are common in young children with ASD: repetitive and challenging behaviors. Repetitive behavior in children with ASD are common occurrences and

may include arm-flapping, hand-flapping, finger-flicking, spinning, twirling, rocking, jumping, or a variety of complex movements. Additionally, a child may use an object repetitively, such as twirling a piece of string, flicking a rubber band, or repetitive activities involving the senses (e.g., repeatedly feeling a particular texture or smelling objects). Repetitive behavior varies from child to child to gain sensory input, (e.g., hand-flapping to evoke visual stimulation, rocking to stimulate the vestibular system). Children may use repetitive behaviors in order to reduce sensory input and/or to deal with stress and anxiety and to block out uncertainty. Other children may find that the repetitive behavior provides a source of enjoyment or a focus for attention.

Children with autism are at greater risk for challenging behaviors that additionally impede social interaction with others (Horner, Carr, Strain, Todd, & Reed, 2002). Research has indicated that children with autism use maladaptive strategies (e.g., hitting, kicking, running, crying, and screaming) more frequently than children with other developmental disorders. These behaviors often arise from difficulty in processing verbal information, hypersensitivity and hyposensitivity to activity or environment, a change in routine or physical reasons (e.g., sickness, fatigue or hunger). Additionally, children with limited communication skills often become frustrated with the inability to communicate wants and needs, understand a situation, or experience a change in routine (Kaiser & Hancock, 2003).

<div align="center">**Areas of Strength**</div>

Visual Processing Skills

Studies have indicated that children with ASD perform better on activities related to visual processing rather than those activities that require social or language reasoning (Harris, Handleman, & Burton, 1990; Quill, 2000; Siegel, 2003). Studies have focused on interventions that include a visual medium (e.g., visual supports, social stories) to improve the performance of

children with ASD. Hagiwara and Myles (1999) utilized a multiple-baseline design to determine the impact of using visual supports as a medium for teaching three elementary children with ASD daily routines in the school setting. Two children were taught appropriate handwashing and the third child was taught on task behaviors. The researchers created visual supports that were read to each child before the desired daily routine. The results revealed that the children's performance improved slightly for their independence in handwashing with the use of visual support when compared to the absence of the visual support. However, on-task behavior for the third child did not improve. Thus, visual supports appeared to be more effective for teaching a specific behavior (i.e., handwashing) versus general behavior.

Danko (2004) used a single-subject multiple-baseline design to examine the impact of using visual supports to promote the engagement of three preschools during classroom circle time. Three preschool children with autism and their classroom teachers were selected for the study. Each child teacher dyad was selected across three different preschool classrooms. At baseline, data was collected to determine level of engagement during circle time activities as teachers lead the activities as they typically did. Intervention was initiated by adding visual supports to each classroom circle time activity to support the attention and participation of each child. Teachers were provided with intervention strategies to best implement the visual supports. Visual supports were added across appropriately 20 circle time sessions lasting 15 to 20 minutes. The results suggested that visual supports facilitate both the level and quality of children's engagement with all participants showing steady gains in engagement. Additionally, the training regimen for classroom teachers was determined to be easy to provide and teachers report the use and development of supports to be practical.

High Interest in Special Topics

Many children with ASD demonstrate a unique interest in an object or topic used to facilitate engagement in a variety of routines and activities (Lanou, Hough, & Powell, 2012). Baker, Koegel, and Koegel (1998) completed a study to determine if the social behaviors of young children could be increased using their unique and/or obsessive behaviors. Three young children with autism were matched with typically developing peers to determine if using unique interest facilitated engagement. Using a multiple baseline design, children with autism initially demonstrated low levels of social interaction during play with peers. Intervention was designed by adapting social games and including the child's unique interest (e.g., a child who perseverated on maps was taught to play tag within a large map drawn on the play field). The results indicated that after creating a social game using the child's unique interest, significant gains in social interaction were shown and the gains were maintained over time and generalized to new play routines. The researchers emphasized the need to consider a child's unique interest in designing social and play activities.

Need for Routine and Structure

Most children with ASD prefer routines as these routines seem to serve an essential function by providing structure and predictability. This order appears to increase the child's ability to function. Routines support children with ASD by improving the understanding of a daily event and/or activity and may assist with managing a child's level of stress and anxiety. A child's reliance on routines may increase during times of change, stress or illness (Attwood, 1997). Dawson and Levy (1989) and Ferrara and Hill (1980) concluded that children with ASD become more socially responsive and attentive in an activity when adhering to a predictable routine. During a predictable activity, challenging behaviors decreased simultaneously with

responsiveness and attention while challenging behaviors increased when an activity was unpredictable. Kashinath (2006) examined the effects of improving generalization of parent teaching strategies for facilitating participation in daily home routines. Five preschool children with autism participated in a parent led intervention in which parents learned to embed two teaching strategies into their child's daily routines (e.g., play with toys, bath time and/or mealtime). The routines were videotaped and analysis for the parents' mastery of use of the teaching strategies. A multiple-baseline design was used to determine effectiveness. Results were positive for generalization of use of parents' teaching strategies in addition to improved communication skills for children. Parents perceived the intervention to be beneficial and the use of the home as a context to be especially meaningful to their child. The researchers reported that there was a "contextual fit between parents' strategies, children's communication goals and the identified routines" (p. 482).

The above literature has provided an overview of child factors related to ASD including the etiology of autism, the areas of deficits and the areas of strength. This information serves as a focal point when planning and providing intervention. However, it is imperative to understand the needs of children with ASD by understanding complexity and challenges of their families. Thus an overview of the familial needs, including emotional impact of diagnosis, concerns within the home, roles and responsibility of parents, as well as the home as a context for intervention will be discussed.

<div align="center">

Family Needs of Children with ASD

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Emotional Impact

A diagnosis of autism is a family affair that affects parents and siblings in a life-changing manner. Many researchers indicate that children with disabilities inevitably challenge

families by making inordinate demands on family time, psychological well-being, relationships, and economic resources (Baker et al., 1998; Higgins, Bailey, & Pearce, 2005). DeGrace (2004) examined the experience of five families and reported that parents found that their major challenge was managing the behaviors of their child with autism and attempting to defuse potential emotional outbursts. In the families studied, autism became the primary focus of the family, even to the detriment of other family members and other familial tasks and activities. Research on the level of elevated parenting stress levels for families of children with autism has been well-documented (Koegel, Koegel, Hurley, & Frea, 1992; Sanders & Morgan, 1997). Davis and Carter (2008) examined the parenting stress in mothers and fathers of 54 newly diagnosed toddlers with ASD. They found that the deficits in the toddler's social relatedness abilities were associated with overall parenting stress, challenging parent-child relationships and distress for both the mother and the father. As Bronfenbrenner (1977) described in his ecological model, the challenges that affect a microsystem, such as a family of a child with autism, also affect larger system, exosystem, (perhaps a parent's work suffers due to the strain of home life) and the macrosystem (the toll of health care costs which insurance companies are hesitant to reimburse). Thus, it is necessary to design interventions that alleviate challenges within the family that are associated with ASD.

Role of Parents

Many studies emphasize the role of parents in successful child outcomes (Bristol, 1987; Dunst et al., 1994; Robbins, Dunlap, & Plientis, 1991). The National Research Council (2009) reported that potential positive outcomes are increased when children with autism receive early intervention, when parents are involved, and when opportunities for generalization of treatment goals are provided making families an essential component of the intervention process.

Marden and Nicholas (1997) indicate that parents have a strong desire to learn about their child's health, general development, speech and language development, and behavior and desire to seek out this information from professionals, organizations, and printed materials. They emphasize that when families are actively engaged in their child's learning, powerful and positive changes occur for the parents, the child, and other professionals.

Concerns in the Home

Most families consider the safety of their child with ASD as a significant concern and must frequently make environmental changes to ensure their child's safety. Typical safety precautions and modifications are made (e.g., gates, door locks, childproofing cabinets and covering electrical outlets) during the first few years of childhood. For children with autism, these safeguards persist longer than expected and require all family members to adjust and monitor their behavior (Autism Society, 2011). Additionally, in order to meet an unmet sensory need, a child with autism may demonstrate inappropriate behaviors such as climbing and/or jumping off furniture (Autism Society, 2013).

Benefit of Home Intervention

Research highlights the challenges of families of children with autism, the need for family involvement and the benefits of intervention provided in the natural environment using daily routines (Carter, Stone, Celimli, Nahmias & Yoder, 2011; Dunst, 2000; National Research Council, 2009). Keilty and Galvin (2006) completed a study to explore adaptations that families make to promote children's learning in the home and to determine the types of supports that parents perceived to be beneficial in supporting the adaptations. The researchers completed holistic case studies on five families of infants and toddlers with developmental disabilities. Researchers aimed to determine and understand what parents were currently doing in the

physical home environment in order to enhance and promote existing strengths in the family rather than to replace or duplicate families current resources. The study included a child from each of the following age ranges: a) six to 12 months, b) 13 to 18 months, c) 19 to 24 months, d) 25 to 30 months, and e) 31 to 36 months. The range of developmental disability included two children with Down syndrome, one child with unknown etiology of developmental disability, one child with developmental disability secondary to significant medical impairment and one child with developmental disability secondary to Pervasive Developmental Disorders (PDD). There were four males and one female in the study. Data was collected regarding adaptions in the home via interviews, observations and the review of early intervention documentations. The researchers determined that families made adaptations to their goals based upon their child's developmental characteristics and environmental factors. The types of adaptations noted during parent interviews included supportive seating for children with motor delays, selecting materials and resources that expected their child to benefit from, having the child with the developmental disability complete a daily routine in an adapted way, having a sibling assist the child with developmental disability and/or having an adult assist with the activity. Although limitations of the study included solely parents' perception and recall of the adaptations that parents made, it was important to recognize that all five parents relied on their own knowledge and adapted the materials and activities in a variety of ways. Additionally, parents were able to verbalize their child's needs within the environment.

To meet the needs of individual family members and to meet the needs of the family as a whole, families organize their daily routines. By doing this, families purposely structure their daily routines to reflect the beliefs and values of their families, to meet the functional components and requirements of their life (e.g., shopping, mealtimes and work commitments)

and to meet the needs of their children (Bernheimer & Keogh, 1995; Gallimore, Weisner, Bernheimer, Guthrie, & Nihira, 1993).

Using case studies and surveys, researchers found that an average of 110 learning opportunities and/or daily routines that occur in the everyday activities for typically developing preschoolers (Dunst, Hamby, Trivette, Raab, & Bruder 2000). For children with disabilities, these learning opportunities require more effort for families as they must consider their child's unique needs. For children with disabilities, learning opportunities need to be more deliberately constructed (Bernheimer & Keogh, 1995; Dunst, Hamby, Trivette, Raab, & Bruder, 2002).

Given this, it is worthwhile to consider that families may need guidelines on how to best structure their routines and their home environment in order to adapt to the needs of their children and to facilitate learning opportunities. The specific components of the physical environment including the environmental arrangement, aesthetics, the availability and use of visual supports and the impact of safety and securing within the environment is described below.

Physical Environment

No specific research was found on the effects of the home's physical environment on children with ASD. Conversely, there has been some research on how the classroom physical environment plays an important role in preschoolers' lives, especially those with special needs (Boyd, Conroy, Asmus, McKenney & Mancil, 2008; Brotherson, Cook, Erwin, & Weigel, 2008; Colman, Frankel, Ritvo, Freeman, 1976; Duker & Raising; 1989; Goodman & Williams, 2007). Classroom elements studied include the physical arrangement and classroom layout (e.g., organization), the aesthetics (e.g., color and textures, lighting), the use of visual supports in the environment and ways to promote safety and security in the environment.

Physical arrangement. In regards to the arrangement of the physical environment in the classroom, Dukes and Lamar-Dukes (2009) stated the first step to examining the environment is to look at the arrangement of the environment. The authors reported that children "feed" off the environment which results in successful learning and enriched opportunities. Bailey and Wolery (1992) indicated that the arrangement of the environment influences how the child interacts within its environment. They emphasized that theorists, such as Skinner and Piaget, supported and agreed that the environment has a significant influence on a child's early development and education, and thus the experiences in the environment of young children and especially on children with special needs was of importance.

The importance of the physical environment in the primary classroom provides support for the relevance of modifications to the home environment. Several educators and researchers have identified the particular environmental variables that need to be present in the classroom environment. This includes organization of resources, establishing clear boundaries for activity, and providing a visually supportive and aesthetically pleasing environment (Blaska & Hasslen, 1994; Evanshen & Faulk, 2011; Goldstein, 1991; Greenman, 1998; Isbell & Evanshen, 2012; Moore, 1996). Additionally, the studies and reviews have a common theme which highlights that classroom arrangements must be interesting and engaging to children, must provide opportunities for interaction and learning, and should have a consistent routine that is predictive to the children.

Isbell and Exelby (2001) and Moore (1996) provided insight into the importance of organization of an environment. They observed that two different types of spaces should be accessible in the classroom: 1) spaces where group work is accomplished, and 2) spaces where children work alone. They concluded that if a space is too small and too many children are in

that given space, aggressive behaviors may take place, or children may socially withdraw. In contrast, if a space is too large, it was more difficult for children to pay attention and more prone to noise and confusion. Additionally, Shepherd and Eaton (1997) stated that low shelves might be useful in serving as functional space for storage since it promotes independence and makes children feel responsible for their environment (Shepherd & Eaton, 1997; White, Taylor & Vlastos, 1978).

Hwang and Hughes (2000) and Wetherby et al. (1998) report that the environment could be used to elicit a variety of communication functions and increase verbalizations. Wetherby et al. (1998) defines a communication temptation as an activity or situation designed to encourage a child to engage in a situation, verbalize a want, need or intention, or encourage participation in a social exchange. Physical environmental temptation can include placing preferred objects (e.g., toys and books) in a place that is visible but not accessible, limiting free access to food and electronics and/or providing obstacles to items of interest (e.g., locked doors and cabinets). Studies have shown that the use of environmental temptations have an impact on the increase in eye gaze, verbalizations and increase in use of communication function for requesting (Brotherson et al., 2008; Duker & Raising, 1989; Hwang & Hughes, 2000).

Aesthetics. The lighting, textures and colors in a classroom influence children's interaction (Evanshen & Faulk, 2011; Isbell & Evanshen, 2012; Ludlow &Wilkins, 2009). Several researchers indicated the impact of lighting on children's health and mood (Caples, 1996, Greenman, 1988; Shepherd & Eaton, 1997). They concluded that natural light improves health and calms a child's mood and that soft lamps and direct sunlight had the most positive effects. Greenman (1988) further suggested that fluorescent lights have a challenging impact on hyperactivity while Isbell and Exelby (2001) discussed how different types of lighting impacted

42

activity level. They found that soft lamps or indirect lighting improved attention while fluorescent lights increased challenging behaviors. In a seminal study, Colman et al. (1976) examined the impact of fluorescent and incandescent illumination on the repetitive behaviors of six young children with autism. The results demonstrated that children spent a greater amount of time engaging in repetitive behaviors and less focused time on appropriate interaction and engagement under fluorescent light.

In a report by the Kentucky State Department of Education (Goldstein, 1991), authors concluded that environments with soft materials, such as carpeting, cushions and curtains, were good for low-activity areas; whereas environments with hard surfaces allow for louder, active participation and are beneficial when working with messy materials such as paint or water. With textures and colors, Allison (1999) explored how textures are important when working with children since they tend to be hands-on with materials in physical environments. Various colors can often cause different psychological impacts on an individual. For example, red creates excitement, deep purples and greens create a more soothing or stabilized mood, and yellows are restful and easily perceived by young children (Olds, 2000).

Visual supports. As visual processing is a relative strength for children with ASD, it is widely supported that visual supports are of significant value for meeting the learning style of children with ASD (Prizant & Weatherby, 1998; Quill, 2000; Wheeler & Carter, 1998). Education practice primarily validates the use of visual supports although empirical research is growing. Johnston, Nelson, Evans, and Palazolo (2003) taught three preschool children with autism, ages 4 years 3 months to 5 years 3 months, how to use visual supports to initiate play with peers in the classroom. The visual support served as a communication means for requesting, "Can I play?" A multiple probe baseline design across the three preschoolers was used to

determine if the visual support was an effective way of teaching the children how to obtain entrance in a play activity.   The intervention used the child's current setting and materials. A peer or teacher assistant modelled "how to" give the visual support to another peer or teacher prior to entering the play area. The results showed that all participants increased their level of communication competence when requesting a peer to play and they maintained the ability to request play following intervention. Additionally, social validity measures obtained from the preschool teachers revealed that they perceived the use of visual supports as easy to use, easy to teach and that the visual support had a positive effect on children.

In addition to using visual supports as a communication tool, Quill (2000) indicated that the classroom can serve as a visual cue for helping children with autism understand expectations and routines, providing a signal as to what to do or what to say. Quill (2000) concludes that the classroom environment is an effective way to enhance and promote learning. Visual strategies can include the use of visual supports: such as pictures, symbols or photographs that show a daily routine (e.g., brushing your teeth, making a sandwich, or getting ready for school). In addition, labeling equipment and places for specific activities helps children to understand activities, increases their vocabulary and allows them to participate more fully in the environment (Meadan, Ostrosky, Triplett, Michna & Fetting, 2011). Quill (2000), further cautions that the environment can also be visually over-stimulating. Thus, vast displays on the wall can cause overload, poor attention and challenging behaviors.

A study by Massey and Wheeler (2000) provides further evidence on the efficacy of visual activity schedules. Using a multiple-baseline-across-activities design, the researchers measure the effects of using a visual activity schedule to promote on task behaviors, to increase task engagement and to decrease challenging behaviors in a preschool classroom. With the

introduction of the visual activity schedule, task engagement increased in two trained activities

(i.e., work and leisure) and generalization activities (i.e., lunch). Additionally, less challenging

behaviors decreased in one trained activity (i.e., work) and one generalization activity (i.e.,

lunch). Massey and Wheeler's (2000) study lends support to previous research on using visual

activity schedules to increase engagement and decrease challenging behaviors (Krantz, MacDuff,

& McClannahan, 1993; MacDuff, Krantz, & McClannahan, 1993). Both empirical and

educational practice provide evidence that visual supports in the environment have a positive

impact on facilitating attention (Schopler, Mesibov, & Hearsey, 1995), independence (Hodgdon,

1995, Janzen, 2003), managing challenging behaviors (Hodgdon, 1995; Quill, 2000), and

improving communication (Prizant, Wetherby, Rubin, & Laurent, 2003; Sulzer-Azoroff,

Hoffman, Horton, Bondy & Frost, 2009).

Safety and Security

Creating an environment that is safe and secure is a primary concern for young children.

This is especially true for children with ASD. Many professionals (Burton-Hoyle, 2011; Case-

Smith & Arbesman, 2008; Inan, 2009) have observed that simple environmental modifications

can have an important role in preschoolers' lives, especially those with special needs. Simple

modifications, such as having a quiet corner for overwhelmed children, or rocking chairs, and

bean bag chairs to promote sensory regulation and reduce inappropriate behaviors are noted to be

beneficial (Case-Smith & Arbesman, 2008; Inan, 2009).   Allen and Schwartz (1996) reinforce

that it is important for the physical environment to be free of any obstacles (e.g., clutter, slippery

floors, rumpled rugs) so no serious injury can take place. While Quill (2000) indicated that an

overwhelming and distracting environment had the potential for negative response to the

environment, Moore (1996) agreed and further elaborated that safety can be impeded if the

45

space is too small and too many people are in that space. Additionally, aggressive behaviors may take place causing others to withdraw socially. Alternatively, if a space is too large it will be harder for children to pay attention. Children may be negatively affected by the noise and confusion, which in turn may require more supervision. The reviewed research supports the notion that physical environments may be important elements for consideration for children with or without disabilities, although the findings relate to education settings.

Davis and Fox (1999) completed an evaluation of 43 studies that addressed environment arrangement and/or modification. The studies focused on environmental arrangement as a means to increase task engagement, facilitate prosocial behaviors and reduce challenging behaviors in children with autism in the classroom environment. Davis and Fox (1999) reported that even though research shows specific arrangement can affect child outcomes, the studies are neither theoretically or empirically integrated. The methodological problems included lack of measurement tools or control of the alteration of the environment. They strongly indicated that future research was warranted on modification and arrangement of the environment.

Again, while emerging evidence exists that environmental arrangement can have an impact on behaviors of children with autism in the classroom, only a few considered the impact of the home's physical environment on young children with disabilities. Two studies were specific for children with physical and mental impairment (Cook, Brotherson, Weigel, Garrey & Erwin, 2007; Erwin et al., 2009). Collectively, these studies used a grounded theory method to understand the impact of family and home context. Thirty families of 31 children between the ages of 3 years and 8 years were included in the study. Family participant's socioeconomic status, ethnicity, and types of home dwellings were diverse. Researchers met with families in their home for one visit and spent approximately two hours. The families participated in a semi-

structured intervention and answered questions about activities their child completed in the home. Photographs and field notes completed during the home visit provided the researchers with a detailed description for the observation measure.   Data was analyzed by coding families' resources into categories and identifying common themes. The researchers indicated that the development of early skills for children with disabilities was supported by considering the home environment. Specifically, they suggest that lighting, physical barriers in the home, auditory climate and use of space can have both a positive or challenging effect. They further describe three categories that the interventionist should consider when working with children with disabilities in the home environment: 1) engagement with the home and others, 2) choice and decision making in the home, and 3) control and regulation in the home. Engagement in the home refers to opportunities for the child to sustain focused attention, space available to play with peers and siblings, and for easy access to materials. Choice making and decision making refers to the child's ability to make changes in the physical home environment to meet personal needs. Control and regulation of the physical home environment refers to the purposeful planning of activities and the freedom to explore through personal space (e.g., space behind the couch, tents, or the child's bedroom). This information provides a guide for environmental considerations although no absolute outcomes are available. Further, the research emphasizes the importance of the interventionist attuning to the changing preferences and priorities of families while making an urgent commitment to improving children's level of independence and self-determination.

Based upon the above literature review and the lack of research on the home physical environment for children with ASD, it is hypothesized that modifications and simple changes may be beneficial in the home. Given the growing needs of children with ASD and their families,

it may be essential to observe and evaluate the home physical environments and modify or adjust the home in order to create increased opportunities for learning.

Summary

ASD is a complex disorder, which affects all areas of a child's life and in turn the lives of their families. Given this, it is essential to consider the types of intervention, the interventionist and the context in which the child learns. This is not only true for the child's education setting, but clearly, we must better understand the impact of the physical home environment on a child's communication development. The physical environment, both specific and broad aspects, shows a potential for influencing the engagement and interaction of children with autism in educational settings.

Studies have been conducted to examine communication intervention in the physical home environment (Dunst et al., 1994; Solomon, Necheles, Ferch, & Bruckman, 2007), the impact of parent training programs (NRC, 2009; Sussman, 1999), and the role of the physical environment in the classroom for the young child with and without disabilities (Inan, 2009; Isbell & Exelby, 2001; Moore, 1996). However, these studies did not examine specific modifications appropriate for the home physical environment, or the impact on a child's engagement or presence of challenging behaviors related to modifications.

Additionally, the physical home environment is a crucial part of a family's life. It is important for all members to experience peace and comfort there. When a family has a child with autism, it may be more challenging for them to find peace and comfort, thus causing stress for the entire family. Typical interventions require parents to take their child to the interventionist and to try to implement the professional's suggestions at home, while also managing the usual aspects of running a household. Based on the reviewed studies, it seems that modifications to the

physical environment of the home for children with ASD may improve the communication outcomes for children with ASD and their entire family system. Therefore, it is the intent of this research to determine if modifications to the home have a significant impact on the frequency of engagement and the decrease in challenging behaviors.

The purpose of Chapter 2 was to provide information on the characteristics of autism, the impact of autism on children and their family and an understanding of how the environment may serve to address these concerns. Chapter 3 provides the research methodology used to understand the impact of the physical home environment on children with autism and their families.

CHAPTER 3

METHODOLOGY

Overview

The aim of this study was to determine the impact of physical modifications in the home environment and physical modifications plus visual supports on engagement and challenging behaviors in children with ASD. The homes of three male children diagnosed with ASD were modified to examine these effects. The frequency of engagement and the occurrence of challenging behaviors were measured during daily play routines. The research design, setting, participants, research measures and interventions (i.e., physical modification and physical modifications plus visual supports) for this study are described.

Research Design

This study used a nonconcurrent multiple-baseline single-subject design (SSD) across participants to examine the efficacy of modifications and modification plus visual supports to the home physical environment on the frequency and level of engagement and frequency of challenging behaviors occurring during play routines in the child's home. A momentary time sampling method was used to measure the frequency of engagement and challenging behaviors during baseline, Treatment 1 and Treatment 2 and follow-up phases. A nonconcurrent multiple-baseline design across participants allowed the researcher to apply interventions to all participants without a staggered delay, thus allowing each participant to receive needed intervention without the delay as is customary with concurrent multiple-baseline designs. Though this method lacks experimental control, it is more conductive in applied settings, thus allowing for improved flexibility in recruitment of participants and portability within family settings. Additionally, it allowed the researcher to compare the effects of the intervention at

different points across time and participants (Watson & Workman, 1981; Wheeler & Richey, 2014). The use of nonconcurrent multiple baseline across participants reflects a series of A-B designs implemented with delay unlike a traditional multiple-baseline design. An important aspect of this design is it allowed for the intervention to be implemented in a timely manner, which is most important when considering the detrimental effects of delaying an intervention for children who experience challenging behaviors and/or lack appropriate engagement (Wheeler & Richey, 2014).

Single-subject designs allow researchers to focus on the individual and to view each individual as his or her own control while effectively describing an individual's behaviors and responses in varied contexts (Busk & Marascuilo, 1992; Gast & Ledford, 2010; Odom et al., 2003). The design allows for the continuous observation of change in behaviors throughout the intervention and allows for modification to intervention procedures to fit each participant's needs without affecting the validity of the study. The SSD provides a visual representation that allows the researcher to inspect trends in behaviors and patterns of responses and to detect clinically significant gains, regardless of statistical significance (Richards, Taylor, Ramasamy, & Richards, 2000; Wheeler & Richey, 2014).

The intervention studied in this research consisted of two components: first, physical modifications (e.g., defined space for learning, organization of space and materials) and second, the addition of visual supports (e.g., "how to" schedules, first-then boards and choice boards). Parent instruction on purpose of the physical modifications and use of visual supports (i.e., place visual in high traffic area, bring child's attention to the visual, show the visual prior to interacting) within the homes of the three children was additionally provided. The Physical Modification Home Guide and the Visual Supports Home Guide are located in Appendix B and

Appendix C, respectively, and were used to provide parent(s) the types of and rationale for physical modifications and visual supports that were considered for implementation. The specific physical modifications made and the visual supports incorporated were based upon the child's home environment and family routines.

Setting

This study was conducted in the home environment for each child. Each child's parents agreed to the environmental modifications and the addition of visual supports to the home environment, and participated in individualized daily play routines. The researcher was a doctoral candidate in the Early Childhood Education Ph.D. program and had 20 years of experience as a practicing speech-language pathologist providing intervention for children with communication disorders related to autism. One master's level graduate student in speech language pathology served as a research assistant. The research assistant supported the researcher with implementing modifications to the child's physical home environment, developing visual supports and with data collection. This research assistant assisted with interrater reliability. An additional graduate student, who served as a research assistant, was unfamiliar with the study and completed the treatment fidelity checklist.

Informed Consent

Upon approval from the ETSU Institutional Review Board (IRB), participant recruitment was initiated. The Informed Consent (See Appendix A) was provided to parents of children participating in the study. Parents received details of the study and were ensured that participation was voluntary. The researcher provided a thorough description of the purpose and the procedures of the study to the parents and answered all questions.

Participant Privacy and Confidentially

The primary investigator ensured confidentiality though exclusive access to participant information. Information collected was stored in accordance with the Institutional Review Board standards. Collected information included demographic information, pre- and post-measures of modifications, videos, notes from interviews, and pre- and post- photos of modifications and visual supports.

Participants

A nonprobability convenience sample of children diagnosed with ASD who received therapy at local speech and language clinics were recruited for this study. Nonprobability convenience sampling was appropriate as it provided a timely, inexpensive method for recruiting a disorder population in which treatment is warranted (Wheeler & Richey, 2009). The participants chosen for the study demonstrated deficits in both engagement and challenging behaviors indicating a need for treatment. Three children with ASD and their families met criteria for enrollment in this study. A minimum of three participants are needed for a single subject design to be efficacious (Lonigan, Elbert, & Johnson, 1998; McReynolds & Kearns, 1983). Inclusion criterion was established for both participation and environment. Inclusion criteria for participation included the following: (1) chronological age from 3 years through 6 years, (2) diagnosis of ASD by a developmental pediatrician or a child psychologist, and (3) a severity rating of moderate to severe on the DSM-IV or Level 1 or Level 2 according to the DSM-V severity rating for autism (American Psychiatric Association, 1994; American Psychiatric Association, 2013). Additionally, participants demonstrated communication delay as indicated by current speech and language assessment. Table 1 displays participant criteria.

Table 1

Description of Participants

Participant	Gender	Severity Level	Age	Communication Means	Communication Intents
Child 1	M	2 (DSM-IV)	4.4	Gestures, behaviors, single word	Protest and Request
Child 2	M	2 (DSM-IV)	3.2	Gestures, four signs	Protest and Request
Child 3	M	Moderate (DSM-V)	4.11	Gestures, behaviors, CV vocalizations	Protest and Request

Note: M: male; DSM-IV: Diagnostic Statistical Manual: 4th Edition; DSM-V: Diagnostic Statistical Manual: 5th Edition; CV: Consonant vowel

Inclusion criterion of the physical environment was: (1) absence of organizational, supports, 2) absence of a defined learning space, 3) absence of visual supports, 4) researcher observation that modification had the potential to increase engagement and decrease challenging behaviors, and 5) parents' allowance of modifications of their physical environment and the willingness to maintain the environment for the duration of the study. Home environment inclusion required the home environment to meet specific criterion that demonstrated the lack of organization, visual supports, and/or learning space. Environmental criteria are displayed in Tables 2, 3, 4 and 5. To qualify for inclusion in the study, homes needed to demonstrate two of four organizational supports as absent (refer to Table 2).

Table 2

Organizational Supports

Organizational Supports		Occurrence	
		Present	**Absent**
Storage containers used and clearly visible	Child 1		X
	Child 2		X
	Child 3		X
Open space for child's movement	Child 1		X
	Child 2	X	
	Child 3		X
High interest items designed to need adult assistance	Child 1		X
	Child 2		X
	Child 3		X
Play items of unique interest are available	Child 1	X	
	Child 2	X	
	Child 3		X

Further, to qualify for the study homes needed to demonstrate one of two learning space criteria as absent (refer to Table 3). To provide additional information for the environmental modification plan, sensory components were recorded (refer to Table 4). Although the information was not an inclusionary criterion, it provided the researcher with information related to the sensory environment.

Table 3

Learning Space

Learning space		Occurrence	
		Present	**Absent**
Defined place for learning	Child 1		X
	Child 2		X
	Child 3		X
Defined place for sensory breaks	Child 1		X
	Child 2		X
	Child 3	X	

Table 4

Sensory Components

Sensory Components		Occurrence		
		Yes	**No**	**N/A**
Soft items	Child 1			X
	Child 2			X
	Child 3	X		
Free access	Child 1			X
	Child 2			X
	Child 3	X		
Child control	Child 1			X
	Child 2			X
	Child 3		X	
Clean and safe	Child 1			X
	Child 2			X
	Child 3	X		
Private space	Child 1			X
	Child 2			X
	Child 3	X		

Note: N/A indicates the home had no defined place for learning or sensory breaks; therefore, no sensory components were present

Finally, homes needed to demonstrate three of five visual supports as absent (refer to

Table 5) to be included in the study.

Table 5

Visual Supports

Visual Supports		Occurrence	
		Present	**Absent**
Daily schedule(s)	Child 1		X
	Child 2		X
	Child 3		X
Play choices	Child 1		X
	Child 2		X
	Child 3		X
Self-care	Child 1		X
	Child 2		X
	Child 3		X
Play procedures	Child 1		X
	Child 2		X
	Child 3		X
Material label(s)	Child 1		X
	Child 2		X
	Child 3		X

Measures

The following measures used in the research project are discussed in the subsequent

paragraphs. The purpose of the measurement, information gained from the measurement and

how measurement tools were developed will be discussed.

Assessment Measure 1: The Evaluation of the Home Environment for Children with ASD

The Evaluation of Home Environment for Children with ASD (Appendix D) was used to

examine the features of the home environment. First, the presence of physical modifications

(i.e., containers for organization, open space for movement, high interest items out of reach of

child, and items that were unique to child's interest) was documented. Second, the presence of a

defined place for learning and the presence of the following features within a defined place were

recorded: sensory items available, free access to space, limited distractions, space that is clean,

and a quiet area. Notes were taken that provided information on lighting, and visual and auditory distractions. Following the observation of the physical modifications and defined place, the presence or absence and/or use of visual supports was recorded. Lastly, a rating of overall visual clutter was made. The researcher indicated if the particular environment feature was present and provided any comments to describe the environment. The tool provided a description of the environment that contributed to the determination of needed modifications. The Evaluation of the Home Environment was a researcher-developed measure. Content validity was established through the primary investigator's experience in appropriate environments for young children and literature supporting the role of the environment on children with special needs. The measure was validated by the early childhood professor who served as the dissertation chair, has 15 years of experience teaching courses on appropriate learning environments for children, and has published two books on learning environments. Additionally, the educator has 17 years' experience in the public school system serving typical and atypical students in a variety of learning environments. Further, the measure was validated by a pediatric occupational therapist and professor who has 15 years' experience in the treatment of children with ASD and who has authored two books on learning environments. The Evaluation of the Home Environment for Children with ASD was administered during the assessment phase and prior to the first follow up.

Assessment Measure 2: Parent Rating Scale of Participation in Home Routines

The Parent Rating Scale of Participation in Daily Routines (Appendix E) was developed to assess the child's participation in home routines (i.e., play, self-care, meals and snack time) and to capture the child's unique interests. In regards to play routines, the parent was asked to identify five preferred toys and five non-preferred toys and indicate if the toy was played with in

a typical (e.g., using a bottle to feed a baby doll) or atypical manner (e.g., lining up toys without interest in play).   In regards to daily routines (i.e., self-care, meals and snacks), the parent selected the degree of independence (i.e., child does independently, child can do with verbal directions, child can do with verbal directions and physical cues, or child is unable to do). If the routine is not part of the family daily activities, the parent selected non-applicable. The Parent Rating Scale of Participation in Home Routines (Appendix E) was used to understand the context (i.e., play routine or daily routine) in which modification(s) were made and visual supports were developed. The Parent Rating Scale of Participation in Home Routines was a researcher-developed measure. Content validity was established through the primary investigator's experience in the play development of young children and was further validated by the early childhood professor and dissertation chair.   The rating scale was administered during baseline.

Treatment Measure 1: The Individual Child Engagement Record-Revised (ICER-R)

The Individual Child Engagement Record-Revised (ICER-R) (Kishida et al., 2008) (Appendix F) was used to record individual child engagement. In a 2008 study by Kishida et al., inter-observer reliability of the ICER-R was examined by calculating levels of agreement between observers, and coding video-clips of children with special needs engaged in three types of routines (i.e., mealtimes, free play and group structured play). Kappa coefficients with positive overall percent agreement were achieved for the codes. A statistically significant correlation was found between data gathered using the ICER-R and the E-Quall III, a gold standard tool, when comparing level of engagement. The ICER-R was found to be a valid and reliable measure in early childhood settings for measuring engagement in children with special needs. Although the assessment tool was not developed for use in the home environment, this

researcher spoke with the assessment developers who indicated it to be a useful tool for measuring engagement in other contexts (Y. Kishida, personal communication, May 13, 2015).

The ICER-R consisted of three distinctive components: a) direct observation for periods of 10 minutes using 15-second momentary time sampling, b) an anecdotal running record, and c) a rating scale. Using predetermined codes, direct observation allowed the researcher to record engagement type and any physical prompts provided. The types of engagement were classified as passive engagement, active engagement, active non-engagement and passive non-engagement. The ICER-R provides a tally for whether a physical prompt was provided; however, this information was not obtained for the study purpose. The rating scales were completed following the conclusion of the direct observation, and the researcher rated overall engagement, frequency and quality of interaction, and frequency of repetitive behaviors. This tool was used to collect data at baseline, Treatment 1 and 2, and follow up to measure changes in the child's engagement across treatment sessions.

Treatment Measure 2: Challenging Behavior Record

The Challenging Behavior Record was developed by the researcher to expand upon the ICER-R (Kishida et al., 2008) and to tally the occurrence of the following challenging behaviors: hitting, crying, roaming, throwing, biting, or protesting with the intent of avoiding interaction or participation in an activity. Comprehensive definitions of the behaviors are found in Appendix F. The occurrence of challenging behaviors was coded every 15 seconds for a total of 10 minutes. The Challenging Behavior Record (Appendix G) was used to track challenging behaviors that occurred as the result of a communication breakdown, functioned as an attempt to communicate, served to control others, and/or avoid or escape a situation. The tool was used to

collect data and was completed at baseline, Treatment 1 and 2, and follow up to measure changes in the child's challenging behaviors across treatment sessions.

Social Validity Measure: Post-Modification Parent Interview

The Post-Modification Parent Interview (Appendix H) was used to determine parents' perception of physical modifications and visual supports on their child's daily play routines. Guided questions and review of pre- and post-modification was used to gain information on the parents' perception of change in their child's engagement and challenging behaviors. The post-modifications interview included four areas (i.e., environment, engagement, behavior and other) with two to four open-ended questions per area. Questions included opportunities for the parents to describe the impact of modification and addition of visual supports on self and child, to expand on positive and negative perception of modifications, to discuss the child's engagement and behavior in the modified environment, and to describe their personal thoughts and/or feelings related to the modifications. The post-modification interview occurred after follow-up session two.

Procedures

The procedures in the current study are illustrated in Figure 1. Each phase of the study will be discussed including: a) pre-treatment assessment and environment modification plan, b) baseline, c) Treatment 1 (physical modifications), d) Treatment 2 (physical modifications and visual supports), and e) follow up. Details are provided on measures of social validity, reliability and treatment fidelity.

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│        Pretreatment Assessment and Enviromental Modification Plan     │
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│                      Baseline Data Collection                         │
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│                 Treatment 1: Physical Modification                    │
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│          Treatment 2: Physical Modification + Visual Supports         │
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│                            Follow up                                  │
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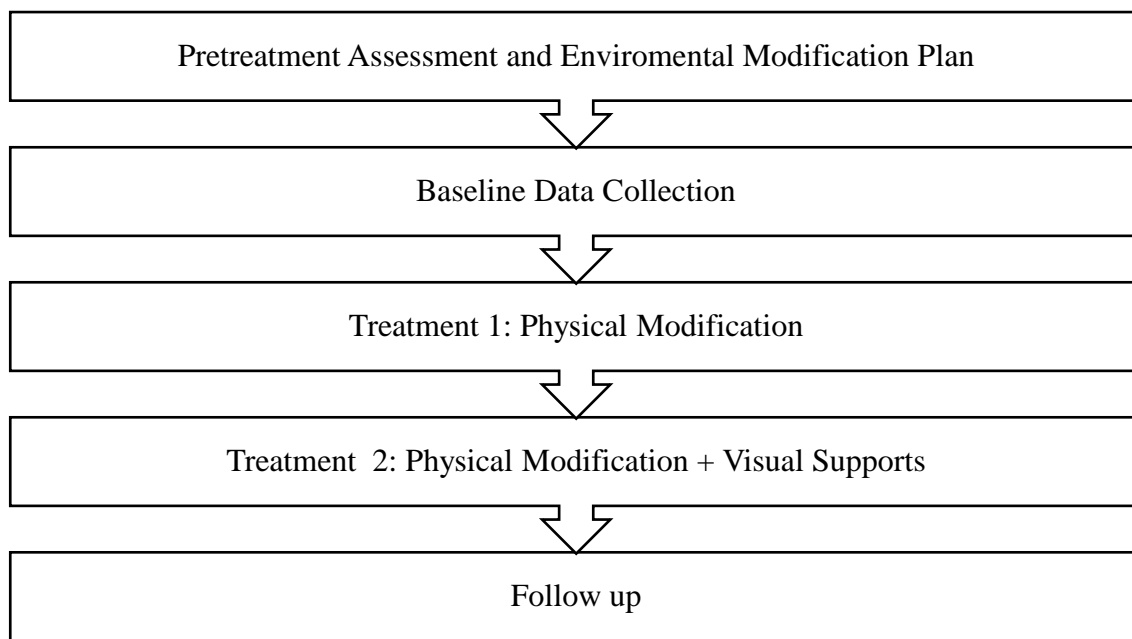
Figure 1. Data Collection Flow Chart for Participants

Phase 1: Pre-Treatment Assessment and Environment Modification Plan

The pre-treatment assessment and environment modification plan served three primary functions: obtaining descriptive information on the current home environment (independent variable), determining specific modifications needed, and determining the child's current play routines. Determining play routines provided the researcher needed information on play items to include in the environmental modification plan. After obtaining parental consent, an observation of the child's home environment and the administration of the Evaluation of the Home Environment for Children with ASD (Appendix D) and informal parent interview were completed. The researcher completed the Evaluation of the Home Environment for Children with ASD (Appendix D) to identify the presence or absence of organization of the child's materials and resources including features in the environment that support learning for children with ASD (i.e., availability of sensory items, organization of toys and materials, and child's calming place in the home) (Quill, 2000). The first area observed and rated by the researcher

was the overall organization and accessibility of materials. The researcher recorded the presence or absence of organization of the child's play items and documented if labels and pictures identified items. Additionally, the accessibility of appropriate play items was noted and recorded including the availability of high interest toys, the availability of play items that promote interaction, and play items that include the child's unique interests. Documentation of the availability of open space for child movement was also recorded. Additionally, the researcher documented features in the environment that supported learning. The researcher noted and documented if a defined place for learning and/or a defined sensory place was available. If so, the following features of the space were noted: (a) the availability of sensory items, (b) the child's free access to the space, (c) the ability to change the space, (d) to determine if the space was safe and clean, and (e) to determine if the space was relatively private. A description of lighting (e.g., natural, fluorescent, incandescent, etc.) in the home was noted, followed by a list of other physical modifications, if applicable.

The second area observed and documented was the presence or absence of visual supports. Specifically, if visual supports were available to depict daily schedules, allowed for choice making, and provided a visual representation for the procedure for self-care and play. If visual supports were available, the researcher documented when the visuals were accessible to the child, if they were located in an appropriate area, and if the visuals were on a neutral surface in order to eliminate distraction. Further, the researcher rated the visual clutter in the child's primary learning space as no visual clutter, minimal clutter, some clutter and significant clutter.

Further, the researcher took photographs to document the current physical environment. The photographs were presented to the chair of the dissertation committee who specializes in classroom environments and an occupational therapist (specializing in environments for children

with autism) to determine an optimal environmental modification plan. The photographs, along with Evaluation of the Physical Home Environment (Appendix D) administered during pre-treatment, were used to document the arrangement of toys, furniture and objects within the environment, the presence or absence of visual supports, and the presence and quality of a defined space for calming and/or learning.

In summary, results of the Evaluation of the Home Environment for Children with ASD (Appendix D), an observation and informal parent interview served as a guide for the researcher in determining if modifications and visual supports were needed in the environment to support play and/or daily routines.

Phase 2: Baseline Data Collection

After the completion of the assessment of the home environment, baseline data were collected using the ICER-R and the Challenging Behavior Record. The ICER-R and the Challenging Behavior Record determined pre-treatment levels of the dependent variables (engagement and challenging behaviors) in the physical home environment (independent variable).

The ICER-R (Kishida et al., 2008) measured the frequency and type of engagement during the daily home activities (i.e., play, and/or snack routines). The researcher instructed the parents to engage with their child in the way they typically do during any of the play routines recorded on the Parent Rating Scale of Participation in Routines (Appendix E). The parent was encouraged to get the child's attention and to attempt to engage the child. If the child left the activity or designated room in which the activity was taking place, the parent was instructed to provide a verbal prompt to return. If the child did not respond to a verbal prompt, the activity was discontinued and a second parent-initiated routine was presented. If the child did not

respond to the second parent-initiated routine, the activity was discontinued and the third parent-initiated routine was presented. If the child did not respond to the third parent-initiated routine, data collection for the ICER-R was discontinued. On the second day of baseline, the same procedure was followed, however, the presentation of the routines was adjusted with the last routine being targeted first or the routine that was discontinued targeted first in order to elicit a variety of play activities. The ICER-R was used to observe and record frequency, type of engagement and challenging behaviors. The specific child data included: 1) number of times the child was engaged or non-engaged with the adult using behaviors that are contextually appropriate during a 10-minute time frame, 2) the type of engagement (i.e., passive or active engagement), and 3) the routine in which engagement or challenging behaviors occurred. As prescribed by the ICER-R (Appendix F), behaviors were tallied for 10 minutes at 15-second intervals using a partial interval scoring procedure. Each play and/or daily routine varied, although similar, with different activities and materials. Baseline measures, using the ICER-R, were obtained until a consistent baseline of engagement during routines was demonstrated. The baseline measures allowed the researcher to ensure that changes to engagement following treatment could be attributed to the physical modifications and/or physical modification plus visual supports.

Finally, to provide a more specific understanding of types of behaviors, data was further collected using the Challenging Behavior Record (Appendix G). The number of challenging behaviors used to avoid interaction or participation in the play routine was tallied (i.e., hitting, crying, roaming, throwing, biting, or protesting). The data was recorded using the same play routines. Thus, the ICER-R (Appendix F) and Challenging Behavior Record were recorded simultaneously during the chosen routines. At each 15-second partial interval, the researcher

indicated "yes" or "no" as to the presence of a challenging behavior. If the researcher indicated "yes", the specific behavior occurring was circled on the data sheet (i.e., hitting, crying, roaming, throwing, biting, protesting). The data was collected for 10 consecutive minutes at 15-second partial intervals across the routines.

Following the final baseline session, the Parent Rating Scale of Participation in Home Routines (Appendix E) allowed the researcher to determine the types of play and daily activities the child completed in the home and the degree of success the child had in completing the activity independently. Parents were instructed to indicate up to five preferred and five non-preferred toys that were currently available in the child's home environment and whether the toys were played with in a typical (e.g., throwing a ball back and forth with another person) or atypical (e.g., child prefers to line up blocks during play) manner. If parents were unsure if the play was typical or atypical, the researcher provided assistance. After parents completed the play section of the Parent Rating Scale of Participation in Routines (Appendix E), they completed the daily routines section. In this section parents rated the child's level of independence on five self-care activities and four meal and/snack time activities. Self-care activities were: brushes teeth, washes hands, goes to the bathroom upon request, brushes hair, and bathes or showers without difficulty. Meal and/snack time activities were: sits at table during meals, uses age-appropriate utensils, requests needed items (e.g., more food) and demonstrates age-appropriate manners (e.g., please, thank you, taking turns).   The parent indicated whether the child completed the routine independently, completed the routine with verbal directions only, completed the routine given physical cues (e.g., hand over hand) or indicated that the child was unable to perform the activity. If the activity was not part of the child's daily routine, the parent selected not applicable.

The Parent Rating Scale of Participation in Daily Routines (Appendix E) allowed the

researcher to determine the play activities in which engagement and challenging behaviors were

documented and to determine the environment evaluation plan, physical modification and visual

supports to be implemented. Specifically, the researcher selected three to four play routines from

the scale in which the child demonstrated difficulty. Play routines were selected if a preferred

toy was played with in an atypical manner (e.g., spinning wheels on a car) or if a preferred or

non-preferred toy was a developmentally appropriate play item and offered an opportunity for

parent and child engagement.   A daily routine was selected if the skills (i.e., self-care and

meal/snack time) were noted to be of significant concern to the parent or if the daily skill offered

opportunity for engagement. The routines selected by the researcher included two to three play

routines for one child and two to three play routines and a snack routine for the other two

participants. The flexibility of play and daily routines used allowed for three considerations: a)

child's interest, b) parents' desire in selection of routines in which the modifications would occur

and, c) researcher selection of developmentally appropriate activities to implement to facilitate

engagement. The rating scale served as a guide for determining routines in which engagement

and challenging behaviors were measured.

Phase 3: Treatment 1: Physical Modifications

Treatment 1 included three defined components: 1) implementing the environmental

modification plan, 2) providing parent awareness training on the implemented plan, and 3)

collecting data on the play and daily routines following the modification. The three components

are detailed below:

Modifications. The purpose for each modification in the home was to increase structure and predictability while meeting sensory needs with the intent of decreasing challenging behavior and increasing opportunities for engagement. Physical modifications structured the environment for four specific purposes: 1) in order to prompt understanding (e.g., placing items that are commonly used together); 2) increase independence (e.g., age-appropriate toys and manipulatives); 3) facilitate interdependence (e.g., placing toys and materials in areas to facilitate interaction between parent and child); and 4) create a defined space for learning (i.e., having a quiet and comfortable space for regulating behavior and/or addressing sensory needs and providing a context for completing play routines). Modifications included placing children's personal items on shelves, in baskets and labeled containers; creating open spaces for play and movement; making accessible or limiting accessibility to play/toys items; providing play items that promote interaction and/or including play items specific to the child's unique interest. Additionally, a space for learning included creating a defined area in the home for a sensory break or to play (e.g., tent or enclosed area, placing soft pillows or sensory items in the child's preferred place, providing soft lighting, and eliminating visual clutter from the space).

Each child's physical home environment was distinctly different from the other participants. Consequently, different play routines and activities with varied materials were available. These natural variations resulted in physical modifications that were unique to each home. Modifications were similar across home settings, although not identical. Photographs of pre- and post-modifications permitted the researcher to discuss the similarities and differences in the data analysis phase. During the modifications, it was important to consider, in coordination with the parents, how each modification would appeal to their child. The resulting specific modifications for each home are included in Chapter 4.

Parent awareness training. Parent awareness training allowed the researcher to describe how the modification was appropriate in the home environment, how best to use the families' current materials and resources, and how to present the modifications to the child. The Physical Modification Home Guide (Appendix B) was a researcher-developed tool used to provide type of modification and rationale for modification. Additionally, at the beginning of each treatment session, the parent was reminded to maintain the essential components of the physical environment:

- Play in the defined play area (e.g., table, playroom, living room) for as long as possible

- When possible, place two or fewer toys in child's sight during the play

- Be the "keeper" of toy parts

- Clear toys/activities away before preceding to new play routine

- Offer child a defined sensory space if upset or distracted

The reminder was provided once, and parents did not receive any feedback if the components were not maintained.

Data collection for treatment 1. Following modifications, data was collected using the ICER-R (Appendix F) and the Challenging Behavior Record (Appendix G). Data collection occurred during six to nine home observations lasting 30 to 60 minutes in duration. The parent chose two daily and/or play routines as identified on the Parent Rating Scale of Participation in Home Routines (Appendix E). Prior to each treatment session, a brief parent awareness training was initiated with the parent to review the purpose of the environment arrangement for the specific play routine chosen (e.g., placing toys of interest out of reach to facilitate the need for the parent to provide assistance to the child, decreasing overstimulation by having only one to

two play items available for the child or exposing the child to pictures/words on the transparent

containers to increase predictability). The parent was then asked to begin by inviting the child to

play and/or to participate in a daily routine. If the child refused to participate in the routine, data

collection was discontinued, and the second routine was initiated. If the child refused to

participate in the second routine, the session was discontinued. Adjustment to the physical

modification for the routines was made if deemed appropriate, and additional modifications were

documented. For data collection, the researcher selected an area in the home so that the parent

and child were in visual proximity of the observer, but the observer was not intrusive to the

activity. The researcher collected data on engagement and challenging behaviors according to

the protocol of the ICER-R (Appendix F) and the Challenging Behavior Record (Appendix G).

Additionally, the routines were videotaped to allow the researcher to review engagement and

challenging behaviors that were missed during observations. A percentage of the videotaped

play routines were reviewed by a trained research assistant for interrater reliability. A second

research assistant unfamiliar with the study completed a treatment fidelity checklist to determine

the consistency of treatment across sessions.

Data were reviewed following each home observation and graphed for both engagement

and challenging behaviors to allow for visual analysis of the data. As SSD relies on visual

analysis of the graphed data, the slope, trend, and mean of graphed data were observed. To make

a decision about the introduction of Treatment 2, the trend of data was specifically considered.

First, the direction of the behaviors (i.e., engagement and challenging behaviors) was observed to

determine increase in the occurrence, decrease in the occurrence, or no change in the occurrence

of the behaviors. Once the data reached a level of stability across three to five observations with

either increase, decrease, mixed trend in engagement and challenging behaviors, or no change in

occurrence of the behaviors (i.e., engagement and challenging behaviors), Treatment 2 was implemented. Implementation for Treatment 2 varied across participants dependent on learner performance as indicated by the data.

Phase 4: Treatment 2: Physical Modifications + Visual Supports

Treatment 2 included three defined components: 1) developing and placing visual supports; 2) providing parent awareness training on the visuals; and 3) collecting data on the play and daily routines using the visuals. The three components are detailed below:

Visual supports. Visual supports were implemented as a means of enhancing the environmental modification and to provide a picture representation of the play and/or daily routine. Visual supports were determined based upon the results of Evaluation of the Home Environment for Children with ASD (Appendix D), data from Treatment 1 (i.e., if level of engagement or challenging behaviors resulted in minimal change or if no change occurred) and current literature on the use of visual supports for children with ASD.   The rationale for the selected visual supports was provided to parents (Appendix C) and was individualized to the child's specific needs. Visual supports were used to increase the child's attention, understanding and participation in daily routines. Although the specific visual supports and parent awareness varied slightly given child play and/or daily routines, criterion for general visual supports and parent awareness was consistent.

The visual supports used aimed at promoting a better understanding of daily routines (i.e., schedule of daily events, visuals indicating the steps of a routine, or demonstration of self-care tasks), promotion of choice making (i.e., use of choice board) and a description of social expectations (i.e., script for what to say or do in a social situation, or showing steps in play). Additionally, visual modifications included continued awareness of minimizing visual clutter

71

and/or placing visuals in a less distracting area. Specific information on the visual supports on each home will be described in Chapter 4.

Parent awareness training. Parent awareness related to visual support modification was provided using the Visual Support Guide (Appendix C). This allowed the researcher to describe how the visual supports would be appropriate in the home environment, how best to integrate the visual supports into play and/or daily routines and how to present the visual supports to the child. In addition, strategies for introducing the visual support and/or showing how to use the visual support were provided. These included showing and reading the visual support to the child, pointing to the visual support, and/or modeling how to complete the task using the visual support. Additionally, at the beginning of treatment sessions, the parent was reminded to incorporate the visual supports into the physical environment by:

- having visual support available during the play and/or daily routine and,
- referencing the visual support prior to the play and/or daily activity by "pointing, showing and/or commenting.

Reminders were not provided for the essential components of the physical environment and were only provided at the beginning of the treatment for visual supports.

Data collection for treatment 2. Following the addition of visual supports to the home environment, data was collected using the ICER-R (Appendix F) and the Challenging Behavior Record (Appendix G) using the same procedure as in Treatment 1. Data collection ranged between six to nine home observations lasting 30 to 60 minutes.   Parents were instructed to complete the daily activities and play routines from Treatment 1 using the visual supports provided to increase comprehension and/or participation in the routine. The parent did not have to use the same play routine as used in Treatment 1; however, they were encouraged to use a

similar play routine (e.g., varied puzzle types, books or game). If the child refused to participate in the routine, data collection was discontinued, and the second routine initiated. If the child refused to participate in the second routine, the session was discontinued. As in Treatment 1, the researcher and/or research assistant selected an area in the home so that the parent and child were in visual proximity of the researcher but the researcher was not intrusive to the activity. The researcher collected data on engagement and challenging behaviors according to the protocol of the ICER-R (Appendix F) and the Challenging Behavior Record (Appendix G). Additionally, the routines were videotaped to allow the researcher to review engagement and challenging behaviors for interrater reliability.

Data were reviewed following each home observation and graphed for both engagement and challenging behaviors and to allow for visual analysis of the data. Once the data attained a level of stability (i.e., across three to five observations), Treatment 2 was discontinued.

Phase 5: Follow up

The follow-up phase was used to determine the following: 1) the maintenance of the environmental modifications; 2) current level of engagement; and 3) the frequency and types of challenging behaviors. Follow up occurred after one month and two month intervals following the discontinuation of Treatment 2. The researcher completed the ICER-R (Appendix F) and the Challenging Behavior Record (Appendix F) during a play and/or daily routine during both visits and maintained the same procedures as previous treatment session. Collected data was analyzed in comparison to the previous data points.

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Social Validity

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To promote qualitative social validity (e.g., acceptability and satisfaction with the treatment), a parent interview was conducted. The interview provided a rich description of the

parents' perception of the impact of the modifications and visual supports in the home environment. The parent interview was conducted at the conclusion of the study using the Post-Modification Parent Interview (Appendix H). The Post-Modification Parent Interview used open-ended questions and reviewed pre- and post-modification to elicit responses from parents regarding their perception of the home environment. Parents' responses were written by the researcher and reflected back to parents to provide an opportunity for the parents to elaborate or to clarify responses. The interview was conducted face-to-face in the home. The Post-Modification Parent Interview's guiding questions (Appendix H) ensured that each interview provided the opportunity to explore and support the parents' ability to describe their thoughts and ideas related to the environment and the child's engagement and challenging behaviors. The parent interview allowed for the parent and researcher to review and discuss photo documentation of the modifications, to ask questions about the modifications and/or visual supports and to discuss desire for additional modifications and/or visual supports.

Reliability

Reliability of this study was ensured in two primary ways. First, all measures (i.e., ICER-R, Child Behaviors Record Scale and Post-Modification Parent Interview) were scored by the primary investigator. This consistency ensured that all data was scored in a uniform manner. In addition, inter-observer agreement was determined from 20% of the ICER-R and 20% of the Challenging Behavior Record data. The research assistant rated the data independently across baseline, Treatment 1, and Treatment 2. The research assistant completed a five-hour training on the ICER-R and 2-hour training on the Challenging Behavior Record. In addition, the research assistant had over 100 hours of clinical training in working with children with autism. Overall agreement was calculated by dividing number of agreements by the total number (agreement

plus disagreements) and multiplying by 100. The mean of the inter-observer agreement was

94.7% for total engagement and 90% for challenging behaviors.

Treatment Fidelity

Treatment fidelity was measured to ensure that the treatment implementation was

provided as designed. A treatment fidelity checklist (Appendix I) was used to determine the

extent to which essential elements of the treatments were maintained during the study.

Treatment fidelity data was collected by observing the environment during play and/or daily

routines across Treatment 1 and Treatment 2. The essential elements measured for Treatment 1

included: a) treatment conducted in focused or designated play area, b) materials in the general

play environment that were removed were organized in clear containers or on shelves, c) two or

less toys were placed in the child's direct sight during play routines, d) parent maintained control

of toys parts (e.g., pieces of puzzles), e) toys and/or activities were cleared away before new toys

were offered, and f) the child was directed to a quiet/calm place when upset or distracted. For

Treatment 2, two additional essential elements were included on the fidelity checklist: a) visual

supports were available during the play activities, and b) the parent referenced the visual support

prior to or during play by pointing, showing or commenting on the visual. Each essential

element was recorded as "yes" (the essential element occurred), "no" (the essential element did

not occur), or not applicable. The overall score was calculated by adding all the "yes" check

marks and dividing by the number of "yes" and "no" check marks, then multiplying by 100.

Treatment fidelity data was recorded for 20% of all Treatment 1 and Treatment 2

sessions. An independent graduate student, unfamiliar with the study, reviewed videotaped

sessions and completed the treatment fidelity checklist (Appendix I). The results indicated that

fidelity agreement was achieved at 92%, 98% and 94% for Child 1, Child 2 and Child 3, respectively.

Additionally, to support treatment fidelity, the researcher established a set schedule for parent researcher interaction for each treatment session. The schedule included the following: 1) family and child greeting (approximately five minutes), 2) questions and/or comments related to previous treatment sessions (if applicable) (approximately five minutes), 3) a description of the session purpose (approximately five minutes), 4) a review of the parent awareness strategies relevant to the environmental modification and/or visual supports (approximately five to ten minutes), 5) data collections (15 to 20 minutes), 6) recommendation on additional modifications to environment (if applicable), and 7) other unrelated conversations (approximately 15 to 20 minutes). This schedule provided both opportunity for interaction and structure for how each session would be conducted.

Data Collection

To determine participation, pre-treatment assessment procedures were conducted prior to the initiation of the study using the Evaluation of the Home Environment for ASD (Appendix D) and researcher observation of the home. Once participation was determined, data was collected over a six-month period with a total of four to five sessions at baseline, six to nine sessions for Treatment 1, six to nine sessions for Treatment 2 and two follow-up sessions per participant. Baseline measures were obtained using the Parent Perception of Participation in Home Routines (Appendix E), the ICER-R (Appendix F) and the Challenging Behavior Record (Appendix G). Following baselines measures, Treatment 1 (i.e., physical modification) was conducted, and data was collected using the ICER-R and the Challenging Behavior Record. After stable data from Treatment 1 was obtained, Treatment 2 was implemented (i.e., physical modifications plus visual

supports) again using the using the ICER-R (Kishida et al., 2008) and the Challenging Behavior Record. At the conclusion of both treatments and after data was collected for each participant, follow up was conducted one and two months post-treatment using the ICER-R and the Challenging Behavior Record. The Evaluation of the Home Environment and the Post-Modification Parent Interview were completed at the end of the study.

Data Analysis

A visual/graphical analysis of behavioral change, including trend, level (mean) and percentage of increase or decrease within phases, was completed for each child to determine the relationship of modifications and visual supports made to the physical home environment and the frequency and type of engagement and challenging behaviors. The analysis included the assessment of the stability of the baseline within the assessment timeframe and the change in the level of data collected following modification of environment. Data was examined to determine the type and frequency of engagement and the frequency of challenging behaviors at baseline, after the modification, and at follow up. It is traditional in a single-subject design that the sooner change is observed after the modification, the greater the effect and the more confidence that the change is an effect of the modification.

Summary

The purpose of Chapter 3 was to describe the research methodology including research design, setting, participants, and measures used during the study. Additionally, the study procedures were detailed across all study phases; a) pre-treatment assessment, b) baseline data collection, c) Treatment 1, d) Treatment 2, and e) follow up. Social validity, reliability, and treatment fidelity measures used to determine quality of the study were described. Finally, data

collection and data analysis were discussed.   Chapter 4 will provide the results of the study for

each participant by phases.

CHAPTER 4

RESULTS

Introduction

This chapter will provide the results of the study across all five phases and participants and address the proposed research questions: 1) Do physical modifications to the home environment (e.g., defined learning space, organization of materials, and/or availability of toys and materials) increase engagement and decrease the number of challenging behaviors? and 2) Does the use of physical modifications plus visual supports in the home environment increase engagement and decrease the number of challenging behaviors?

Results from each phase will be presented for each child in the following manner: a) pre-treatment assessment and environmental modification plan, b) baseline data, c) Treatment 1, d) Treatment 2, and e) follow up. Specifically, the pre-treatment assessment and environmental modification phase will provide a description of the child's home prior to the collection of baseline data. The baseline phase will provide the results of the Parent's Perception of Participation in Daily Routines and the data analyzed from the ICER-R and the Challenging Behavior Record. The Treatment 1 phase will provide a detailed description of the environmental modifications, photographs of pre- and post-modifications, parent awareness training provided, and data analyzed from ICER-R and the Challenging Behavior Record. The Treatment 2 phase will provide a detailed description of visual supports added to the environment, two examples of the supports and data analyzed from the ICER-R and the Challenging Behavior Record. Data from the ICER-R will be used to answer research questions related to engagement, and data from the Challenging Behavior Record will be used to answer questions related to behavior. The follow-up phase will provide the results of the Evaluation of

the Home Environment for Children with ASD, as well as the results for the ICER-R and

Challenging Behavior Record at month one and month two.

Visual analysis will include the comparison of the dependent variable (engagement and

challenging behaviors) across and within treatment conditions. Finally, results of social validity,

treatment fidelity and inter-rater reliability will be described.

<div align="center">**Child 1**</div>

Child 1 was a 4 year, 4 –month-old Caucasian male. He resides at home with both

parents. He received a diagnosis of moderate autism at 25 months.   He primarily communicates

to protest and request basic wants and desires. Both parents participated in the initial interview,

agreed to the modification plans and was in the home during the treatment sessions. The child's

mother served as the play partner for the study.

Phase 1: Pre-Treatment Assessment and Environmental Modification Plan

For Child 1, the result of the Evaluation of the Home Environment for Children with

ASD (Appendix D) revealed that one of five physical modifications were in place. The first area

rated was overall organization and accessibility of materials and space. The child's primary play

area had several play items that were of the child's unique interest available (i.e., robots and

squeeze toys). However, the child had an abundance of play items in his environment with

preferred and non-preferred items. Child 1's parents indicated that many of the items were not

played with or the items were played with inappropriately (e.g., lining toys up or throwing when

angry). The lack of availability for open space was recorded. Although the child was free to

play in the entire home, the primary play area had limited open space for movement due to the

size of the room as well as the number of toys in the space. The researcher further documented

the lack of a defined space for learning and/or meeting sensory needs. Child 1's parents

attempted to help their child meet his sensory needs by converting a playpen into a sensory ball pit. Child 1 did appear to use the ball pit to meet his sensory needs; however, he then engaged in dangerous play by placing a large therapy ball in the ball pit and jumping from the ball to other unstable items in the room. Child 1 also climbed on an unstable bookshelf and attempted to jump into the ball pit. The second area rated was the presence or absence of visual supports. It was noted that no visual supports (e.g., daily schedules, choice boards) were available for the child. Finally, the researcher rated the visual clutter for the primary play environment as "moderate clutter". The environmental modification plan was developed and will be described at the beginning of Phase 3 for improved clarity.

Phase 2: Baseline Data Collection

Baseline data collection included the administration of the Parent Perception of Participation in Daily Routines, the ICER-R and the Challenging Behavior Record. In regards to the child's play and daily routines, Child 1's parents reported four preferred toys (i.e., books, robots, cars/trucks and blocks). Of the four preferred toys, only one was played with in a typical manner (i.e., cars/trucks). His parents reported that all other toys in his room were non-preferred and played with in an atypical manner. His parents were unable to rate the frequency with which he played with the toys. In regards to daily routines, his parents indicated that he is able to wash hands independently but is unable to brush his teeth, toilet self, brush hair or bathe without full assistance. During meals and/or snacks, they reported that he could sit at the table for meals and use his utensils; however, he did not request food or demonstrate age-appropriate manners.

Using the ICER-R and Challenging Behavior Record, Child 1's mean for passive engagement was 10.5% with a range of 4% to 20%. The mean for active engagement was 1.75%, with a range of 0% to 4%. Frequency of challenging behaviors was 75% with a range of

58% to 90% (*Figure 2*). Child 1's challenging behaviors were characterized by yelling, crying, hitting and roaming (i.e., leaving the play area).
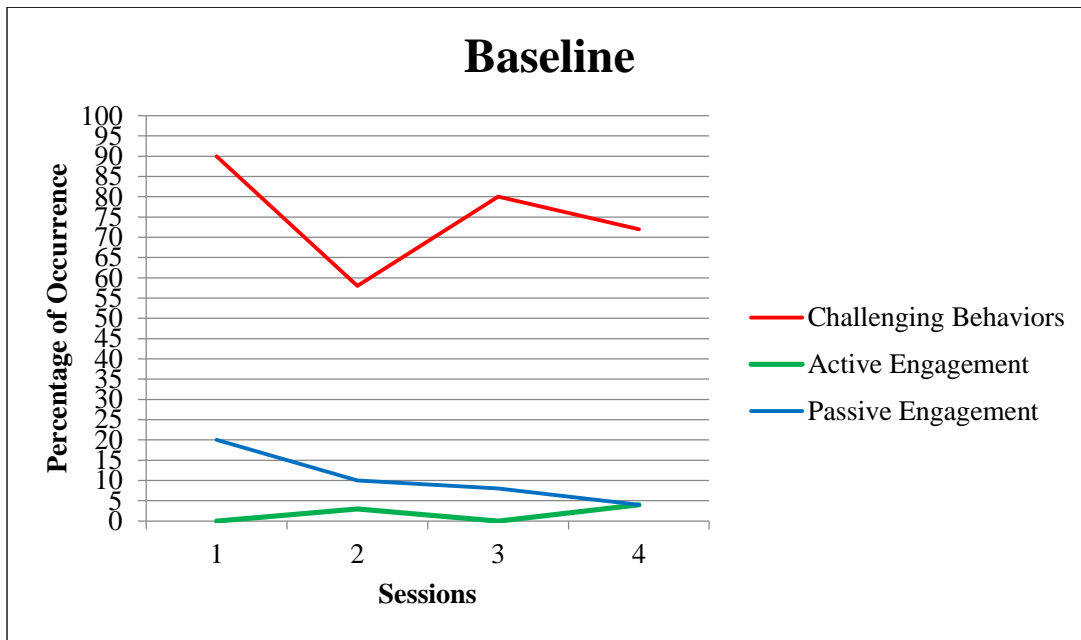
Figure 2. Child 1's Baseline Data

Phase 3: Treatment 1 Environmental Modifications

The environmental modification results for Child 1 included the following changes: removing excessive toys (i.e., decreasing from 22 cars/trucks to four), removing toys played with inappropriately (i.e., toys and materials that were thrown), and removing toys that were not developmentally appropriate (i.e., board games or creative play materials). After excessive toys and materials were removed (i.e., put in 2 large non-transparent storage containers and placed in the family's storage building), common toys were placed together in existing bins that were on a shelf in Child 1's play area. Each bin was labeled with a picture of the toy (*Figure* 3). Child 1's toys, robots, blocks and books were placed at eye level, as these were identified on the Parent Rating Scale of Participation as preferred but not played with appropriately. His cars and trucks were preferred, and although they were played with in a typical way, Child 1 would not engage in play with his parents. These items were placed in a transparent container and slightly out of

Child 1's reach. Additionally, developmentally appropriate puzzles were placed in transparent containers and slightly out of his reach as both parents indicated that he was beginning to show an interest in puzzles. Following the removal and organization of toys and materials, a small trampoline was added to Child 1's room to provide physical play. A defined space for learning was created by adapting Child 1's playroom closet, which had previously been used to hold extra toys. Soft pillows, a beanbag and a blanket were placed in the space. Soft lighting (i.e., Christmas lights) were placed in the closet. The playpen was removed, and balance beams and a small trampoline were alternated in his room to allow for appropriate movement (*Figure* 4). The family kitchen table was chosen as a defined space for Child 1 (*Figure* 5). He enjoyed snack time and had already learned to sit at the table during meals. The kitchen and table were clutter free and in a quiet place of the home.

Figure 3. Pictures of Child 1's Environment Pre- and Post-Modification (reading left to right)
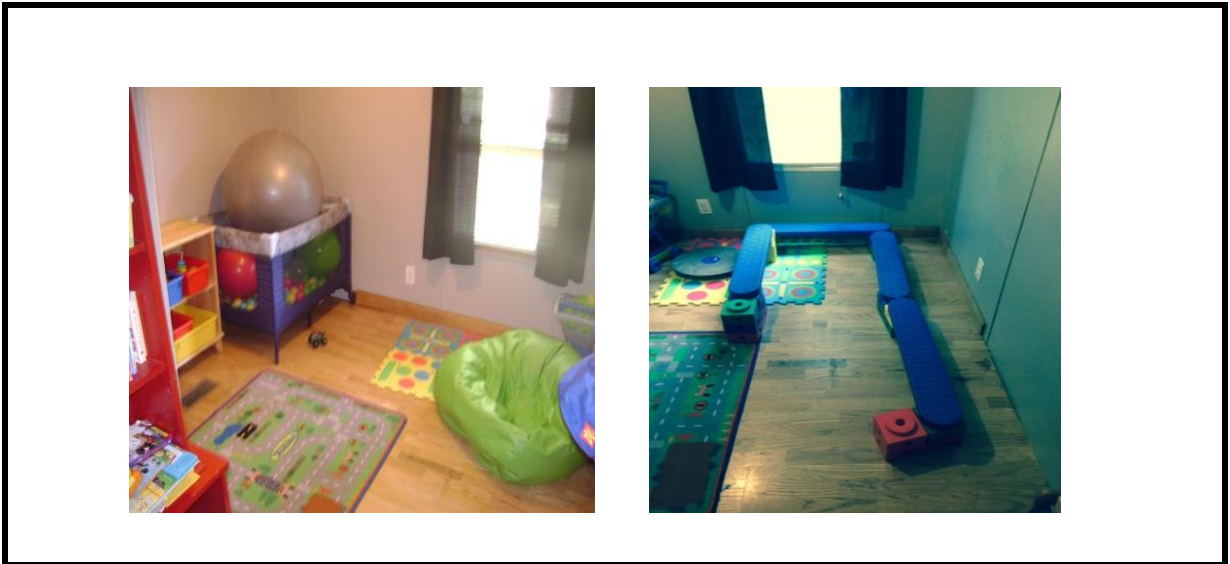
Figure 4. Pictures of Child 1's Sensory Movement Items Pre-Modification and Post-Modification (reading left to right)

Figure 5. Picture of Child 1's Defined Learning Space

During Treatment 1, Child 1's mean for passive engagement was 20% with a range from 10% to 53%. The mean for active engagement was 51.67% with a range of 25% to 73%. Challenging behaviors occurred 6% of the time and ranged from 0% to 10%. Child 1 demonstrated an increase of 49.9% from baseline for active engagement, a 9.5% increase for passive engagement, and a 69% decrease in challenging behaviors (*Figure* 6). Additionally,

Child 1's challenging behaviors consisted of roaming (i.e., leaving the play area) and no incidence of yelling, crying, or hitting.
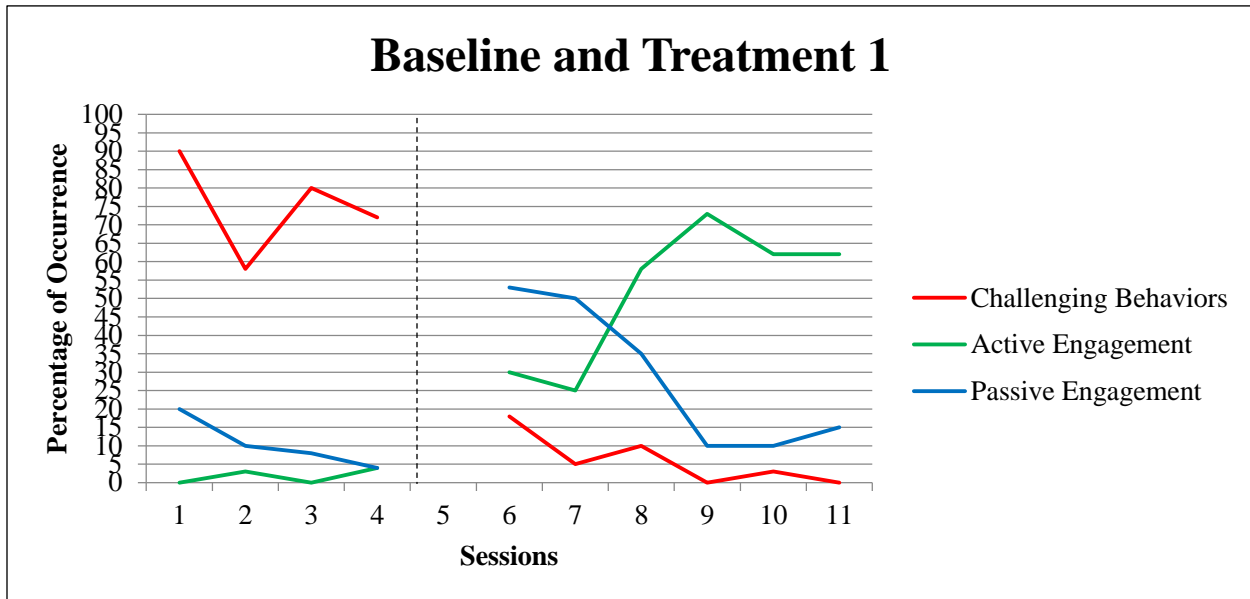
Figure 6. Child 1's Baseline and Treatment 1 Data

Phase 4: Treatment 2 Environmental Modifications + Visual Supports

Following Treatment 1 (six sessions), Treatment 2 was implemented. Visual supports that supported the environmental changes and complimented the play routines used during Treatment 1 were developed. Visual supports developed for Child 1 served the purpose of increasing his attention and his understanding of play routines and providing him a means to request items and activities during play routines. Child 1's visual supports included providing a choice board for play activity (*Figure 7*), creating a visual support for making requests during both play activities (*Figure* 8) and developing a description of how to complete an activity. Child 1's choice board and his accompanying visual supports for requesting were also placed on his Assistive Augmentative Communication (AAC) device using Proloquo 2 go application (AssistiveWare, 2008-2013). Parent awareness on the use of visual supports for Child 1 was provided prior to Treatment 2 and at the beginning of each treatment session. This included how

to integrate the visual supports into play activities. Specifically, Child 1's mother was instructed to show him the visual support, read the supports while pointing to the visuals and finally to place the visual support in Child 1's field of vision throughout treatment.
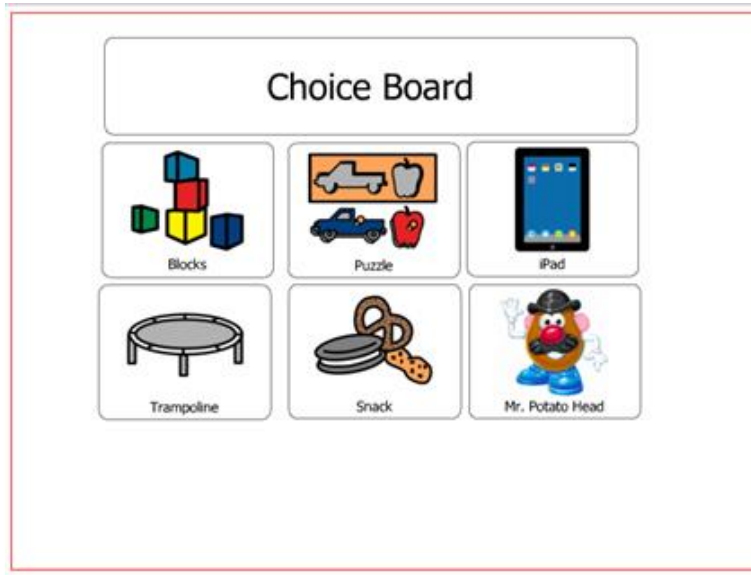
Figure 7. Child 1's Visual Choice Board (The Picture Communication Symbols ©1981–2011 by Mayer-Johnson LLC. All Rights Reserved Worldwide. Used with permission.)
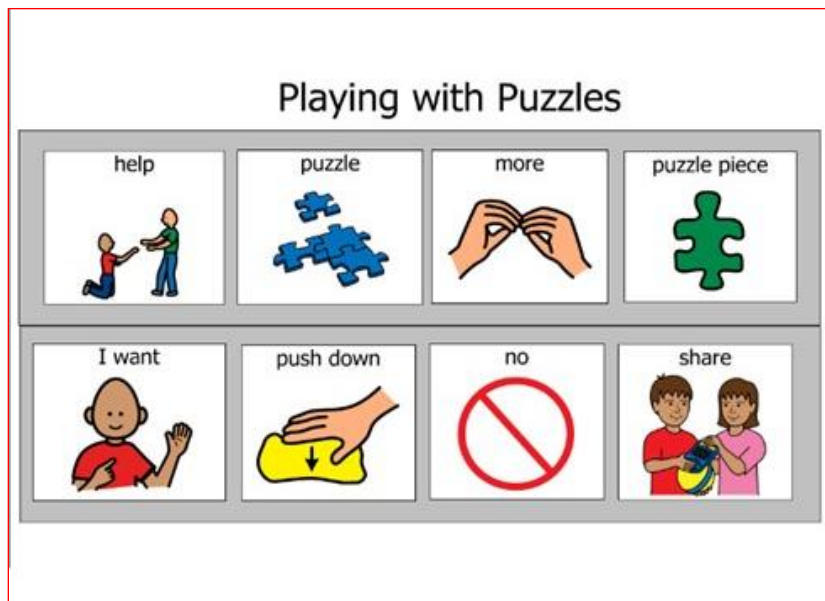
Figure 8. Child 1's Requesting Visual Support (The Picture Communication Symbols ©1981–2011 by Mayer-Johnson LLC. All Rights Reserved Worldwide. Used with permission.

Using the ICER-R and Challenging Behavior Record, Treatment 2 data for Child 1's passive engagement resulted in a mean of 13.67% with a range of 3% to 28%. The mean for active engagement was 62%, ranging from 60% to 65%. Challenging behaviors resulted in a mean of 7.3% with a range of 3% to 13%. Child 1 demonstrated an increase of 10.33% from Treatment 1 for active engagement, a 6.33% increase for passive engagement, and a 1.33% increase in challenging behaviors. Challenging behaviors consisted of one verbal protest.

Notably, Child 1 demonstrated a slight increase in active engagement and no significant decrease in challenging behaviors once Treatment 2 was added. It can be hypothesized that either the environmental modifications were sufficient for improving engagement and decreasing challenging behaviors, or the visual supports were not meaningful and/or informative to the child.
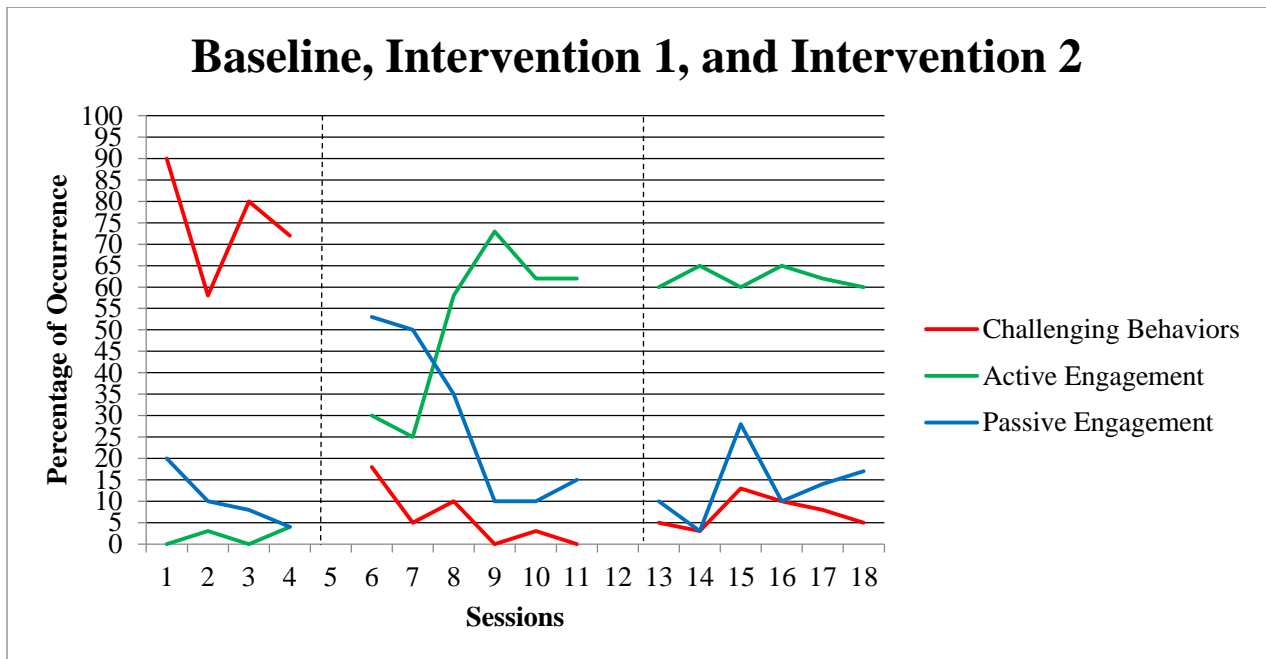
Figure 9. Child 1's Baseline, Treatment 1 and Treatment 2 Data

Phase 5: Follow up

Follow up occurred at one and two months post- treatment. The first follow up included the re-administration of the Evaluation of the Home Environment for Children with ASD. Child 1's parents had maintained all of the components of the original modification. The results showed significant improvement in all three areas observed. In regards to organization modifications, four of four supports were available as compared to one of four components at assessment (See Table 6).

Table 6

Child 1's Organizational Supports Occurrence Pre- and Post-Treatment

Organizational Supports	Pre-Occurrence		Post-Occurrence	
	Present	**Absent**	**Present**	**Absent**
Storage containers used and clearly visible		X	X	
Open space for child's movement		X	X	
High interest items designed to need adult assistance		X	X	
Play items of unique interest are available	X		X	

In regards to learning space, two of two components were available as compared to zero of two components at pre-assessment (See Table 7).

Table 7

Child 1's Learning Space Occurrence Pre- and Post-Treatment

Learning space	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Defined place for learning		X	X	
Defined place for sensory breaks		X	X	

In regards to sensory components of a space for sensory breaks, five components were available at post-treatment as compared to the absence of all components at pre-treatment assessment.

Table 8

Child 1's Sensory Components Occurrence Pre- and Post-Treatment

Sensory Components	Pre-Occurrence			Post-Occurrence		
	Yes	No	N/A	Yes	No	N/A
Soft items			X	X		
Free access			X	X		
Child control			X	X		
Clean and safe			X	X		
Private space			X	X		

In regards to the presence of visual supports, four of five types of supports were available as compared to zero of five available at pre-assessment. It was noted that three of the five were

developed by the researcher during Treatment 2 and maintained to follow up, and 1 visual

support (self-care) was developed by the parent following Treatment 2.

Table 9

Child 1's Visual Supports Occurrence Pre- and Post- Treatment

Visual Supports	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Daily schedule(s)		X		X
Play choices		X	X	
Self-care		X	X*	
Play procedures		X	X	
Material label(s)		X	X	

*Parent developed

Following the Assessment of the Home Environment for Children with ASD, the parent

was instructed to engage the child in a play or daily routine of his choice and to follow the same

procedures as in Treatment 1 and Treatment 2. As in previous phases, the ICER-R and

Challenging Behavior Record were used to collect data. During Child 1's first follow up, the

mean for passive engagement was 5%, the mean for active engagement 95% and the frequency

of challenging behavior was 12.5%. Challenging behaviors were limited to roaming away from

the play area with the child easily redirected back to the activity with one verbal cue from his

parent. On the second follow up, Child 1 demonstrated passive engagement at a mean of 15%, a

mean of 80% for active engagement and frequency of challenging behaviors at 5%. (See *Figure

9*). Challenging behaviors were limited to roaming once from the designated area. This

demonstrated maintenance of treatment gains for both engagement and challenging behaviors.
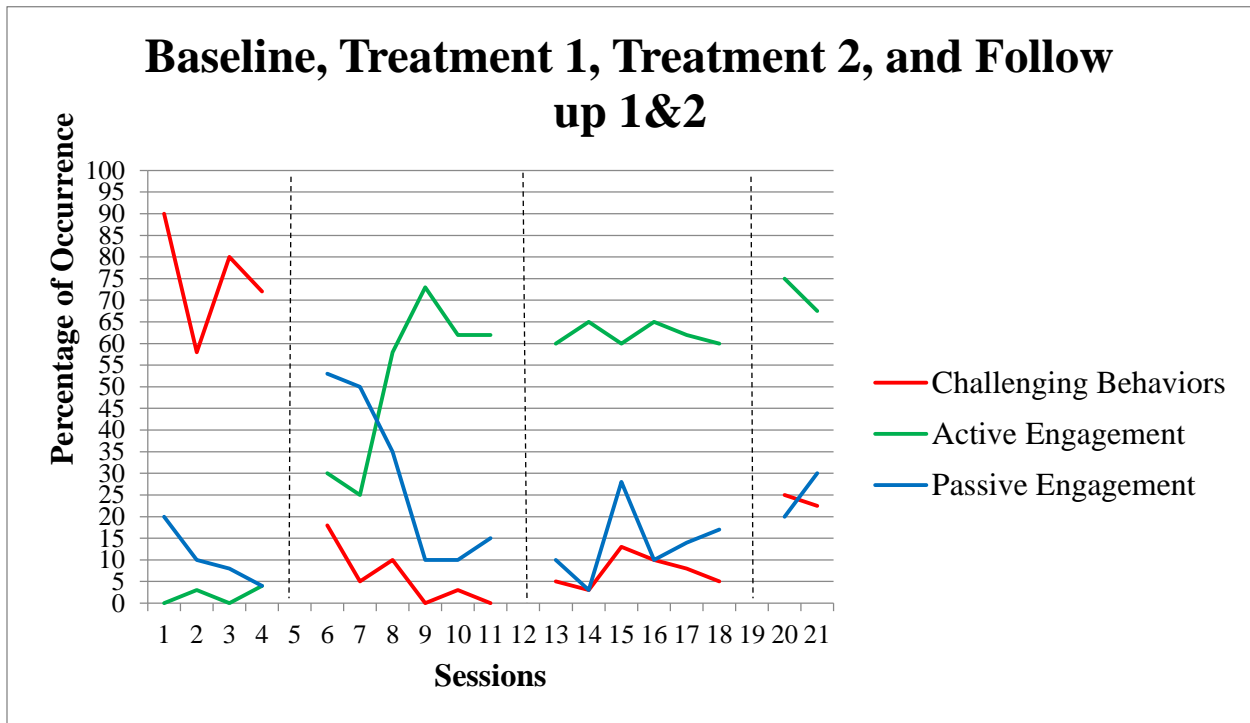
Figure 10. Child 1's Baseline, Treatment 1, Treatment 2, and Follow-up 1 & 2 Data

Child 2

Child 2 was a 3 year, 2-month-old of male of Asian descent. He resides at home with both parents. He was adopted at 18 months and received a diagnosis of moderate autism at 24 months. He primarily communicates using vocalizations and hand leading to protest and request basic wants and desires. Both parents participated in the initial interview and agreed to the modification plans. The father was in the home during 2 of the following treatment sessions. The child's mother served as the play partner for the study.

Phase 1: Pre-treatment Assessment and Environmental Modification Plan

In regards to physical arrangement, the Evaluation of the Home Environment for Children with ASD (Appendix D) revealed that two of five physical modifications were in place. The first area rated was overall organization and accessibility of materials and space. The child's primary play area had several play items that were of the child's unique interest available (i.e.,

cars and puzzles). The toys were organized in the child's closet into small containers. As with Child 1, there was an abundance of play items that Child 2 was not interested in or did not seem to enjoy. There was open space in the primary play area for movement. The researcher further documented the lack of a defined space for learning and/or meeting sensory needs. The second area rated was the presence or absence of visual supports. It was noted that only one visual support was available (six pictures of food items were placed on the refrigerator). His mother, however, reported Child 2 did not seem interested in the pictures and did not use them to request food items. Finally, the researcher rated the visual clutter for the primary play environment as "minimum clutter". The environmental modification plan was developed and is described at the beginning of Phase 3 for improved clarity.

Phase 2: Baseline Data Collection

In regards to the child's play routines, Child 2's mom reported five preferred toys (i.e., cars, books, puzzles, crayons and iPad) and five non-preferred toys (i.e., toy barn, airport, playdough, iPad for new activities and sensory items such as sand). Of the five preferred toys, his mother reported that three were played with in a typical manner (i.e., puzzles, crayons and iPad). However, his mother indicated that he refused to let others engage with him during play with preferred items and would cry or leave the activity if an attempt to engage him was made. Of the non-preferred toys his mother reported that they all were played with in an atypical manner. His mother was unable to rate the frequency with which he played with the toys. In regards to daily routines, his mother indicated that he is able to wash hands, brush teeth, brush hair and bathe independently but is not toilet trained. During meals and/or snacks, she reported that he could sit at the table for meals, use his utensils and sign the word "more" for additional food. He did demonstrate age-appropriate manners.

Using the ICER-R and Challenging Behavior Record, Child 2's mean for passive engagement was 32.75% with a range of 25% to 33%. The mean for active engagement was 15.75% with a range of 8% to 25%. Frequency of challenging behaviors was 27.75% with a range of 23% to 33% (*See Figure* 11). Child 2's challenging behaviors were characterized by roaming, crying and turning his body away from his parent.
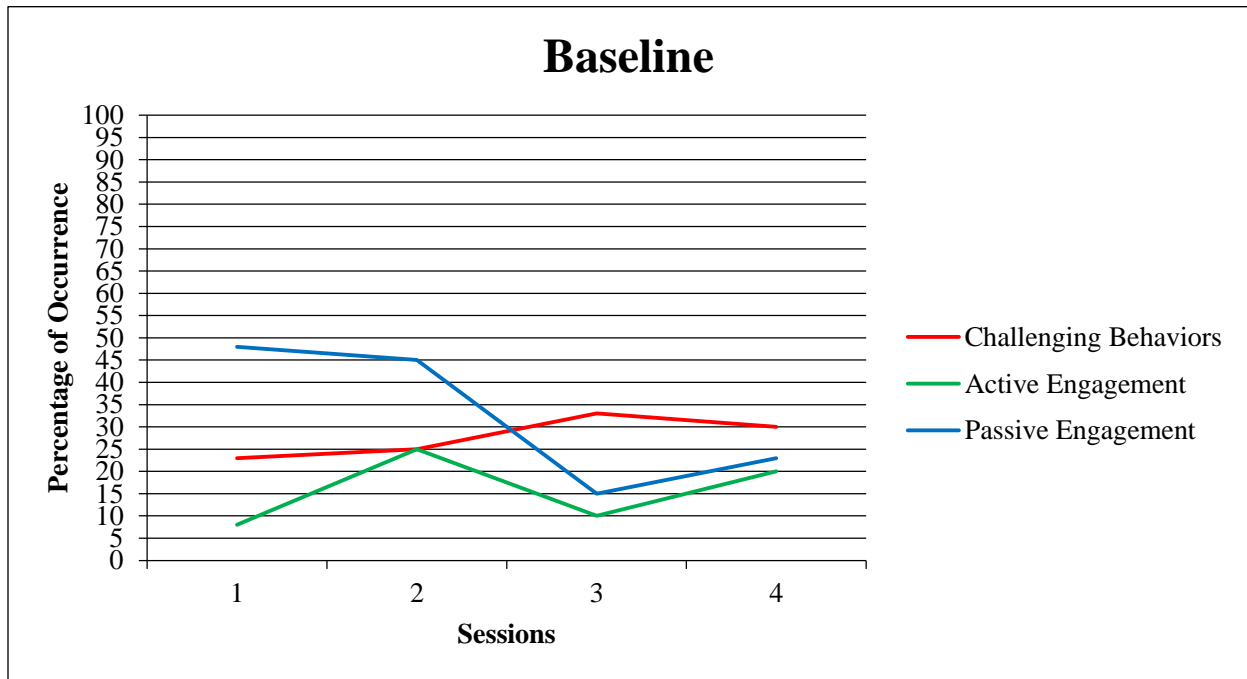
Figure 11. Child 2's Baseline Data

Phase 3: Treatment 1 Environmental Modifications

The modification to Child 2's environment included the following changes: removing extra toys and materials (i.e., decreasing number of puzzles, cars/trucks, books and stuffed animals). Books were also removed if they were not developmentally appropriate (e.g., vocabulary too advanced, complex language or difficult story line). After extra toys, books and play materials were removed (i.e., put in one large non-transparent storage containers and placed in the family's downstairs den), toys that had common features, as well as developmentally appropriate puzzles and books were placed in transparent containers and placed on the existing

93

shelves in Child 2's play area. Each container was labeled with a picture of the toy and/or play material. Toys and/or materials that did not fit in transparent containers were placed in Child 2's sight but out of reach. His trains were preferred, were not played with in a typical way, and Child 2 would vocally protest if his parents or sibling attempted to engage in his play. Following the removal and organization of toys and materials, a calm space for learning was created by adapting Child 2's playroom closet, which had previously been used to hold extra toys. Soft pillows, a bean bag and a blanket were placed in the space. Soft lighting (i.e., white Christmas lights) was place in the closet. Figures 12 and 13 provide pre- and post-modification for sensory space and designated learning space.
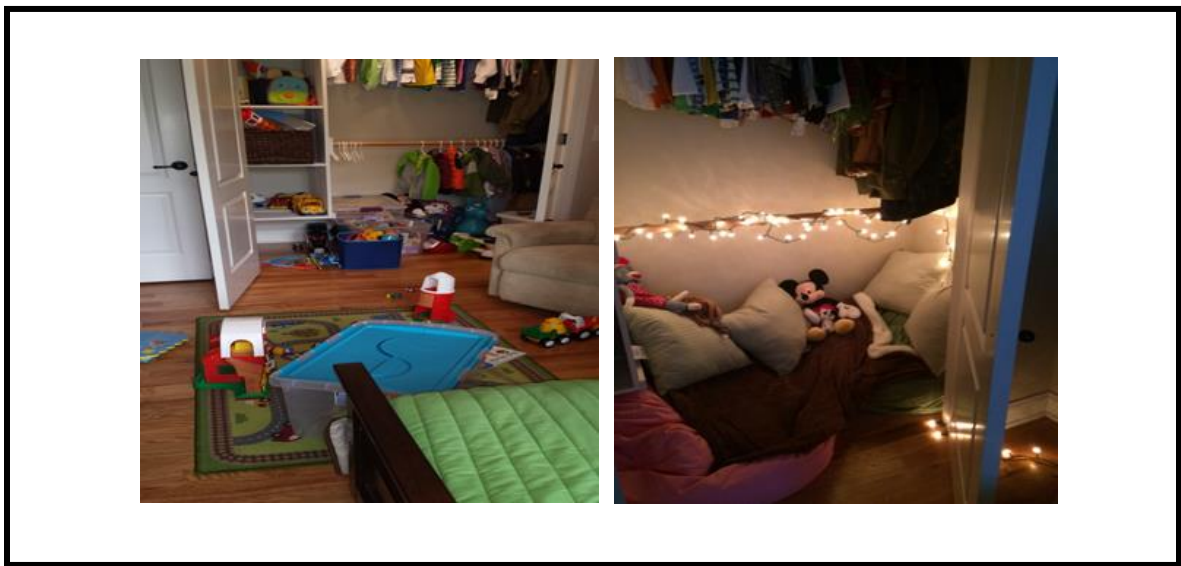
Figure 12. Pictures of Child 2's Environment Pre- and Post-Modification (reading left to right)
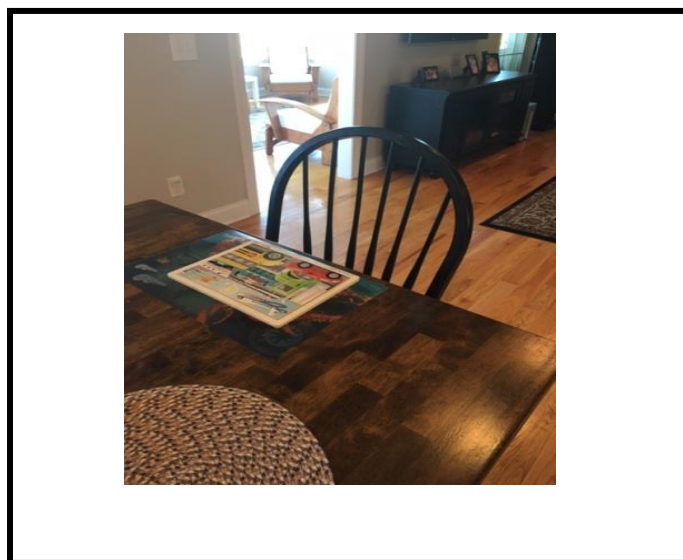
Figure 13. Picture of Child 2's Defined Learning Space

During Treatment 1, Child 2's mean for passive engagement was 25.14% with a range of 23% to 30%. The mean for active engagement was 45.57% with a range of 38% to 50%. Challenging behaviors occurred 10% of the time and ranged from 0% to 30% (See *Figure 14)*. Child 2 demonstrated an increase of 29.82% from baseline for active engagement, a decrease of 7.61% for passive engagement, and a 17.75% decrease in challenging behaviors (*Figure 14*). Although passive engagement slightly decreased from baseline to Treatment 1, active engagement increased significantly. As active engagement serves a more rich communication function, the outcome is desirable. Additionally, Child 2's challenging behaviors consisted of fewer instances of roaming and crying and no incidence of turning away from parent.
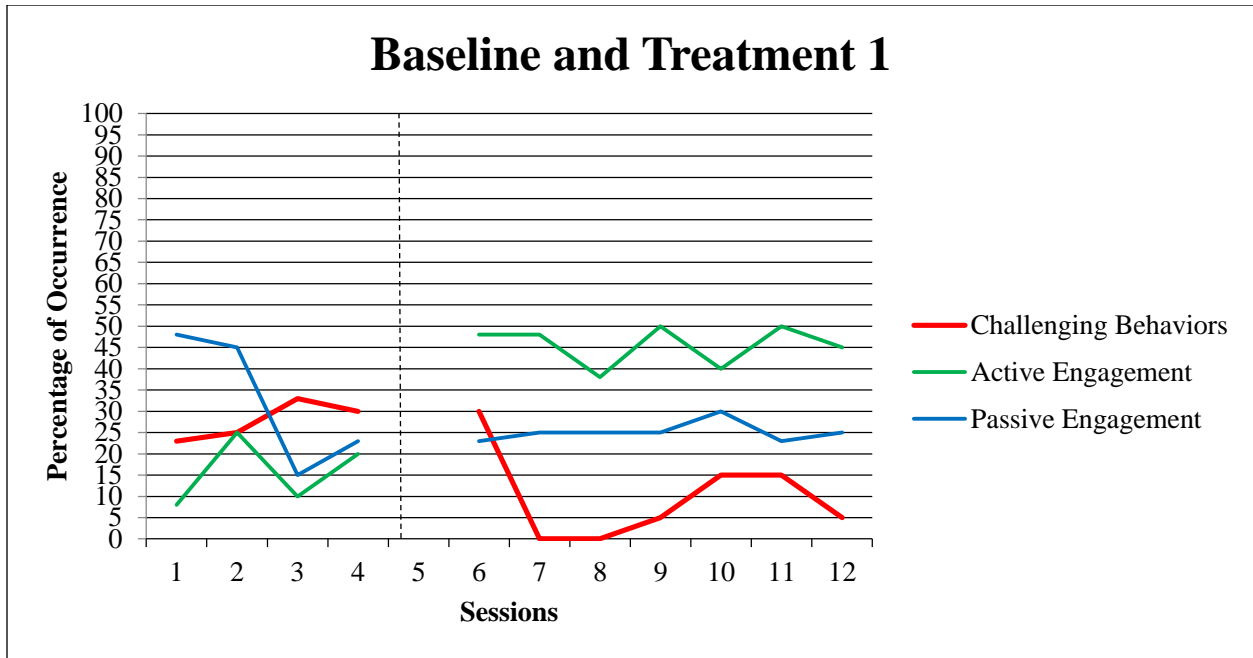
Figure 14. Child 2's Baseline and Treatment 1 Data

Phase 4: Treatment 2 Environmental Modifications + Visual Supports

Following Treatment 1 (seven sessions), Treatment 2 was implemented. Visual supports that supported the environmental changes and complimented the play routines used during Treatment 1 were developed. Visual supports developed for Child 2 served the purpose of increasing attention and understanding of his play routines and providing him a means to request items and activities during play routines. Child 2's visual supports included providing a description of how to complete a puzzle, a choice board for trains (Figure 15) and a requesting and commenting board for snack (Figure 16). Child 2's choice board was also placed on his AAC device using Proloquo to go application (AssistiveWare, 2008-2013). Parent awareness for Child 2's visual supports was provided prior to Treatment 2 and at the beginning of each treatment. This included how to integrate the visual supports into play. Specifically, Child 2's mother was instructed to show him the visual support, read the supports while pointing to the pictures and then place the visual support in Child 2's sight throughout the play session.
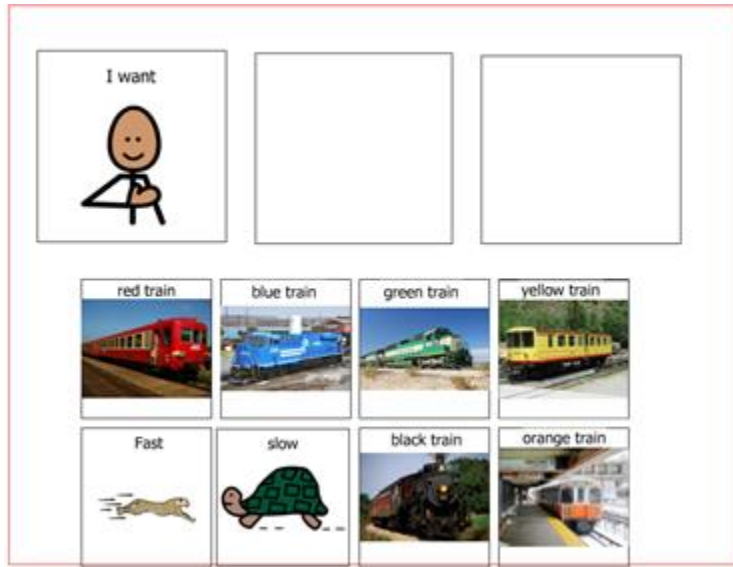
Figure 15. Picture of Child 2's Requesting Visual Supports for Trains (The Picture Communication Symbols ©1981–2011 by Mayer-Johnson LLC. All Rights Reserved Worldwide. Used with permission.)
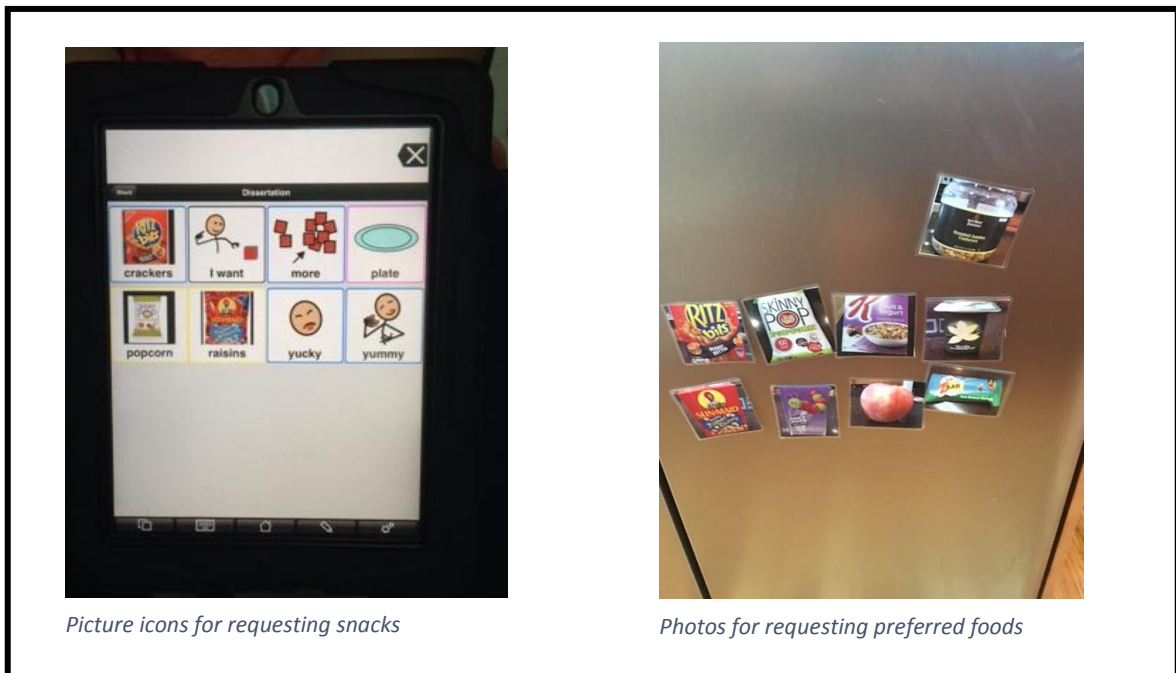
Picture icons for requesting snacks   Photos for requesting preferred foods

Figure 16. Photographs of Child 2's Requesting Visual Supports for Snacks

Using the ICER-R and Challenging Behavior Record, Treatment 2 data for Child 2's passive engagement resulted in a mean of 12.56 with a range of 0%-38%. The mean for active

engagement was 76.89%, ranging from 45% to 92%. Challenging behaviors resulted in a mean

of 6.33% with a range of 0% to 18%. Child 2 demonstrated an increase of 31.32% from

Treatment 1 for active engagement, a 12.58% increase for passive engagement, and a 3.67%

decrease in challenging behaviors. Additionally, challenging behaviors consisted of few

incidences of roaming and no incidence of crying.

For Child 2, although visual supports did not appear to result in an increase in active

engagement, the visuals did appear to facilitate comprehension for on task behavior; thus,

passive engagement increased, and fewer challenging behaviors were demonstrated.
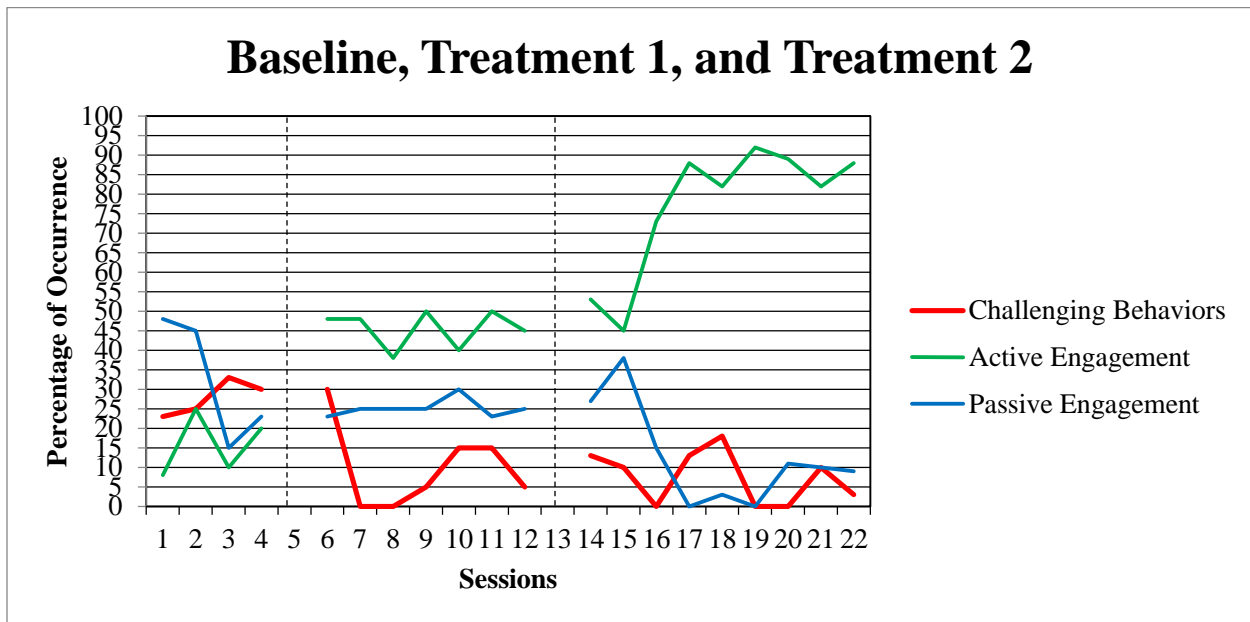
Figure 17. Child 2's Baseline, Treatment 1 and Treatment 2 Data

Phase 5: Follow up

Follow up occurred at one and two months post-treatment. The first follow up included the

re-administration of the Evaluation of the Home Environment for Children with ASD. Child 2's

parents had maintained all of the components of the original modification. The results showed

significant improvement in all three areas observed. In regards to organization modifications

four of four supports were available as compared to two of four components at assessment (See

Table 10).

Table 10

Child 2's Organizational Occurrence Supports Pre- and Post-Treatment

Organizational Supports	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Storage containers used and clearly visible		X	X	
Open space for child's movement	X		X	
High interest items designed to need adult assistance		X	X	
Play items of unique interest are available	X		X	

In regards to learning space, two of two components were available as compared to zero

of two components at assessment (See Table 11).

Table 11

Child 2's Learning Space Occurrence Pre- and Post-Treatment

Learning space	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Defined place for learning		X	X	
Defined place for sensory breaks		X	X	

In regards to sensory components of a space for sensory breaks, five components were available at post-treatment as compared to the absence of all components at pre-treatment assessment.

Table 12

Child 2's Sensory Components Occurrence Pre- and Post-Treatment

Sensory Components	Pre-Occurrence			Post-Occurrence		
	Yes	No	N/A	Yes	No	N/A
Soft items			X	X		
Free access			X	X		
Child control			X	X		
Clean and safe			X	X		
Private space			X	X		

In regards to the presences of visual supports, five of five types of visual supports were available as compared to zero of five available at pre-assessment. It was noted that three of the five were developed by the researcher during Treatment 2 and were maintained to follow up, and two visual supports (daily schedule and self-care) were developed by the parent following Treatment 2.

Table 13

Child 2's Visual Supports Occurrence Pre- and Post-Treatment

Visual Supports	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Daily schedule(s)		X	X*	
Play choices		X	X	
Self-care		X	X *	
Play procedures		X	X	
Material label(s)		X	X	

Parent created visual support

Following the Evaluation of the Home Environment for Children with ASD, the parent was instructed to engage the child in a play or daily routine of his choice and to follow the same procedures as in Treatment 1 and Treatment 2. The ICER-R and Challenging Behavior Record was used to collect data. Child 2's first follow up revealed a mean for passive engagement at 12.5%, a mean of 87.5% for active engagement and frequency of challenging behavior was at 0%. On the second follow up, Child 2 demonstrated passive engagement with a mean of 20%, active engagement with a mean of 80% and no challenging behaviors (See Figure 17). This demonstrated maintenance of treatment gains for both engagement and challenging behaviors.
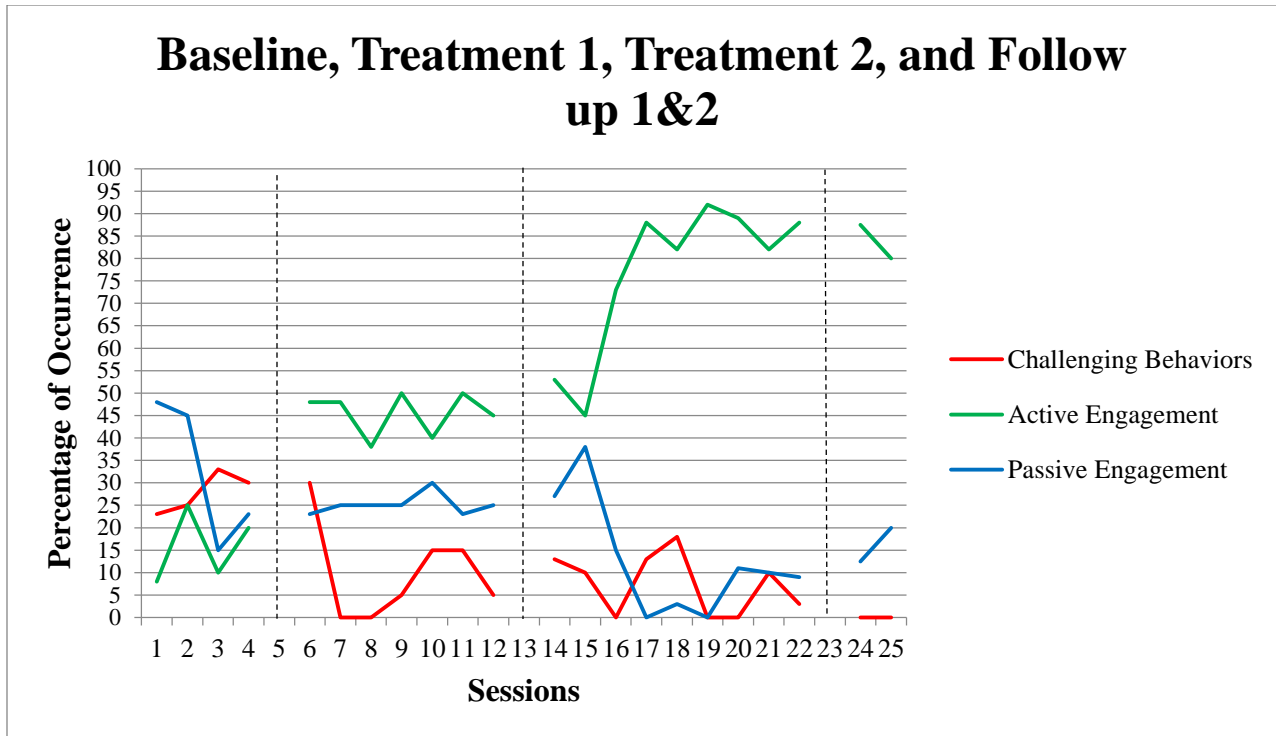
Figure 18. Child 2's Baseline, Treatment 1, Treatment 2, and Follow-up 1 & 2 Data

Child 3

Child 3 was a 4 year, 11-month-old Caucasian male. He resides at home with both

parents. He received a diagnosis of moderate autism 26 months. He primarily communicates

using a few single words to protest and request basic wants and desires. Both parents participated

in the initial interview and agreed to the modification plans. His father was in the home during

10 of the treatment sessions. The child's mother served as the play partner for the study.

Phase 1: Pre-Treatment Assessment and Environmental Modification Plan

In regards to physical arrangement, the Evaluation of the Home Environment for

Children with ASD (Appendix D) revealed that one of five physical modifications were in place.

The first area rated was overall organization and accessibility of materials and space. The child's

primary play area had multiple play items that were of the child's unique interest available (i.e.,

balls and Mickey Mouse). However, the child had an abundance of play items in his

environment with preferred and non-preferred items available. Child 3's parents indicated that many of the items were not played with, or the items were played with inappropriately (e.g., lining toys up, stacking toys or ignoring toys). The lack of availability for open space was also recorded. Although the child was free to play in the entire home, the primary play area had limited open space for movement due to size of the room as well as the number of toys in the space. The researcher further documented a defined space for learning and/or meeting sensory needs (i.e., tent with soft sensory items and away from distractions). However, the parents reported that Child 3 did not use the calm area. The second area rated was the presence or absence of visual supports. It was noted that several visuals (i.e., daily schedules, and choice board of foods on the refrigerator) were available for the child. However, his parents reported that he did not use the pictures to communicate; rather they reported that he took them off of the refrigerator and placed them randomly around the house. Finally, the researcher rated the visual clutter for the primary play environment as "significant clutter".

Phase 2: Baseline Data Collection

In regards to the child's play routines, Child 3's mother reported five preferred toys (i.e., slide, Talking Elmo stuffed animal, balls, iPad and bubbles) and four non-preferred toys (i.e., blocks, cars, crayons, and kitchen set). Of the five preferred toys, his mother reported that one was played with in a typical manner (i.e., slide). Of the non-preferred toys his mother reported that they all were played with in an atypical manner (e.g., lining up, spinning wheels or throwing). His parents were unable to rate the frequency with which he played with the toys; however, they noted that he would play on the slide or use the iPad exclusively during free time. In regards to daily routines, his parents indicated he was unable to wash hands, brush teeth, brush hair and bathe independently and that he was not toilet trained. During meals and/or snacks, they

103

reported that he would not sit at the table for meals, use his utensils, request more food or demonstrate age-appropriate manners.

Using the ICER-R and Challenging Behavior Record, Child 3's mean for passive engagement was 15.8% with a range of 5% to 20%. The mean for active engagement was 14.6%, with a range of 5% to 20%. Frequency of challenging behaviors was 49.2% with a range of 28% to 60% (*Figure 19*). Child 3's challenging behaviors were characterized by crying, turning away and roaming (i.e., leaving the play area).
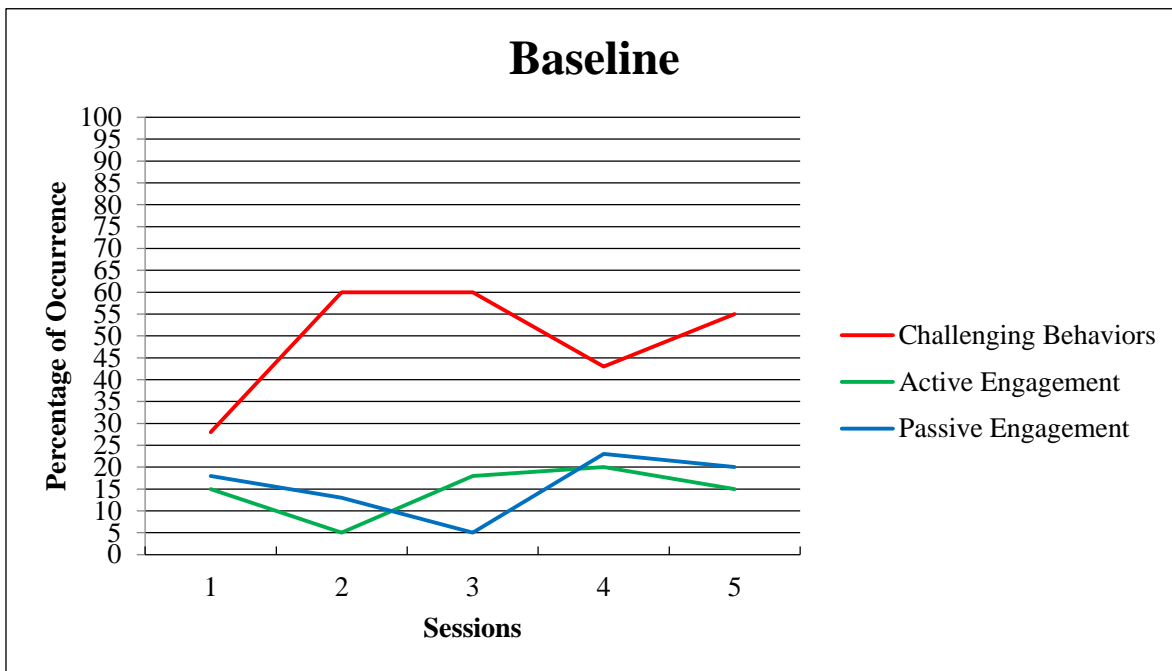
Baseline

Figure 19. Child 3's Baseline Data

Phase 3: Treatment 1 Environmental Modifications

The modification to Child 3's environment included the following changes: removing excessive toys, toys played with inappropriately (e.g., toys and materials that were thrown and/or ignored), and toys that were not developmentally appropriate (e.g., academic toys and electronic toys). After excessive toys and materials were removed (i.e., put in 4 large non-transparent

storage containers and placed in an unused bedroom), common toys were placed together in transparent containers and placed on the shelf or on the floor in Child 3's play area. Each container was labeled with a picture of the toy. Child 3's balls and Elmo stuffed animal were placed at eye level as these were identified on the Parent Rating Scale of Participation as preferred but not played with appropriately. His cars and trucks were preferred, and although they were played with in a typical way, Child 3 would not engage in play with his parents. These items were placed in a transparent container and were placed slightly out of Child 3's reach. A defined space for learning was already available in the home; however, it was moved to an area closer to the child's play space. Additionally, the family kitchen table was chosen as another play space for Child 3. Child 3 enjoyed snack time but refused to sit at the table. A soft booster chair was placed on a preexisting chair. A stool was placed at the foot of the chair to allow him to independently climb in and out of the chair. Additional clutter (e.g., family mail) was removed, and a preferred stuffed animal was placed on another chair at the table. Figures 20 and 21 illustrate pre- and post- play space, covered shelf, and the child's sensory space.

Playroom prior to modification

Playroom after removal of excessive materials and organization of play items

Crowded bookshelf with excess materials

Covered bookshelf to reduce visual clutter

Figure 20. Pictures of Child 3's Environment Pre- and Post-Modification (reading from left to right)

Figure 21. Picture of Child 3's Defined Learning Space

During Treatment 1, Child 3's mean for passive engagement was 33.63% with a range

from 15%-52%. The mean for active engagement was 30.13% with a range of 15%-46%.

Challenging behaviors occurred 24.5% of the time and ranged from 8% to 60%. Child 3

demonstrated an increase of 15.57% from baseline for active engagement, a 17.83% increase for

passive engagement, and a 24.7% decrease in challenging behaviors (*Figure 22*). Additionally,

Child 3 demonstrated fewer incidences of roaming, no crying, and no incidences of turning away

from parent.
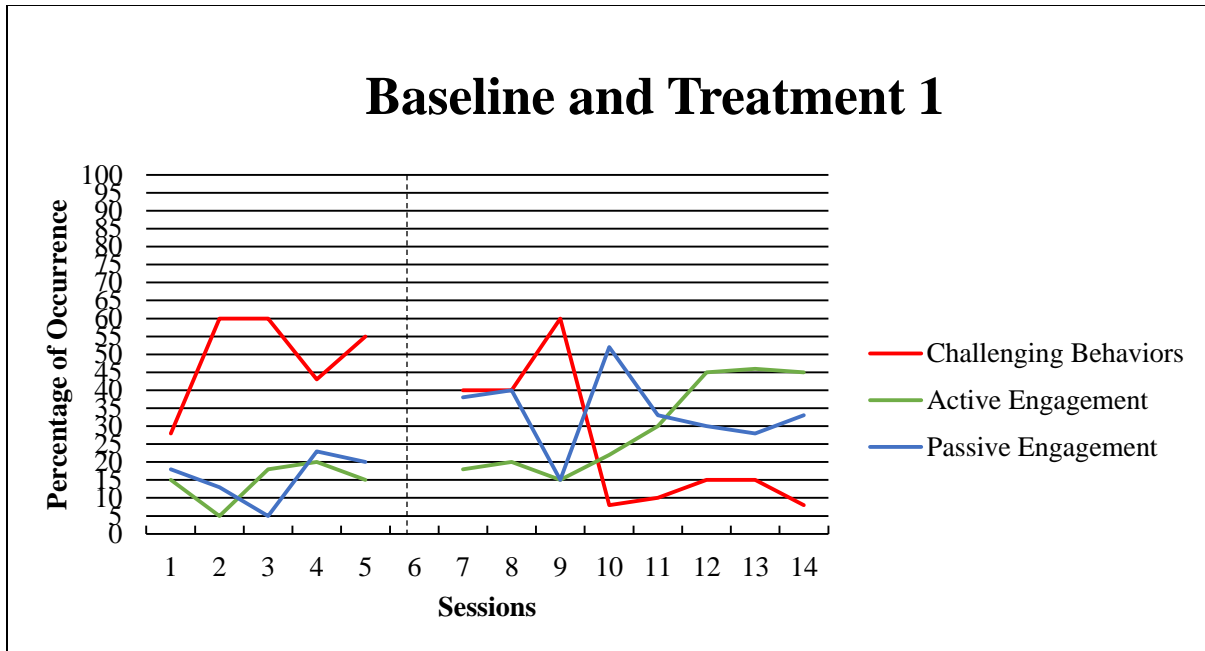
Figure 22. Child 3's Baseline and Treatment 1 Data

Phase 4: Treatment 2 Environmental Modifications + Visual Supports

Following Treatment 1 (eight sessions), Treatment 2 was implemented. Visual supports that supported the environmental changes and complimented the play routines used during Treatment 1 were developed. Visual supports developed for Child 3 served the purpose of increasing attention and understanding of his play routines, and providing him a means to request items and activities during play routines. Child 3's visual supports included a description how to turn take when rolling a ball (Figure 23) and provided a choice board for play activity (Figure 24). Parent awareness for Child 3's visual supports was provided prior to Treatment 2 and at the beginning of each session. This included how to integrate the visual supports into play. Specifically, Child 3's mother was instructed to show him the visual support, read the supports while pointing to the pictures and then placing the visual support in Child 3's field of vision throughout session.

Figure 23. Pictures of Child 3's Playing Ball Visuals (The Picture Communication Symbols ©1981–2011 by Mayer-Johnson LLC. All Rights Reserved Worldwide. Used with permission.)

Figure 24. Picture of Child 3's Choice Board

Using the ICER-R and Challenging Behavior Record, Treatment 2 data for child 3's

passive engagement resulted in a mean of 14.71% with a range of 8%-20%. The mean for active

engagement was 74.71%, ranging from 56%-88%. Challenging behaviors resulted in a mean of

2.14% with a range of 0%-8%. Child 3 demonstrated an increase of 44.58% from Treatment 1

for active engagement, a 18.59% decrease for passive engagement, and a 22.36% decrease for

challenging behaviors. Although passive engagement decreased from Treatment 1 to Treatment

2, active engagement increased significantly. As active engagement serves as a more rich

communication function, this outcome is desirable. Child 3 demonstrated no challenging

behaviors after Treatment 2.

Of the three participants, Child 3 appeared to benefit the most from the addition of the

visual supports for active engagement. Child 3's active engagement increased by 44.58% once

visual supports were implemented. It was demonstrated that visual supports for Child 3 were the

most meaningful and/or informative.
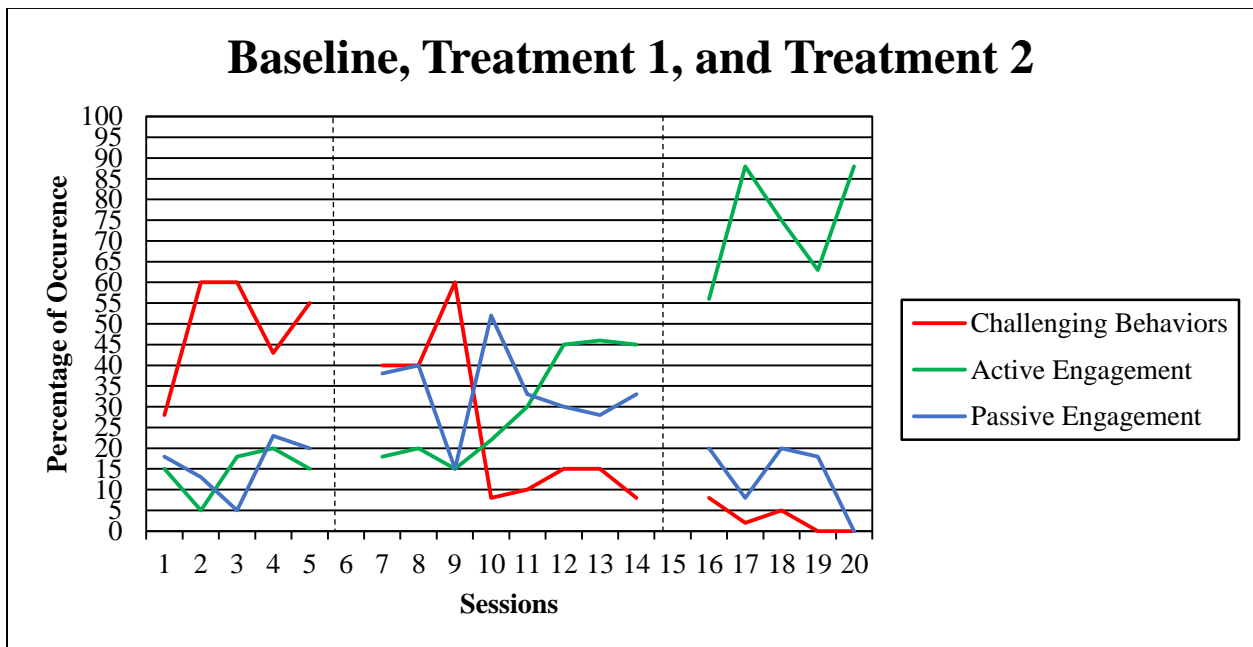
Figure 25. Child 3's Baseline, Treatment 1, and Treatment 2 Data

Phase 5: Follow up

Follow up occurred one and two months post-treatment. The first follow up included the

re-administration of the Evaluation of the Home Environment for Children with ASD. Child 3's

parents had maintained all of the components of the original modification. The results showed

110

significant improvement in all three environmental modification areas observed. In regards to

organization modifications, four of four supports were available as compared to zero of four

components at assessment (See Table 14).

Table 14

Child 3's Organizational Supports Occurrence Pre- and Post-Treatment

Organizational Supports	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Storage containers used and clearly visible		X	X	
Open space for child's movement		X	X	
High interest items designed to need adult assistance		X	X	
Play items of unique interest are available		X	X	

In regards to learning space, two of two components were available as compared to one

of two components at assessment (Table 15).

Table 15

Child 3's Learning Space Occurrence Pre- and Post-Treatment

Learning space	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Defined place for learning		X	X	
Defined place for sensory breaks	X			X

In regards to sensory components of a space for sensory breaks, the parents had removed the tent created for sensory breaks as they indicated that Child 3 did not use it.

Table 16

Child 3's Sensory Components Occurrence Pre- and Post-Treatment

Sensory Components	Pre-Occurrence			Post-Occurrence		
	Yes	No	N/A	Yes	No	N/A
Soft items	X					X
Free access	X					X
Child control			X			X
Clean and safe	X					X
Private space	X					X

In regards to the presence of visual supports, three of five types of supports were available as compared to zero of five available at assessment.

Table 17

Child 3's Visual Supports Occurrence Pre- and Post-Treatment

Visual Supports	Pre-Occurrence		Post-Occurrence	
	Present	Absent	Present	Absent
Daily schedule(s)		X		X
Play choices		X	X	
Self-care		X		X
Play procedures		X	X	
Material label(s)		X	X	

Following the Evaluation of the Home Environment for Children with ASD, the parent was instructed to engage the child in a play and/or daily routine of his choice and to follow the same procedures as in Treatment 1 and Treatment 2. The ICER-R and Challenging Behavior Record was used to collect data. During Child 3's first follow up, the mean for passive engagement was 12.5%, the mean for active engagement was 87.7%, and the frequency of challenging behavior was 5%. Challenging behaviors were limited to roaming away from the designated play area. On the second follow up, Child 3 demonstrated passive engagement with a mean of 20%. The mean for active engagement was 80% and frequency of challenging behaviors was 7.5%. Challenging behaviors were limited to roaming (See Figure 26). This demonstrated maintenance of treatment gains for both engagement and challenging behaviors.
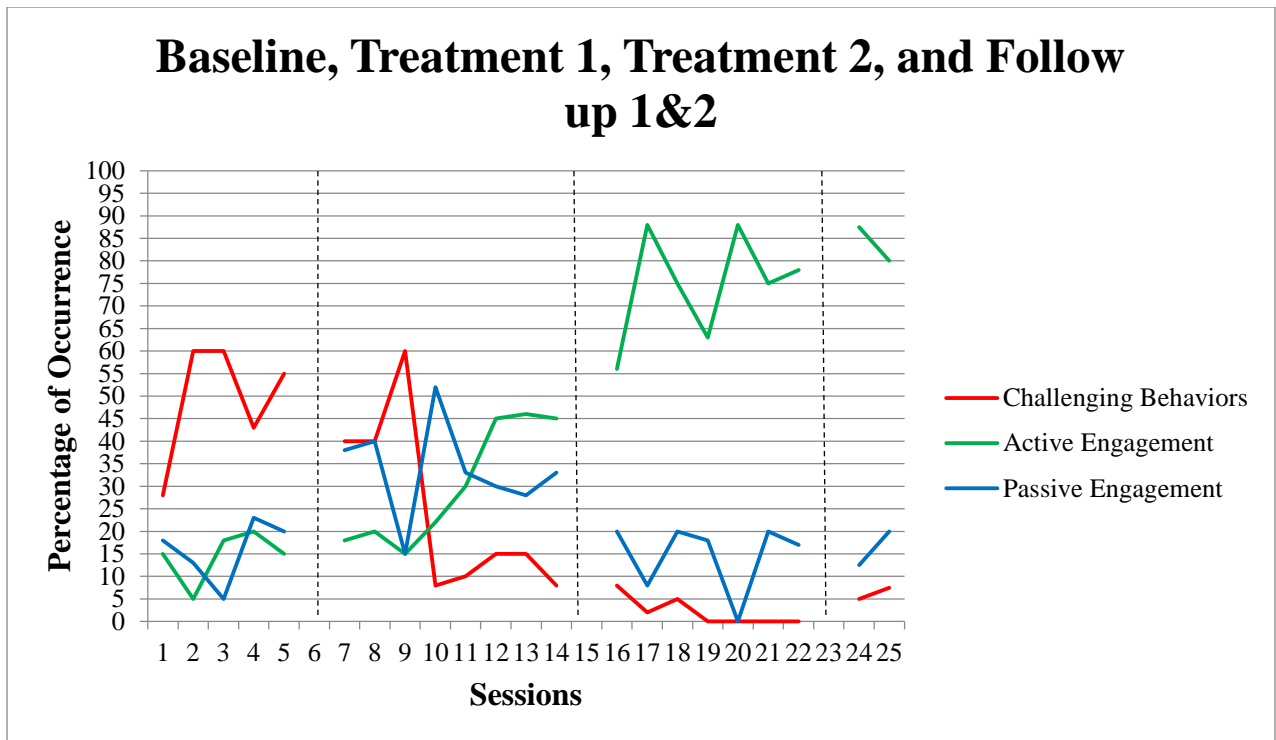
Figure 26. Child 3's Baseline, Treatment 1, Treatment 2, and Follow-up 1 & 2 Data

Collective Data for Child Participants

Table 18 provides a summary of previously reported data including passive engagement, active engagement, and challenging behaviors across treatments with percent of increase or decrease from baseline to Treatment 1 and percent of increase or decrease from Treatment 1 to Treatment 2. Additionally, total engagement summing both active and passive engagement is included. Percentage was collected by calculating the number of occurrences for each type of engagement and each occurrence of challenging behaviors every 15 seconds during a consecutive 10-minute play and/or daily activity. The number of occurrence was divided by the number of opportunities to obtain a percent per session. An overall percentage was obtained by summing the percentages per phase (i.e., baseline, Treatment 1 and Treatment 2) by the number of sessions within the phase.

In regards to active engagement across participants, each participant demonstrated an ascending trend across treatment sessions. One child demonstrated the highest increase following Treatment 1. One child maintained level of active engagement across Treatment 1 and Treatment 2. One child demonstrated the most significant gains with the addition of Treatment 2.

In regards to passive engagement across participants, each participant varied in the percent occurrence of passive engagement. However, a trend was noted for each participant that as passive engagement decreased, active engagement increased.

In regards to total engagement across participants, each participant demonstrated an ascending trend across treatment sessions for both treatments. Although active and passive engagement varied across participants, total engagement was achieved and maintained through follow up.

In regards to challenging behaviors across participants, each participant demonstrated an ascending trend across treatment sessions. All participants demonstrated a significant decrease ranging from a 24%-69% reduction in the frequency of challenging behaviors. Child 1 had a slight increase of 1.33% from Treatment 1 to Treatment 2; however, the trend remained stable and was not deemed a concern. Of all participants, Child 1 demonstrated the most significant decrease in challenging behaviors from baseline and Treatment 1 (59.87%). All participants had significantly fewer behaviors that interfered with engagement during play and/or daily activities. Thus, children demonstrated a decrease in challenging behaviors, which resulted in increased opportunities for engagement.

Table 18

Total Mean Percent of Active Engagement, Passive Engagement, Total Engagement and Challenging Behaviors for Baseline, Treatment 1 and Treatment 2, and Mean Percentage Increase or Decrease across Conditions for all Participants

Child	Type of Behavior	Baseline %	Tx 1%	Total % +/-	Tx2%	Total % +-	Follow up 1%	Follow up 2%
Child 1	Active Engagement	1.75	51.67	49.92	62	10.33	75	67.5
	Passive Engagement	10.5	20	9.5	13.67	6.33	20	30
	Total Engagement	11.80	71.67	59.87	75.67	15.8	95	97.5
	Challenging Behaviors	75	6	69	7.3	1.33	25	22.5
Child 2	Active Engagement	15.75	45.57	29.82	76.89	31.32	87.5	80
	Passive Engagement	32.75	25.14	7.61	12.56	12.58	12.5	20
	Total Engagement	48.5	70.71	22.21	89.45	18.74	100	100
	Challenging Behaviors	27.75	10	17.75	6.33	3.67	0	0
Child 3	Active Engagement	14.6	30.13	15.53	74.71	44.58	87.5	80
	Passive Engagement	15.8	33.63	17.83	14.71	18.59	12.5	20
	Total Engagement	30.4	63.76	33.36	89.42	25.66	100	100
	Challenging Behaviors	49.2	24.5	24.7	2.14	22.36	5	7.5

In addition to the frequency of challenging behaviors, the type of behaviors changed across treatments and were less disruptive to learning. At baseline, challenging behaviors were more aggressive and distracting (e.g., hitting, yelling and crying), whereas Treatment 2 behaviors were not aggressive and interfered less with learning (e.g., roaming). Table 19 provides challenging behavior progression.

Table 19

Types of Challenging Behaviors across Baseline, Treatments and Follow up

Participant	Baseline	Treatment 1	Treatment 2	Follow up
Child 1	Hitting, yelling, crying, roaming	Roaming, yelling	Verbal protest with yelling	Roaming
Child 2	Crying, turning away, roaming	Crying, roaming	Roaming	none
Child 3	Crying, turning away, roaming	Roaming	Roaming	none

Social Validity

The Post- Modification Parent Interview served as a qualitative form of social validity

and provided the researcher information regarding how the parents perceived physical

modifications, visual supports and their child's engagement and challenging behaviors. The

parents overwhelmingly were pleased with their participation in the study and expressed

increased engagement and fewer challenging behaviors during play with their child. Table 20

provides quotes form the interview across all three participants.

Table 20

Social Validity Data

	Child 1	Child 2	Child 3
Environment and/or Visual supports: What was learned?			
Impact on Parent	"He had too much stuff." "He liked playing at the kitchen table (referring to the designated place). I wouldn't have thought about that." "At first he didn't seem to like the pictures but when you (referring to researcher) put them on his chat pad he paid better attention."	"I recognized how overwhelmed he was with his environment." "I saw ways that I could change things for him." "When I put a toy out to focus on and put others away he was more interested."	"Some toys I thought he would like, but he never played with them." "I kept a lot of toys thinking he would like them some day." "He liked his room better when it didn't have so much stuff. I just could tell." "It really felt good to get rid of so much stuff" (referring to toys in the child's playroom).
Impact on Child	"If he wanted something, he needed me to help him." "He likes to help clean up so now he knows where the toys go" (referring to the labeled containers).	"He had to ask for help." "The visual makes it easier to make choices, and he wasn't as overwhelmed." "He is trying to talk so much when we are playing."	"When there weren't so many toys, he seemed to notice them better." "He did really good picking what he wanted to play with. I was surprised" (talking about using the choice board). "He said balloon, stop and go. Those are words that go with the toys we use now."

	Child 1	Child 2	Child 3
Engagement: Any changes?			
Impact on Child	"We knew what to play with." "I liked that he would let us play instead of being mad when we tried to."	"It was okay to move from one activity to another as long as he was still engaged." "His ability to choose is so much better."	"He started to ask for different cars when we played and stayed with me longer." "He was just more interested."
Parent Awareness Training			
	"That he doesn't need as much stuff as he has." "I knew he had a lot, but I didn't realize it made it hard for him to play sometimes." "I think I would know how to make some changes on my own. I might even set up the living room a little differently."	"I learned to keep some of the parts of the toys so he could ask me for them." "I love clear containers."	"I learned to just show him the choices and wait for him to pick. He almost always did." "That I need to put up stuff after we play or that he does."
Behavior: Any Changes?			
	"He would let us play instead of being mad when we tried to." "The trampoline really helped and he could play with us and jump at the same time."	"He's not getting mad when I play with the trains. He still has some non-negotiable toys, but I know which ones to join in on." "How to play" (visual support) really worked.	"I liked that he stays in the playroom now. I feel like we don't have as many bad behaviors because I'm not having to make him come back."

	Child 1	Child 2	Child 3
Anything else you or your child learned or changed?			
	"We put a lot of toys in the out building and gave some more away." "To be more patient and give him a chance to show me what he wanted" (talking about the choice board).	"I started to identify his likes and dislikes and how to select which toys to put out." "I started changing out his books every 2 weeks instead of having the same ones." "At Christmas, I asked family for specific things and just put them in his play area over time so he wouldn't be overwhelmed." "I put a mirror in his quiet place. He really liked that when we were reading."	"I finally took the tent down." He really didn't use it, but I really wanted him to."

Summary

This chapter provided the results for each participant by study phase noting positive gains in engagement and a significant decrease in frequency and type of challenging behaviors. Chapter 5 will provide a discussion that includes key findings, limitations, and recommendations for future research.

CHAPTER 5

DISCUSSION

Overview

This study served to determine if physical modifications and physical modification plus visual supports facilitate improved engagement and decrease challenging behavior in children with autism. Two research questions lead the research study: 1) Do physical modifications to the home environment (e.g., defined learning space, organization of materials, and/or availability of toys and materials) increase engagement and decrease the number of challenging behaviors? and 2) Does the use of physical modifications plus visual supports in the home environment increase engagement and decrease the number of challenging behaviors?

Only a few studies (Blaka & Hasslen, 1994; Cook et al., 2007) have been conducted to understand the role of the environment on children with autism, while other studies have examined the benefits of visual supports (Danko, 2004; Hodgdon, 1995; Johnston et al., 2003) on children with autism. However, no study was found that examined both components in the home environment. This research serves as a beginning look into how modifications can facilitate engagement and decrease challenging behaviors in young children with autism and demonstrates the potential benefit of using a "treatment package" (e.g., physical modification, visual supports and parent awareness training).   Koegel and Koegel (1990) recommended using a treatment package to address stereotypical behaviors in children with autism while Pelios, MacDuff, and Axelrod (2003) used a treatment package to assist children with autism in independent academic work. Given the diverse needs of children with autism, a treatment package takes into consideration the complexity of the disorder and can accommodate the levels of severity while providing a variety of evidence-based intervention strategies.

The findings from the study are presented as follows: a) key findings, b) limitations of the study, c) recommendations for future research and d) summary.

Key Findings

Key findings will be discussed in terms of: a) the young children with ASD, b) parents of children with ASD, c) physical modifications, and d) physical modifications plus visual supports.

Children with ASD

For each participant in the study, steady improvements in the level of engagement and a decrease in level of challenging behaviors was noted during both Treatment 1 and Treatment 2. Each child demonstrated significant improvement compared to his baseline levels, and the improvements were maintained during follow-up sessions. Given this, it can be stated the changes in Treatment 1 and Treatment 2 for the children were not based on novel effect alone rather on the components of each treatment.   The results demonstrate that by modifying the physical environment (e.g., organizing materials and resources, defining play options) and incorporating visual supports (e.g., choice boards, "how to boards") children with autism make significant gains in engaging with their parents. As engagement in young children with autism increases, children are more available for learning, communicating and recognizing the social behaviors of others.

Parents of Children with ASD

All three parents reported positive changes in their child's engagement and a decrease in challenging behaviors after both physical modifications and with addition of visual supports. The follow-up session revealed that two parents had spontaneously made novel changes to the physical environment, reduced the number of toys provided to their child during the holiday and were more aware of the need to organize playthings during and after play routines. Additionally,

two parents were developing visual supports to use in the home (i.e., self-care routine, daily schedule and choice board). During the post-interview, each parent indicated that the instruction they received related to organizing their home environment was "extremely helpful" and allowed them to play more easily with their child.

Although not specifically addressed, parents made statements that revealed that a decrease in the amount of clutter was a positive outcome on their personal well-being (e.g., parent 2: "It was great to get rid of some of the things we really didn't need."). Bourg (2012) and Tunajek (2009) indicate that clutter contributes to stress by mentally bombarding individuals with excessive stimuli (i.e., visual, auditory and tactile).

This study provides an indication as to how parents can facilitate engagement and decrease challenging behaviors in the home and highlights the value of the formulation of parent partnerships. The study further supports the role of the parent as a primary interventionist and the home as a natural context for learning (Bermbeimer & Keogh; 1995; Sussman, 1999).

Physical Modifications

The results of the study support that physical modifications can use a family's current materials and resources to impact engagement and challenging behaviors. Thus, simple and low cost modifications can improve the likelihood that modifications used could be easily implemented in other home settings. The specifics of the study (i.e., physical modifications and visual supports) were individually determined and applied to the home based on the child and family strengths and needs as well as the child's own resources, toys and materials. This allowed for a relativity nonintrusive intervention that supported each child in his home during play and/or daily routines.

Physical Modifications plus Visual Supports

The visual supports added to the physical modifications were shown to further increase the child's level of engagement and decrease the number of challenging behaviors. As noted above, two families developed their own visual supports, while all three families reported using the visuals that had been developed by the researcher. The study results support that the implementation of visual supports can be easily developed, and modeled by interventionist, and implemented by parents in the home environment. The results of Treatment 2 demonstrate that parents were effective in using the visual supports following a brief period of awareness/training on the rationale and use of the visual supports.

Limitations of the Study

1. The nature of single-subject research design makes it difficult to include a large number of participants thus given the small sample size of this study results should not be generalized to all young children with autism. Additionally, all participants were male and resided in a 2-parent household with their mother serving as the primary caregiver, thus generalization across gender or for children who reside with only one parent can not be made.

2. Although the individualization of the physical modifications and visual supports were essential in meeting the needs of each participant these slight variations in the types of modifications and visual supports used across the home settings make replication of the study challenging.

3. Physical modifications added to the home environment were shown to result in increased engagement and decrease changing behaviors for all three participants; however, visual supports resulted in inconsistent gains in engagement and no changes in challenging behaviors. Additionally, as parent awareness was a component of the treatments, it is difficult

to determine specifically the influence of physical modifications and/or visual supports alone. Thus, it is challenging to discern whether all components are necessary to improve engagement and/or decrease challenging behaviors.

4. Social validity could further be measured by developing a Likert-type scale. This type of quantitative data would provide the researcher a metric scale across phases to supplement the qualitative measure for social validity.

5. Since the researcher served as the evaluator and was aware of the conditions and design of the study, the fact that the researcher was not blind to the conditions and design is considered a potential limitation. Additionally, the impact of the physical presence of the researcher in the home may have had an impact on parent-child interaction, parent report and parent level of comfort.

Recommendations for Future Research

1. A limitation of the study was the confounding variables that may exist between types of modifications, visual supports, and parent awareness training; thus, research could be conducted to examine each of these separately. There is existing information on the benefits of using visual supports to increase engagement and decrease challenging behaviors; however, there continues to be a lack of research on the impact of physical modifications to the home environment on engagement and/or challenging behavior. Thus, more research on the impact of physical modification alone could prove beneficial.

2. It is important that future research explore the impact of modifications and modifications plus visual supports on a greater number of participants to provide generalization insight.

3. Future studies should be conducted for older children and children across the autism severity levels.

4. Future research should include replication of the study and should develop stringent guidelines for parent awareness training. It would be advantageous to develop training protocol so each parent participant receives consistent instruction.

Summary

Two researcher questions were presented at the beginning of this research study: 1) Do physical modifications to the home environment increase engagement and decrease the number of challenging behaviors? and 2) Does the use of physical modifications plus visual supports in the home environment increase engagement and decrease the number of challenging behaviors? The data answered yes to each of these questions. All three participants showed significant improvements in level of engagement and a decrease in challenging behaviors in Treatment 1 and showed additional change in Treatment 2. Thus, the data supports that physical modifications and visual supports did increase engagement and decrease challenging behaviors in three young children with autism.

Additionally, the quality of engagement improved with more active engagement (i.e., engaging with others) rather than passive engagement (i.e., engaging with materials) occurring for each child. Parents were able to use the physical modifications and the visual supports to facilitate their child's engagement given brief training related to the importance of the changes. The treatments were simple, cost efficient and honored the children's home while empowering the children's parents as primary interventionist.

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Appendix A

Informed Consent

PRINCIPAL INVESTIGATOR: <u>Teresa Boggs</u>

TITLE OF PROJECT: <u>The Effects of Environmental Modifications and Visual Supports in the Home on Engagement and Challenging Behaviors in Children with Autism</u>.

This Informed Consent will explain about being a participant in the following research study. It is important that you read this material carefully and then decide if you wish to be a volunteer.

<u>PURPOSE</u>:

<u>The purpose of this research study is as follows</u>:

 The primary purpose of this study is to find out whether making simple modifications (i.e., putting toys in new locations, organizing child's materials and playthings, creating a play area) to the home and/or adding visual supports (pictures) can improve a child's ability to engage better with parent(s) in daily routines and if the simple changes can reduce or eliminate challenging behaviors.

 The specific aims of this study are to measure engagement between parent(s) and their child during home activities (e.g., mealtime times, play). In this study, we want to see if engagement improves and challenging behaviors decrease after simple modifications are made to the home environment and after visual supports are placed in the home.

<u>DURATION</u>

 During this research study, the number and length of sessions will vary slightly. There will be approximately 15 to 20 sessions lasting 30 minutes to one hour. The first three to five sessions will be baseline sessions in which you and your child will engage in your typical daily routines without any changes recommended by the researcher. The researcher will make simple physical changes. The next three to five sessions, occurring one to two times per week, will measure your child's engagement and challenging behaviors following the physical modifications.

Then, the researcher will add visual supports (i.e., pictures). The next three to five sessions, occurring one to two times per week, will measure your child's engagement and challenging behaviors following the addition of the visual supports.

The researcher will return for a session two weeks, one month, and two months after the study is completed to again measure engagement and challenging behaviors during a home routine, and to learn what you think about the simple physical changes and the use of visual supports.

<u>PROCEDURES</u>

Your participation in the research will involve 5 stages: pre-baseline, baseline, intervention 1, intervention 2 and follow up. All sessions in each stage occur in your home at a time that is convenient for you and will last 30 minutes to one hour.

The pre-baseline session will happen once during the study. The purpose of this session is to get a description of the home's physical environment, to discuss with the parent(s) specific environmental needs, to determine the home routines in which the child participates, and to take photographs of the areas of the home in which the child's home routines occur. An assent task will be provided to the child. For nonverbal children or children who do not understand the assent task, assent will be based on their willingness to engage or interact with parents and parent consent. The assessment tools that will be used are the Evaluation of the Home Environment for Children with ASD and the Parent Rating Scale of Participation in Home Routines.

The Evaluation of the Home Environment for Children with ASD will allow the researcher to note availability of play items, organization of toys and materials and the presence or absence of visual supports. The Parent Rating Scale of Participation in Home Routines will be completed by the parent(s). You will indicate the toys your child prefers and the toys your child has available, but does not prefer. Additionally, you will rate your child's level of independence on self-care activities (e.g., brushes teeth, washes hands, brushes hair, etc.). If the researcher finds that modifications would not be beneficial to you or your child, you will not be included in the study.

Baseline sessions will range from three to five sessions during the study. After you have completed the Parent Rating Scale of Participation in Home Routines, the researcher will ask you to play with your child using toys and materials that your child already has available. Each play routine will last 10 minutes. The researcher will observe the play and document your child's engagement and any challenging behaviors on one to three 10-minute routines. The play may be videotaped to ensure that the researcher is documenting your child's engagement and behaviors correctly.

Intervention 1 sessions will range from three to five sessions during the study. Simple physical modifications will be made with your permission and may include one or more of the following changes: changing lighting by using lower wattage bulbs or lamps, labeling or categorizing toys and materials, creating a comfortable space for your child to be alone or to complete quiet play (e.g., reading books or completing puzzles) and/or arranging toys and materials differently. Following the modifications, you will be provided with a reason for the modifications and again will be asked to play with your child using toys and materials that your child has available. Each play routine will last 10 minutes and you may complete one to three different 10-minute play routines. The researcher will observe the play and document your child's engagement and any challenging behaviors. The play may be videotaped to ensure that the researcher is documenting your child's engagement and behaviors correctly.

Intervention 2 sessions will range from three to five sessions during the study. Visual supports (pictures) will be added to the home environment. These pictures will be used to help your child understand the daily schedule, daily routines, and choices that they can make while playing. Following the addition of the visual supports, you will be provided with a reason for the visual supports and again will be asked to play with your child using toys and materials that your child has available. Each play routine will last 10 minutes, and you may complete one to three different 10-minute play routines. The researcher will observe the play and document your child's engagement and any challenging behaviors. The play may be videotaped to ensure that the researcher is documenting your child's engagement and behaviors correctly.

After intervention 2, follow-up home sessions will be scheduled for two weeks, one month, and two months following the completion of the study. These home sessions will allow you to provide information to the researcher on the simple physical modifications and the visual supports used in the study. The researcher will complete the Evaluation of the Home Environment for Children with ASD, as in the baseline session, and will have you and your child choose a play routine from intervention 1 and intervention 2.

ALTERNATIVE PROCEDURES/TREATMENTS

Participation in this study is voluntary. You can choose to not participate in the research study or you may choose to participate and later change your mind. You may also choose to participate and later decide to withdraw following baseline sessions or sessions incorporating intervention. If you choose to not take part in the study or decide to stop participating, you and your child will not be affected by this choice nor will your child's care in the clinic be affected. If you choose to not participate, you will be given the Physical Modifications Home Guide and Visual Supports Home Guide for personal use.

POSSIBLE RISKS/DISCOMFORTS

There are possible risks and/or discomforts by participating in this research study. By agreeing to participate, you will allow a researcher to enter your home for observation and be willing to change your home environment. The researcher will make simple changes to your home environment that may/may not include moving of furniture, moving of personal belongings, and addition of objects within the home (containers, lamps, etc.). You and your child will be recorded by video recorder. The changes made to your home will remain until the study has ended. There are few risks for this study; however, opening up your home for the research study and changing the environment may lead to some sense of discomfort.

POSSIBLE BENEFITS

The possible benefits of participating in this research study can include an increased chance for communication between you and your child as a result of increased engagement and decreased challenging behaviors. Simple changes and visual supports will be made to reduce challenging behaviors in the home. This study will also allow for an increase in knowledge for other practitioners about the effects of physical modifications and visual supports within the home for young children with autism.

COMPENSATION FOR MEDICAL TREATMENT:

East Tennessee State University (ETSU) will pay the cost of emergency first aid for any injury that may happen as a result of your being in this study. ETSU makes no commitment to pay for any other medical treatment. Claims against ETSU or any of its agents or employees may be submitted to the Tennessee Claims Commission. These claims will be settled to the extent allowable as provided under TCA Section 9-8-307. For more information about claims call the Chairman of the Institutional Review Board of ETSU at (423)439-6055.

FINANCIAL COSTS

There is no additional cost to participants that may result from participation in the research. There is no cost for modifications to be made as the researcher.

 VOLUNTARY PARTICIPATION

Your participation in this research study is voluntary. You can choose to not participate or may choose to participate and later change your mind. If you choose not to take part or decide to stop participating, your child's care in the clinic will not be affected by your choice. If you choose not to participate, you will be given the Physical Modifications Home Guide and the Visual Support Home Guide for personal use. You may stop participation by calling Teresa Boggs at (423)439-4535 or by email at **boggs@etsu.edu**.

CONTACT FOR QUESTIONS

 If you have any questions, problems or research-related medical problems at any time, you may call Teresa Boggs at (423)439-4535 or by email at **boggs@etsu.edu**, or Pamela Evanshen at (423)439-7694 or by email at **evanshep@etsu.edu**. You may call the Chairman of the Institutional Review Board at (423)439-6054 for any questions you may have about your rights as a research participant. If you have any questions or concerns about the research and want

to talk to someone who is not part of the research team, or if you cannot reach the study staff, you may call an IRB Coordinator at (423)439-6055 or (423)439-6002.

<u>CONFIDENTIALITY</u>

Every attempt will be made to see that your study results and your child's study results are kept confidential. A copy of the records from this study will be stored on a password protected computer and/or flash drive and will be destroyed at the end of the study. The results of this study may be published and/or presented at meetings without naming you or your child. Although your rights and privacy will be maintained, the ETSU IRB and personnel particular to this research, Teresa Boggs and research assistant(s), have access to the study records. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above.

<u>AUTHORIZATION TO USE AND DISCLOSE</u>
<u>PROTECTED HEALTH INFORMATION FOR RESEARCH PURPOSES</u>

The privacy law, Health Insurance Portability & Accountability Act (HIPAA), protects my individually identifiable health information (protected health information). The privacy law requires me to sign an authorization (or agreement) in order for researchers to be able to use or disclose my protected health information for research purposes in the study entitled *The Effects of Environmental Modifications and Visual Supports in the Home on Engagement and Challenging Behaviors in Children with Autism.*

I authorize *Teresa Boggs* and her research staff to use and disclose my protected health information for the purposes described below. I also permit my doctors and other health care providers to disclose my protected health information for the purposes described below.

My protected health information that may be used and disclosed includes:

- Demographic information and Speech Language Evaluation

   The Investigator, Teresa Boggs, may use and share my health information with:
- The East Tennessee State University Human Research Protections Program (HRPP) Institutional Review Board Administration when the researcher or the research site is undergoing *Quality Improvement Program* (*QIP)* auditing.

   Once my health information has been disclosed to anyone outside of this study, the information may no longer be protected under this authorization.

   The investigator, Teresa Boggs, agrees to protect my health information by using and disclosing it only as permitted by me in this Authorization and as directed by state and federal law.

   I do not have to sign this Authorization. If I decide not to sign the Authorization:

- It will not affect my treatment, payment or enrollment in any health plans nor affect my eligibility for benefits.
- I cannot be allowed to participate in this research study.

    After signing the Authorization, I can change my mind and:
- Not let the researcher disclose or use my protected health information (revoke the Authorization).
- If I revoke the Authorization, I will send a written letter to: Teresa Boggs at to inform her of my decision.
- If I revoke this Authorization, researchers may only use and disclose the protected health information **already collected** for this research study.
- If I revoke this Authorization my protected health information may still be used and disclosed should I have an adverse event (a bad effect, or experience something unanticipated).
- If I change my mind and withdraw the authorization, I may not be allowed to continue to participate in the study.

    This Authorization does not have an expiration date.

    If I have not already received a copy of the Privacy Notice, I may request one by contacting the Privacy Officer. If I have any questions or concerns about my privacy rights, I should contact the East Tennessee State University, James H. Quillen College of Medicine Privacy Officer, Paula Wright,, at 423/433-6074 OR *if applicable* **(for the VAMC Angela Mullins, Chief, Health Information Management Service, VAMC Privacy Officer at (423)926-1171, x-7620).**

    I am the subject or am authorized to act on behalf of the subject. I have read this information, and I will receive a copy of this form after it is signed.

By signing below, you confirm that you have read or had this document read to you. You will be given a signed copy of this informed consent document. You have been given the chance to ask questions and to discuss your participation with the investigator. You freely and voluntarily choose to be in this research project.

In addition, by signing below, you are authorizing the use and disclosure of your protected health information for research purposes as described above.

_____

SIGNATURE OF PARENT   DATE

_____

PRINTED NAME OF PARTICIPANT   DATE

_____

SIGNATURE OF INVESTIGATOR   DATE

_____

SIGNATURE OF WITNESS (if applicable)   DATE

The Physical Modifications Home Guide

Physical Modifications of the Home Environment

Types of Modifications	Examples	Rationale for the modification
Labeling toy containers (e.g. a box for cars, dolls, games, block)		Providing a label with both a picture and word increases predictability in the child, thus, decreasing challenging behaviors. It also increases independence.
Keeping toys out of reach (e.g. toys of interest placed higher on shelves)		Placing toys of interest higher facilitates engagement in that the child will need to elicit help.
Creating a soft area for the child to go (calm space) in the corner of a room (i.e. rug, pillows, blankets, stuffed animals)		Creating a calm area allows the child to decompress from overstimulation.

Types of Modifications	Examples	Rationale for the modification
Creating appropriate lighting (e.g. dimmed lighting, using lamps, lower wattage bulbs)		Using dimmed lighting creates a calm environment that decreases anxiety and challenging behaviors, in children with autism, who become over stimulated with too much light.
Decreasing visual stimuli (e.g. loud colors, pictures)	Use calm colors (e.g., pale yellow, lavender, etc.) instead of bright paint on walls. Remove excess visual stimuli (e.g. pictures).	Decreasing visual stimulus improves attention to desired person, object, or task.
Creating a specific place for learning	Have a separate place for completing homework or reading.	Transitioning the child to their learning area to complete undesirable tasks (i.e. school work) increases engagement and attention to the task.

Types of Modifications	Examples	Rationale for the modification
Labeling and categorizing items appropriately in designated areas	Have a cabinet with the word and picture of "plates" and a dresser with a picture and word of what it contains. Like toys are organized together (e.g. quiet vs. active toys).	Exposing the child to verbal and written language increases predictability and independence.
Use specific or unique interests to increase engagement in the child's daily activities (e.g. Picture of Scooby Doo brushing his teeth in the bathroom).		Using the child's specific or unique interest enhances engagement and independence.

Types of Modifications	Examples	Rationale for the modification
Reducing clutter (e,g. covering the bookshelf with a curtain to distract from excessive stimuli)		Reducing distractions allows for increases in focus and engagement.
Creating an open space for movement	 Have a designated open area for activity, trampoline and therapy ball	Creating a specific area for movement allows for the child to meet sensory needs while decreasing challenging behaviors.

Visual Supports Home Guide

1. **Schedule Boards**
   - Schedule of daily events
   - Morning schedule

Schedule boards provide the child with the expected sequence of eventers during a period of time. By presenting the child with the order of events the day becomes more predictable and routine. By providing a schedule challenging behaviors decrease because transitions between tasks become smoother.

2. **Daily Routines**
   - Using the potty
   - Wash hands
   - Getting Dressed
   - Brushing Teeth
   - Taking a Bath
   - Meal time

Daily routine visual supports provide the child with picture symbols that help the child to transition easier from one activity to the next. It provides the child with visual cue of what is expected of them during that specific time. Daily routine visual supports are visually engaging and easy to change. They increase engagement and predictability, while decreasing challenging behaviors.
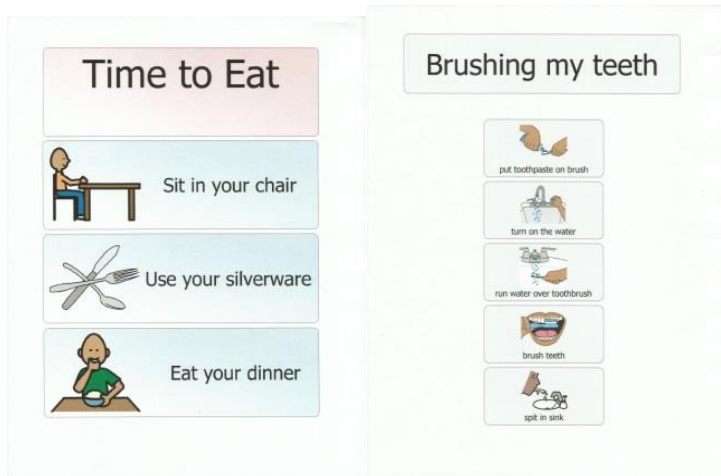
3. **Choice Boards**
   - I want ... Choice Board
     (e.g., read a book, play iPad, go outside, make a craft, etc.)

   - I want to go … Choice Board
     (e.g., to the park, to the library, for a walk)

Visual choice boards provide the child with a visual display of different options. Usually a statement (e.g., I want....) and pictures that provide the child with an opportunity to make a choice on what they would like to do. They increase engagement and predictability, while decreasing challenging behaviors. Choice boards are also easy to change and to adapt based on the child's current interest.

4. **Behavioral Expectations**
   - When I'm frustrated
   - When I'm mad
   - Meal time behavior

Behavioral expectation visuals are a way to use visual cues to explain what the expected behavior is during a specific task or situation. This can be used in many different situations. This visual provides the child a social story and the expected behaviors. They increase engagement and predictability, while decreasing challenging behaviors.

When I get frustrated

Sometimes I get frustrated. When I am frustrated, I need to make good chocies.

I can ask to have time alone in my calm space.

In my calm space, I can hug a pillow or read a book.

I must use my quiet voice and have calm hands.

5. **Play Routines**
   - Playing with dolls
   - Playing with cars

Play routine visuals help to increase functional play in a naturalistic setting. Knowing the appropriate manner to play with an object help to decrease challenging behaviors by decreasing frustration. This visual schedule increases engagement and predictability by creating an environment while decreasing challenging behaviors.

Playing with Baby Dolls

Push the Carriage

Rock the Baby

Feed the Baby

Baby Doll

Wash the Baby

Dress the Baby

Burp the Baby

Appendix D

Evaluation of the Home Environment for Children with ASD

Evaluation of the Home Environment for Children with ASD

ORGANIZATION	PRESENT	COMMENTS
Shelves, baskets, containers are used and clearly visible	☐	
Open space for child's movement in home	☐	
High interest items are designed to be requestable (e.g., clear boxes/visible but out of reach)	☐	
Play items are available that promote interaction	☐	
Play items of child's unique interest are available	☐	

Describe other organization modifications:

VISUAL SUPPORTS	PRESENT	COMMENTS
Visuals are available that depict the daily schedule	☐	
Visuals are available to allow the child to make choices	☐	
Visuals showing procedure for self-care tasks	☐	
Visuals showing procedure for play	☐	
Labels and pictures are used to identify them	☐	
Are visual supports on neutral-colored surfaces	☐ Always ☐ Sometimes ☐ Never ☐ N/A	
Rate the visual clutter in the child's primary areas: ☐ No visible clutter ☐ Minimal clutter ☐ Some clutter ☐ Significant clutter		

SPACE	PRESENT	COMMENTS	
Has a defined area/place for learning	☐		
Have a cubby/tent/corner for sensory	☐		
If present, please rate the following:	YES	NO	SOMETIMES
Soft or sensory items available	☐	☐	☐

Child has free access to personal space	☐	☐	☐
Child can change and modify his/her space	☐	☐	☐
Child space is clean and safe	☐	☐	☐
Child space is private	☐	☐	☐

Describe the lighting (e.g., natural, fluorescent, incandescent, etc.) in the child's space(s):

_____

Describe the colors (e.g., neutral, bold, primary, etc.) used in the child's space(s):

_____

Describe any distractions (e.g., noise, visuals, etc.) in the child's space(s):

_____

Appendix E

Parent Rating Scale

Parent Rating Scale of Participation in Daily Routines

Directions:
In the blank spaces provided, please indicate up to five (5) of your child's preferred toys and five (5) non-preferred toys (toys available in your home, but he/she does not play with them). The toys may include gross-motor activities (e.g. slide, therapy ball, tricycle, small toys (e.g. Mr. Potato Head, puzzles, blocks), and sensory items (e.g. Play-Doh, bubbles, paint). Indicate if your child plays with the toy in a typical or atypical manner (e.g. child pushes toy car across floor (typical); child turn car upside down and spins wheels only (atypical).

PLAY			
Preferred Toys	**Atypical**	**Typical**	**Comments**
1)	☐	☐	
2)	☐	☐	
3)	☐	☐	
4)	☐	☐	
5)	☐	☐	
Non-Preferred Toys	**Atypical**	**Typical**	**Comments**
1)	☐	☐	
2)	☐	☐	
3)	☐	☐	
4)	☐	☐	
5)	☐	☐	

Directions:
Please check the level that your child performs the following tasks from independently to unable to do.

DAILY ROUTINES					
Self-Care	**Does Independently**	**Can do with verbal direction only**	**Can do with physical cues**	**Unable to do**	**N/A**
Brushes teeth	☐	☐	☐	☐	☐
Washes hands	☐	☐	☐	☐	☐
Goes to the bathroom when requested	☐	☐	☐	☐	☐

	Does Independently	Can do with verbal direction only	Can do with physical cues	Unable to do	N/A
Brushes hair	☐	☐	☐	☐	☐
Bathes or showers without difficulty	☐	☐	☐	☐	☐
Meal/Snack Time	**Does Independently**	**Can do with verbal direction only**	**Can do with physical cues**	**Unable to do**	**N/A**
Sits at table during meals appropriate for age	☐	☐	☐	☐	☐
Uses utensils	☐	☐	☐	☐	☐
Request needed items "more food"	☐	☐	☐	☐	☐
Demonstrates age appropriate manners (e.g. please, thank you, waiting, giving to others)	☐	☐	☐	☐	☐
Other Routines:	☐	☐	☐	☐	☐

ICER-R

ICER-R: Individual Child Engagement Record-Revised (Kishida & Kemp, 2009)

A.

Coder's Name:_____	Child's Name:_____	Date:_____
Time:____:____-____:____	Activity Type:_____	Group Size:_____ Number of Adults:_____

Teacher Directiveness: ← □ low   □ medium   □ high→

B.

Int.#	Engagement Type	Interaction Occurrence	Partner	Physical Prompts	Observer's Notes
1	AE PE AN PN	Yes No	A P	Yes No	
2	AE PE AN PN	Yes No	A P	Yes No	
3	AE PE AN PN	Yes No	A P	Yes No	
4	AE PE AN PN	Yes No	A P	Yes No	
5	AE PE AN PN	Yes No	A P	Yes No	
6	AE PE AN PN	Yes No	A P	Yes No	
7	AE PE AN PN	Yes No	A P	Yes No	
8	AE PE AN PN	Yes No	A P	Yes No	
9	AE PE AN PN	Yes No	A P	Yes No	
10	AE PE AN PN	Yes No	A P	Yes No	
11	AE PE AN PN	Yes No	A P	Yes No	
12	AE PE AN PN	Yes No	A P	Yes No	
13	AE PE AN PN	Yes No	A P	Yes No	
14	AE PE AN PN	Yes No	A P	Yes No	
15	AE PE AN PN	Yes No	A P	Yes No	
16	AE PE AN PN	Yes No	A P	Yes No	
17	AE PE AN PN	Yes No	A P	Yes No	
18	AE PE AN PN	Yes No	A P	Yes No	
19	AE PE AN PN	Yes No	A P	Yes No	
20	AE PE AN PN	Yes No	A P	Yes No	
21	AE PE AN PN	Yes No	A P	Yes No	
22	AE PE AN PN	Yes No	A P	Yes No	
23	AE PE AN PN	Yes No	A P	Yes No	
24	AE PE AN PN	Yes No	A P	Yes No	
25	AE PE AN PN	Yes No	A P	Yes No	
26	AE PE AN PN	Yes No	A P	Yes No	
27	AE PE AN PN	Yes No	A P	Yes No	
28	AE PE AN PN	Yes No	A P	Yes No	
29	AE PE AN PN	Yes No	A P	Yes No	
30	AE PE AN PN	Yes No	A P	Yes No	
31	AE PE AN PN	Yes No	A P	Yes No	
32	AE PE AN PN	Yes No	A P	Yes No	
33	AE PE AN PN	Yes No	A P	Yes No	
34	AE PE AN PN	Yes No	A P	Yes No	
35	AE PE AN PN	Yes No	A P	Yes No	
36	AE PE AN PN	Yes No	A P	Yes No	
37	AE PE AN PN	Yes No	A P	Yes No	
38	AE PE AN PN	Yes No	A P	Yes No	
39	AE PE AN PN	Yes No	A P	Yes No	
40	AE PE AN PN	Yes No	A P	Yes No	

C. Comment on this observation (e.g., child's, peers', adults' behaviours or activities).

Please turn over.

Rating Scales

D. Please complete after the observation. Please circle the number that best describes your rating.

In relation to the observation session:

1. How do you rate this child's overall engagement?

1	2	3	4	5
nonengaged	poorly engaged	engaged	highly engaged	very highly engaged

2. How often did you observe this child's stereotypic and repetitive behaviours?

1	2	3	4	5
never	rarely	sometimes	most of the time	all the time

3. How do you rate the *frequency* of interaction between the child and *adults*?

1	2	3	4	5
never	rarely	sometimes	often	very often

4. How do you rate the *quality* of interaction between the child and *adults*?

1	2	3	4	5
negative		neutral		positive

5. How do you rate the *frequency* of interaction between the child and *peers*?

1	2	3	4	5
never	rarely	sometimes	often	very often

6. How do you rate the *quality* of interaction between the child and *peers*?

1	2	3	4	5
negative		neutral		positive

Observation Summary: Total Intervals = (   )

	AE	PE	AN	PN	Adult Interaction	Peer Interaction	Physical Prompts
Num. of intervals							
Percentages	%	%	%	%	%	%	%

Comments

Appendix G

Challenging Behavior Record

Challenging Behavior Record

Int. #	Behavior	Behavior Type						Other
1	Yes No	HT	CR	RM	TH	BT	PR	
2	Yes No	HT	CR	RM	TH	BT	PR	
3	Yes No	HT	CR	RM	TH	BT	PR	
4	Yes No	HT	CR	RM	TH	BT	PR	
5	Yes No	HT	CR	RM	TH	BT	PR	
6	Yes No	HT	CR	RM	TH	BT	PR	
7	Yes No	HT	CR	RM	TH	BT	PR	
8	Yes No	HT	CR	RM	TH	BT	PR	
9	Yes No	HT	CR	RM	TH	BT	PR	
10	Yes No	HT	CR	RM	TH	BT	PR	
11	Yes No	HT	CR	RM	TH	BT	PR	
12	Yes No	HT	CR	RM	TH	BT	PR	
13	Yes No	HT	CR	RM	TH	BT	PR	
14	Yes No	HT	CR	RM	TH	BT	PR	
15	Yes No	HT	CR	RM	TH	BT	PR	
16	Yes No	HT	CR	RM	TH	BT	PR	
17	Yes No	HT	CR	RM	TH	BT	PR	
18	Yes No	HT	CR	RM	TH	BT	PR	
19	Yes No	HT	CR	RM	TH	BT	PR	
20	Yes No	HT	CR	RM	TH	BT	PR	
21	Yes No	HT	CR	RM	TH	BT	PR	
22	Yes No	HT	CR	RM	TH	BT	PR	
23	Yes No	HT	CR	RM	TH	BT	PR	
24	Yes No	HT	CR	RM	TH	BT	PR	
25	Yes No	HT	CR	RM	TH	BT	PR	
26	Yes No	HT	CR	RM	TH	BT	PR	
27	Yes No	HT	CR	RM	TH	BT	PR	
28	Yes No	HT	CR	RM	TH	BT	PR	
29	Yes No	HT	CR	RM	TH	BT	PR	
30	Yes No	HT	CR	RM	TH	BT	PR	
31	Yes No	HT	CR	RM	TH	BT	PR	
32	Yes No	HT	CR	RM	TH	BT	PR	
33	Yes No	HT	CR	RM	TH	BT	PR	
34	Yes No	HT	CR	RM	TH	BT	PR	
35	Yes No	HT	CR	RM	TH	BT	PR	
36	Yes No	HT	CR	RM	TH	BT	PR	
37	Yes No	HT	CR	RM	TH	BT	PR	
38	Yes No	HT	CR	RM	TH	BT	PR	
39	Yes No	HT	CR	RM	TH	BT	PR	
40	Yes No	HT	CR	RM	TH	BT	PR	

Appendix H

Post-Modification Parent Interview

Parent Interview: Post-Modification

I.   Environment

1. How has the modification, either physical changes and visual supports, impacted and/or benefitted:

   - You as a parent?

   - Your child?

   - Siblings (if applicable?)

   - Others?

2. What changes in the environment did you notice the *most*? Positives? Negatives?

3. Did your child react and/or notice the changes? If so, how?

II.   Engagement

1. Have you noticed any changes in your child's ability to engage or interact with parents? If so, what did you notice?

- Siblings?

- Others?

2. What modifications, if any, had the greatest impact on your child's engagement?

- Least impact?

III.   Behavior

1. How, if at all, have the modifications, both physical modifications and visual supports, changed your child's behaviors when he/she is upset?

2. Did the changes to the home environment impact the strategies used to minimize or extinguish challenging behaviors? If so, please describe.

3. Did the modifications impact the child's overall behaviors in the home? If so, how?

IV.   Other

1. Describe your thoughts or feelings regarding the modifications, physical and visual.

2. Have you made additional changes to the environment following modifications related to:

   a. Physical Modifications

   b. Visual Supports

Treatment Fidelity Checklist

Treatment Fidelity Checklist

Treatment 1

Participant:_____

Session #: _____

Rater: _____

Treatment 1

Question/observation	Yes	No	NA
1. Intervention was conducted in focused play area (i.e., kitchen table or play room)			
2. The materials (i.e., clear containers, opaque containers, and shelves) in the general environment were used to organize toys and activities			
3. Two or less play items were in child's sight during parent/child interaction			
4. Parent was the keeper of most toys/toy parts			
5. Toys/activity was cleared away before a new toy or activity was presented or offered			
6. A quiet place was readily available and offered to child if he became upset or distracted.			

Number of yes:_____

Number of no:_____

Number of NA:_____

Percent correct: Number of Yes divided by total yes/no responses=_____

Rater 2: Percent correct _____

Treatment Fidelity Checklist

Treatment 2

Participant:_____

Session #: _____

Rater: _____

Treatment 2

Question/observation	Yes	No	NA
1. Intervention was conducted in focused play area (i.e., kitchen table or play room)			
2. The materials (i.e., clear containers, opaque containers, and shelves) in the general environment were used to organize toys and activities			
3. Two or less play items were in child's sight during parent/child interaction			
4. Parent was the keeper of most toys/toy parts			
5. Toys/activity was cleared away before a new toy or activity was presented or offered			
6. A quiet place was readily available and offered to child if he became upset or distracted.			
7. Visual supports were available during the play and/or activity			
8. Parent referenced (i.e. pointing, showing and/or commenting) visual support prior to the play and/or activity			

Number of yes:_____

Number of no:_____

Number of NA:_____

Percent correct: Number of Yes divided by total of yes/no responses =_____

Rater 2: Percent correct _____

VITA

TERESA LYNN BOGGS

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