PROMOTING SOCIODRAMATIC PLAY BETWEEN CHILDREN WITH AUTISM AND THEIR TYPICALLY DEVELOPING PEERS USING ACTIVITY SCHEDULES

by

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A dissertation submitted in partial fulfillment of the requirements for the degree of DOCTOR OF PHILOSOPHY in Disability Disciplines

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ABSTRACT

Promoting Sociodramatic Play Between Children with Autism and Their Typically Developing Peers Using Activity Schedules

by

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Utah State University, 2018

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Young children with Autism Spectrum Disorder (ASD) demonstrate behavioral deficits and excesses that can adversely affect their play skills. Teaching children with ASD to use activity schedules with embedded scripts have led to increased appropriate game play with other children with autism and typically developing peers; however, there is sparse research on promoting more dynamic social play in children with ASD. The purpose of this study was to examine the effects of teaching the use of activity schedules with embedded scripts on the sociodramatic play of preschoolers with ASD with their typically developing peers. We also examined the extent to which we could remove scripts and schedule components and continue to observe appropriate sociodramatic play. Two participants with ASD quickly demonstrated high levels of sociodramatic play with their typically developing peers compared to baseline, and an additional participant with ASD demonstrated similar increases with procedural modifications. The participants also
continued to show these increased levels after all scripts and nearly all components of the activity schedules were systematically removed, including during 1- and 2-week follow-up sessions. In addition, all participants engaged in additional unscheduled, yet contextually appropriate, sociodramatic play behaviors.

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PUBLIC ABSTRACT

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CHAPTER I

INTRODUCTION

For decades, play has been “the work of the child.” Doctors and public service announcements frequently recommend that parents play often with their children (Johnson, Cristie, & Yawkey, 1987). The National Association for the Education of Young Children (NAEYC) stated that pretend play leads to “cognitive, social, and emotional benefits” (Copple & Bredekamp, 2009). While much research with typically developing children involving play has been correlational in nature (i.e., the researchers did not manipulate independent variables), there is no doubt that play has a strong role in child development (Lillard et al., 2013). It is the most common medium for children to learn about their environment, develop gross and fine motor movement, become creative, and become closer to others. As children enter preschool, it is the manner in which academic, self-help, and social skills are frequently taught (Ashiabi, 2007).

Though a set definition of play is often debated, most scholars agree on five core characteristics: (1) self-chosen and self-directed, (2) intrinsically motivated, (3) guided by selected rules, while still leaving room for creativity, (4) imaginative, and (5) performed in an alert yet nonstressed state of mind (Gray, 2009). Other characteristics often discussed are that it is focused on means rather than ends, separate from simple exploratory behavior, and involves some sort of active participation (Rubin, Fein, & Vandenberg, 1983).

While play continues to be empirically studied, most researchers characterize different kinds of play that include its defined components according to work conducted
in the early twentieth century. Parten (1933) observed children between two and five years old to transition through the following kinds of play: (1) unoccupied play, more frequently performed by toddlers, involving seemingly random movements; (2) solitary play, in which children play by themselves and do not appear to notice others; (3) onlooker play, in which children show interest in other children’s play without joining in; (4) parallel play, in which children play with the same materials near each other, but do not interact; (5) associative play, in which children show interest in other children while playing with the same materials; and 6) cooperative play, in which children act together toward some goal or goals, often with children adopting different roles. Included in this last category is thematic or sociodramatic play, typically involving children playing roles of adults. Examples include “playing house,” in which children act out daily life of a mother, father, and baby, and “castle,” in which children act out battles between knights and dragons to save a damsel in distress.

This last play category is the most complex, as children play together while creating rules and acting out different roles that they may never have direct contact with (e.g., playing castle and using knowledge from cartoons involving knights and princesses). Moreover, the child must imagine himself or herself as another individual, and interpret what that individual may do. This is typically combined with perceiving other children who are participating in the play scenario as other individuals, who may engage in behavior different from what they would typically behave. These perceptions of what one may do if playing the role of a different individual is one of the first examples a child has in perspective taking. This skill later evolves from sociodramatic
play to empathy and self-control in later social relationships.

**Autism Spectrum Disorder**

A population that consistently shows play deficits compared to typically developing peers is children with Autism Spectrum Disorder (ASD; Jarrold, 2003). ASD is a developmental disability whose prevalence has more than doubled since 2000, with a current prevalence of 1 in 59 (Centers for Disease Control and Prevention [CDC], 2018). It is diagnosed approximately equally amongst different races, ethnicities, and socioeconomic statuses; however, it is nearly five times more likely for boys than girls. ASD is diagnosed behaviorally based on three main areas: language deficits, social deficits, and rigid or repetitive behaviors that differ from or are more severe than typically developing peers. Often these characteristics exacerbate one another. For example, a child with language impairments may resort to more intense behavior as a way to communicate wants and needs, or a child with language impairments and who demonstrates stereotypy (noncontextual, repetitive motor movements or vocalizations) may have difficulty interacting with peers.

It is not surprising that, with these diagnostic criteria, young children with ASD often do not demonstrate appropriate independent or social play. In fact, children with ASD also demonstrate fewer appropriate play skills than their peers with other developmental and intellectual disabilities (Rutherford, Young, Hepburn, & Rogers, 2007; Wing, Gould, Yeates, & Brierley, 1977). Most notably, children with ASD demonstrate a lack of spontaneous pretend play, which could be categorized in Parten’s
cooperative play (Jarrold et al., 1993; Wulff, 1985). Deficits in language and social skills could most certainly lead to deficits in social play. Further, rigid, repetitive behaviors may hinder these children’s ability to use objects nonliterally. That is, a child with ASD may be less likely to pretend a banana is a phone because the banana’s presence and the child’s history with the banana lead only to behaviors involving peeling and eating (Lam & Yeung, 2011). Further, pretending that oneself as a completely different person (e.g., when playing house) can be in direct conflict to rigid, inflexible experiences with only being the child himself. Even more complex play behavior would be pretending that a peer is another individual from the perspective of the individual the child is pretending to be.

Children who engage in perspective taking during sociodramatic play, such as the playing house scenario, are often said to display Theory of Mind (ToM). A common definition of ToM is one’s ability to understand that others have differing mental states, including emotions, beliefs, and desires, and can further apply those states to oneself and others (Wellman, Cross, & Watson, 2001). Behaviorally speaking, ToM is behaving in response to environmental stimuli as another individual with differing history (Barnes-Holmes, McHugh, & Barnes-Holmes, 2004). This is a key skill within social relationships, including sociodramatic play, although evidence of a causal relationship is not clear (Dore, Smith, & Lillard, 2015). Still, children who typically develop ToM between the ages of 3 to 5 years old also engage in increasingly complex sociodramatic play. This can lead to more empathic social relationships. Researchers have proposed that teaching sociodramatic play could lead to increased performance on ToM tasks, which
could also lead to more perspective taking in everyday situations, although this is difficult to directly assess and separate from other variables such as general development and everyday teachings from caregivers. Regardless, sociodramatic play involves some form of perspective taking, which overall benefits individuals in social encounters.

The needs of children with ASD vary, though they are undoubtedly more than their typically developing peers. Parents of children with ASD experience stress related to accommodating for their needs, and worry about the stigmatization that both their children and themselves may experience (Corcoran, Berry, & Hill, 2015). Often family relationships are strained when caring for these children’s basic needs, and more complex yet important skills like social play is a skill that is desired but at times seemingly unreachable.

There are also risk factors socially for children with ASD. They are more likely to be bullied compared to their typically developing peers, with nearly half experiencing verbal, physical, or relational victimization at school (Maïano, Normand, Salvas, Moullec, & Aimé, 2016). Moreover, approximately 10% of children with ASD are estimated to engage in bullying. Teaching appropriate play skills early, especially social play skills, could facilitate positive peer relationships, and lessen the likelihood of being bullied. Or, if these children with ASD are bullied, they may be more likely to seek out peers with whom they have built positive relationships who could provide support. Teaching play and social skills to children with ASD could improve their social relationships with peers and lower the risk of being bullied.
Teaching Play Skills

The commonly agreed upon characteristic that play is intrinsically motivated can be an issue for those teaching children with ASD, who may not be motivated by the same types of stimulation as other children. Behaviorally speaking, intrinsically motivated play can refer to play that is automatically maintained; that is, the play actions themselves or completion of the play actions serve as reinforcement that lead to an increased likelihood of similar play in the future. Some young children with ASD may initially engage in motor and vocal stereotypy rather than socially appropriate play behavior, as stereotypy can be automatically reinforced. For example, a child with ASD may continually spin items not intended to be spun, or repeatedly say phrases from a movie without context. Children with ASD may also engage in play actions that may be appropriate (e.g., making an action figure jump), but repeat them to an extent that it severely limits other opportunities for play (Baron-Cohen, 1987). As these and other inappropriate behaviors are observed when children with ASD have opportunities to play, the thought of play being intrinsically motivated can be difficult, as it does not suggest that play can be a learned skill. However, play and social skills are common areas explicitly targeted in behavioral interventions for children with ASD, and frequently require externally programmed reinforcement (McConnell, 2002). Researchers and practitioners have worked to bring appropriate play behaviors initially under the control of this external reinforcement, and transfer the control from the external reinforcement to task completion or the play actions themselves.
Social Play

Numerous lines of research have been developed to teach children with ASD to play using various methods based on principles of behavior analysis. Some of this research has involved teaching play skills to children with ASD with their typically developing peers. Intervention packages, including Integrated Play Groups (Wolfberg, Bottema-Beutel, & DeWitt, 2012) and Picture Me Playing groups (Murdock & Hobbs, 2011) are focused on teaching social play between children with ASD and their typically developing peers. Integrated Play Groups involve an adult facilitator leading small groups of children with ASD and their typically developing peers to play with various engaging play materials using modeling, routine, and visual support. These groups meet for 30 - 60 min sessions for at least 12 weeks. Picture Me Playing groups also involve an adult facilitating play between children with ASD and typically developing peers using visual supports. The adult shows Picture Me Playing cards and materials promoting pretend play (e.g., story cards about royalty coupled with prince and princess dolls), narrates a story using the materials, and promotes and gives feedback to all children in the group playing the roles in the story. Murdock and Hobbs found that children with ASD who attended the Picture Me Playing groups engaged in more sociodramatic play related to the stories than the children with ASD who did not attend the groups. In addition, this play generalized to scenarios with novel yet similar toys.

Video modeling is another way pretend play and social play can be promoted. Video modeling involves the child watching a recording of an individual (e.g., adult, peer, or the child) performing the target behavior, immediately followed by an
opportunity to perform the same target behavior (McCoy & Hermansen, 2007). This intervention is beneficial because it generally does not necessitate further prompting or external reinforcement. MacDonald, Sacramone, Mansfield, Wiltz, and Ahearn (2009) taught children with ASD to play with play sets with a typically developing peer using this intervention. The children’s with ASD play vocalizations and play actions systematically increased across play sets after the children viewed videos with adults modeling appropriate play vocalizations and actions with the corresponding sets.

Few video modeling studies have focused on sociodramatic play between children with ASD and their typically developing peers. Reagon, Higbee, and Endicott (2006) examined this area of play between a preshooler with ASD and his typically developing 7-year-old brother. During baseline, the participant and brother were told to play with the designated play materials. The play materials for four different scenarios included dress up items to play a firefighter, cowboy, doctor, and teacher. The participant showed low levels of appropriate play actions and statements during baseline (i.e., less than 40% of intervals). Intervention consisted of showing the participant and his brother video models of sociodramatic play using one set of the play materials. The participant and brother were then instructed to play with the corresponding play materials. Results showed the participant demonstrated the play actions and statements in between 50% and 100% of intervals during the final intervention sessions. The participant also emitted unscripted play statements during intervention sessions, although these were variable. In addition, the participant generalized these play actions and statements in his home with a different sibling. This study also demonstrates the utility of teaching scripted play actions and
statements on the sociodramatic play between a child with ASD and a typically developing peer.

Activity Schedules

Another method of teaching play actions within a larger general sequence to children with ASD is an activity schedule. Activity schedules have been shown to be an evidence-based practice for children with ASD (Banda & Gimmet, 2008). An activity schedule is a series of pictures or words, each of which serving as a discriminative stimulus to complete an activity or a component of an activity (McClannahan & Krantz, 2010). Learners are taught to attend to the first picture or word(s) in the schedule, complete the corresponding activity, attend to the next picture or word(s) in the schedule, complete the corresponding activity, and continue until all tasks depicted in the schedule have been completed. An advantage to this intervention is that it can teach the learner for general schedule-following behavior, which is a lifelong skill. In also does not frequently necessitate external programmed reinforcement, as schedule completion alone may function as reinforcement.

Activity schedules can be a popular intervention choice due to their applicability to a wide variety of learners, behaviors, and settings. While more literature exists with children, adults with autism and intellectual disabilities have also been taught to use activity schedules (Anderson, Sherman, Sheldon, & McAdam, 1997; Carson, Gast, & Ayres, 2008; Watanabe & Sturmey, 2003). They have been implemented in the home (Bambara & Ager, 1992), school (Betz, Higbee, & Reagon, 2008), job site (Carson et al., 2008), group home (MacDuff, Krantz, & McClannahan, 1993), and playground (Akers,
Activity schedules have been shown to reduce challenging behavior, including self-injury, aggression toward others, and tantrums, while increasing compliance, appropriate task engagement, and independent transitions (Lequia, Machalicek, & Rispoli, 2012). Other behaviors targeted to increase in this line of research include independent play (Morrison, Sainato, Benchaaban, & Endo, 2002), self-help skills (K. L. Pierce & Schreibman, 1994), and social initiations and exchanges (Krantz, MacDuff, & McClannahan, 1993; Krantz & McClannahan, 1998).

### Graduated Guidance

A prompting method to teach activity schedule completion, amongst a wide variety of other behaviors, to children with ASD is graduated guidance (Cooper, Heron, & Heward, 2007). This involves initially cueing the child using the highest level of support to engage in the target behavior, and reducing the level of support as quickly as possible until the child demonstrates the target behavior independently. For example, an instructor could use graduated guidance to prompt a child to pick up an item by initially standing behind the child and placing his hands on top of the child’s hands to pick up the item, followed by physical prompt at the wrist, forearm, elbow, a light touch on the shoulder, and eventually no prompting, while increasing the distance between himself and the child. An advantage to this prompting procedure is that it reduces the likelihood the child will make an error, and will instead contact reinforcement for engaging in the target behavior. Another advantage is the child with ASD is able to see the critical components of the behavior (e.g., his hands picking up the item) while being prompted, rather than looking directly at the instructor for prompting, then shifting to the item.
Finally, the only prerequisite skill the child with ASD must demonstrate is the physical movement to engage in the activity, whereas other prompting procedures can require more advanced prerequisites, such as imitation skills.

**Scripts**

Another evidence-based practice for teaching play and social skills to children with ASD is scripting (Akers, Pyle, Higbee, Pyle, & Gerencser, 2016). Scripts are words or phrases depicted visually (e.g., written) or audio recorded (e.g., recorded statement) that are presented to a learner to either read aloud or listen to and repeat (Krantz & McClannahan, 2005). The words selected by the instructor are contextually appropriate statements that the child with ASD can say in play and social settings. These scripts can be systematically faded such that naturally occurring events control the contextually appropriate statement rather than presentation of the script. Typically, scripts are faded by removing one word at a time from the end of the script. For example, a child initially presented with the written script “I like cars” and reliably says the script independently is later presented with the scripts, “I like _____,” “I _____ _____,” “__ _____ _____,” and eventually no written material is presented to the child. However, the child continues to say the complete statement “I like cars.”

Scripts and script fading have been used to teach children with ASD to request help (Dotto-Fojut, Reeve, Townsend, & Progar, 2011), bid for joint attention (MacDuff, Ledo, McClannahan, & Krantz, 2007; Pollard, Betz, & Higbee, 2012), and respond to initiations (Wichnick, Vener, Pyrtek, & Poulson, 2010). The people implementing the procedures have included peers (Ganz et al., 2012), parents (Reagon & Higbee, 2009),
and siblings (Akers, Higbee, & Reinert, in press), demonstrating the relative ease of implementation. An additional advantage to this procedure is that it reduces the need for verbal prompting from the play or conversation partner, allowing the partner to make other contextual statements and actions. Further, the learner often engages in more contextual unscripted (i.e., not directly taught using scripts) statements following the introduction of scripts and their subsequent fading (Akers et al., 2016).

Cooperative Activity Schedules with Embedded Scripts

Researchers have recently investigated the use of cooperative activity schedules to promote social interaction for children with ASD. One such schedule is a joint activity schedule, which includes words or pictures denoting the behavior of two or more participants to achieve the same common goal. Betz et al. (2008) first introduced a joint activity schedule to facilitate play between preschool-aged dyads with ASD. The preschoolers did not play together when instructed to play in a room with several games available. Instead, each child played with a game designed to be played in pairs or a small group by him or herself. After introducing the joint activity schedule, however, the dyads played several games together little little-to-no adult prompting. The schedules also included scripts the participants said to each other (e.g., “Thanks for playing!”). This initial study demonstrated the capability of activity schedules to promote social activities.

Brodhead, Higbee, Pollard, Akers, and Gerencser (2014) furthered cooperative activity schedule research by linking “hider” and “seeker” activity schedule binders to facilitate preschool-aged dyads with ASD to play hide-and-seek. This study was
particularly important as it taught to children with ASD to play a dynamic game with
distinct roles and embedded several scripts, compared to the Betz et al. (2008) study, in
which the preschoolers already knew how to play the games involving the same actions
by both players, but did not play in pairs when given the opportunity. Akers, Higbee,
Gerencser, and Pellegrino (2018) furthered the linked activity schedule literature by
teaching preschoolers with ASD to play hide-and-seek with typically developing peers.
The typically developing preschoolers were also taught to play hide-and-seek in this
setting using activity schedules, which can potentially open the activity schedule research
to include peers more often. The researchers also faded the activity schedule such that
only a list of pictures denoting which preschooler would be the seeker was the only visual
prompt used for two of the three participants. This was the first activity schedule study
used to promote dynamic play that included fading to naturally occurring cues in the
environment. Moreover, those who demonstrate accurate performances in hide-and-seek
tasks have been said to demonstrate ToM, speaking to the advanced nature of the tasks
involving perspective taking.

The recent research in activity schedules shows the promising possibilities in their
use to promote cooperative play between both children with ASD amongst each other and
children with ASD and their typically developing peers. Thus far, this play has included
games with distinct rules and overall goals. However, using activity schedules to promote
sociodramatic play involving more complex perspective taking has yet to be studied. As
it is an area of play in which typically developing preschoolers frequently engage,
teaching this skill to preschoolers with ASD would be of social significance. In addition,
as a goal for nearly all children with ASD is to engage more with typically developing peers, and because typically developing preschoolers have been shown to learn how to use activity schedules, it seems logical and beneficial to study the effects of teaching sociodramatic play using activity schedules with their typically developing peers as play partners.
CHAPTER II
LITERATURE REVIEW

I completed a systematic literature review to identify the use of activity schedules thus far in assisting individuals with disabilities. I did this by searching the term “activity schedule*” in Academic Search Premier, Education Full Text, Education Source, ERIC, Professional Development Collection, Psychology and Behavior Sciences Collection, and PsychINFO search engines. This initial search yielded 661 results. I then limited my search to journal articles, which yielded 479 results. After removing duplicates, this number decreased to 251. To be included in the current literature review, the papers had to implement activity schedules as a primary independent variable, measure the targeted skills within the schedule as a primary dependent variable, and be published in English. This provided 33 articles. I then conducted an ancestral search of the 33 articles to observe if there were additional articles that fit the same criteria. This provided three additional articles. This, in addition to an article from colleagues in press at the time of the search (Akers et al., 2018), provided a total of 38 articles.

Initial Studies

MacDuff et al. (1993) were the first researchers to investigate teaching individuals to follow activity schedules. As this study took place in a residential setting for school-aged children with ASD, materials common to this setting, including homework activities (e.g., tracing worksheets), leisure items (e.g., puzzles), and household items (e.g., television) were available to the participants in all sessions. Also available during all
sessions was an activity schedule, which consisted of a three-ring binder, containing six individual pages within plastic sheet protectors, with a picture depicting a different activity on each page.

Each session began with the researcher telling the participants, “Find something to do.” Participants’ behaviors were measured using a 60-s momentary time-sampling procedure for the next 60 min. Researchers measured if the participants were on-task, defined as looking at the schedule or materials, appropriately using the materials, or transitioning from one task to another. Researchers also measured if the participants were on-schedule, defined as engaging in the corresponding activity to that pictured on the schedule page that was open. Finally, researchers measured the adult interaction with the participants using a 60-s partial-interval procedure. These interactions included verbal contact (e.g., praise, verbal prompts), as well as gestural prompts and physical prompts. During baseline, no adult interaction was provided, and participants had access to any materials in the residence. One participant rarely engaged in on-task behavior during baseline sessions. The other three participants engaged in highly variable levels of on-task behavior during baseline, ranging from 0% to 100% of intervals.

MacDuff et al. (1993) examined the effects of teaching the use of activity schedules using a multiple baseline across participants’ design. The researchers used graduated guidance, delivered from behind the participants, to prompt them to use the activity schedule. This involved physically prompting the participant to (1) retrieve his activity schedule, (2) carry it to his room, (3) open the schedule, (4) point to the picture on the first page, (5) retrieve the materials for the corresponding activity, (6) complete the
activity, (7) put the materials away, and (8) turn the page. This sequence continued for every page, and ended with the participant putting his binder away. These prompts were faded as soon as the participant showed independent completion of schedule steps. This included spatial fading (i.e., moving from prompting hand-over-hand to prompting at the forearm, elbow, upper arm, and shoulder), followed by shadowing (i.e., being close behind the participant but not physically prompting him), and finally fading physical proximity (i.e., increasing the distance between the adult and the participant). If the participant made an error at any point during the teaching phase, the adult would prompt the participant to engage in the prescribed behavior. For example, if the participant began to walk away from the schedule without turning the page and pointing to the next picture, the adult would physically prompt him to do so. Each participant demonstrated a rapid increase of on-schedule behavior to an average of at least 91%, and the adults faded prompts quickly.

A maintenance phase followed the teaching phase, in which the adult gave no prompts to the participants. On-schedule behavior remained high for all participants in this phase. Researchers then implemented a resequencing phase for three participants, in which they placed four of the six activities in a different order than the teaching phase. This was done to ensure the participants were following the actual schedule rather than the prescribed sequenced initially taught. Again, on-schedule behavior remained high for the three participants during this phase. Finally, the researchers implemented a generalization phase, in which two of the six activities were replaced with novel activities that targeted similar skills (e.g., Perfection® replacing Memory®) for all participants.
On-task behind remained over 90% during this phase.

This pioneering study demonstrated the utility of activity schedules. It showed how in relatively few teaching sessions children with ASD learned to follow a sequence of academic and leisure activities. Bryan and Gast (2000) replicated these procedures and observed similar effects with an additional four school aged children with ASD using a withdrawal design, strengthening the experimental control of the activity schedule and graduated guidance prompting procedures. The findings of these studies were especially important because the behaviors maintained and generalized to novel activities without additional teaching. It was of particular interest to practitioners and caregivers, as these adults could do other necessary activities while the children with ASD could engage in meaningful activities independently. For example, practitioners could attend to other clients or complete necessary paperwork during this time, while parents could attend to their other children, cook dinner, pay bills, etc.

Krantz et al. (1993) directly studied the implications made by MacDuff et al. (1993) by investigating to what extent parents could implement activity schedules at home for their children with ASD. The researchers also extended the work by MacDuff et al. by measuring the children’s disruptive behavior, including stereotypy and aggression toward others, themselves, or property. In addition, Krantz et al. measured the children’s social initiations, including giving, showing, or pointing to objects for others to see, prompting others to engage in activities, or making at least one-word understandable vocal utterances to others (not including “I want [object]”).

Sessions were similar to those carried out by MacDuff et al. (1993), except the
durations were longer (from when the children arrived home from school until after dinner, approximately 4 to 5 hours). Activity schedules depicting pictures of leisure, academic, and self-help activities, as well as all the materials required to complete the activities, were present during all sessions. During baseline, the children’s parents told them, “Find something to do.” They then used whatever strategies they wished to care for their children. Following baseline, the researchers taught the parents to implement activity schedules in a series of individualized trainings in the home using behavior skills training, which included modeling the skill, allowing the parent to practice the skill, and providing feedback (Parsons & Reid, 1995). This is what the researchers referred to as the teaching phase, as sessions continued during this time. Following the teaching phase, the maintenance phase began, in which parents continued activity schedule sessions with their children without researcher training for up to 10 months.

A multiple baseline across participants’ design demonstrated the effectiveness of the parent implementation of activity schedules on the increased engagement and social initiations, as well as the reduction of disruptive behavior, of their children with ASD. During baseline, all three children engaged in high levels (i.e., occurring in at least 50% of intervals) of disruptive behavior and low levels (i.e., occurring in less than 50% of intervals) of engagement. In addition, participants rarely (i.e., an average of 0.9 per session) socially initiated. When the researchers taught parents how to implement activity schedules using physical prompting and graduated guidance, disruptive behavior decreased to less than 10% of intervals, engagement increased to at least 80% of intervals, and social initiation increased to at least three initiations per session for all
participants. Responding maintained for all participants during the maintenance phase. This study was also pioneering in that it was the first to demonstrate the positive effects of activity schedules in children with ASD when implemented by their parents in the home for extended periods of time.

**Teaching Activity Schedule Implementation**

Training parents to implement activity schedules in the home continues to be of interest. Gerencser, Higbee, Akers, and Contreras (2017) investigated the use of interactive computerized training (ICT) on the fidelity of parent implementation of an activity schedule intervention. The researchers also measured their children’s performances, as the children (who had an ASD diagnosis) had never been exposed to activity schedules, unlike those in Krantz et al. (1993). The three parents practiced with an adult confederate playing the role of their children during baseline and initial post module sessions so as not to expose the children to inaccurate activity schedule procedures. After baseline sessions, the parents underwent ICT. The ICT took approximately 90 min to complete, and included voiceover narration, video examples, and short exercises on how to implement an activity schedule with their child. Following ICT, the parents continued to implement an activity schedule with an adult confederate playing the role of their child with ASD. All three parents performed to implementation fidelity criterion rapidly with the adult confederate, and progressed to implementing the activity schedule with their children. All parents continued to perform at or above implementation fidelity criterion, and their children’s independent activity schedules
performances subsequently increased to criterion. This study demonstrated the applicability of activity schedules. Three parents learned how to implement an activity schedule intervention with their children, who also learned to complete activity schedules, using only ICT and no further feedback.

Training school paraprofessionals to implement an activity schedule intervention has also been investigated. Hall, McClannahan, and Krantz (1995) investigated the effects of a 90-minute training with school paraprofessionals on implementing an activity schedule with students with ASD. The researchers measured the number and type of prompts delivered by the paraprofessionals, as well as student engagement. During baseline, the paraprofessionals delivered frequent (i.e., during 20%-100% of partial intervals) verbal prompts to engage in various tasks, and students were never engaged in more than 40% of momentary time sample intervals. After the training, which included a video recording and in-vivo descriptions, models, and role-plays with feedback, the paraprofessionals implemented an activity schedule with their students. The paraprofessionals’ physical prompting increased, matching what was described and practiced in the training. All three paraprofessionals, however, required a vocal reminder from the researcher to only use physical prompts at some point during the intervention phase. Following these reminders, verbal and gestural prompting decreased. All students demonstrated independent on-task and engaged behavior that increased to criteria during the intervention. This study showed that relatively little training and additional feedback can lead to school paraprofessionals implementing an activity schedule with fidelity, and that independent student behavior can increase in response to the intervention.
Individuals with Intellectual Disabilities

Children with ASD are not the only individuals who have benefited from the use of activity schedules. Adults and children with intellectual and other developmental disabilities have also increased on-task behavior and decreased challenging behaviors using activity schedules. Anderson et al. (1997) implemented activity schedules with three adults with intellectual disabilities (ID) in a group home setting similar to that in MacDuff et al. (1993). The researchers implemented an alternating-treatments design, including no-schedule sessions and schedule sessions. During no-schedule sessions, all participants’ on-task engagement was low, and challenging behavior was high. During schedule sessions, which included the staff teaching the participants to select self-care, housekeeping, or recreation activity pictures to put in their own schedules, on-task engagement significantly increased, while challenging behavior significantly decreased. Further, staff verbal directions decreased, while overall staff interaction with the participants remained the same, indicating the low amounts of resources and effort needed for implementation. Watanabe and Sturmey (2003) systematically replicated these procedures and found similar effects with three adults with ASD in a day program setting.

Activity schedules have also been used to promote exercise in adults with developmental disabilities. Uphold, Douglas, and Loseke (2016) used an ABAB withdrawal design to examine the effects of an electronic (iPod) photograph activity schedule on exercise completion in six adults with developmental disabilities. During baseline, when the schedule was not present, the researchers told participants to complete
four exercises, and measured their exercising behavior. During activity schedule sessions, the researchers gave the same instruction, followed by teaching the participants using graduated guidance to select the exercises on the iPod to create the activity schedule for the session. The participants were then allowed to complete the session using the activity schedule as a guide. All participants completed averages of at least 80% of exercises in the activity schedule sessions, compared to consistently less than half of the exercises in the no-schedule sessions. In addition, all participants quickly learned to program their activity schedules independently.

School is a setting in which activity schedules can facilitate appropriate behavior for children with ID. Similar to group homes, there may be only be a few staff members who have the responsibility of aiding many students. Activity schedules can provide structure to students’ time in school and promote independent skills. This allows the school staff to interact with all students as necessary. Spriggs, Gast, and Ayres (2007) observed three adolescents with ID on-task behavior more than triple when activity schedules were introduced during academic centers activities, including reading, computer, and math activities. Whatley, Gast, and Hammond (2009) used similar procedures to increase on-task leisure and recreational on-task behavior in four teenagers with ID. Additionally, Carson et al. (2008) used similar procedures to increase independent vocational task completion in three young adults with ID in school and community settings.

Being able to enter one’s own tasks into an activity schedule can have its benefits, especially when attempting to remember a series of tasks to complete. Duttlinger, Ayres,
Bevill-Davis, and Douglas (2012) taught four adolescents with ID to place pictures depicting self-help and school tasks on their activity schedules after being verbally told the corresponding tasks to perform by their teachers. The researchers found that the participants were more likely to complete the tasks using the activity schedules than without the activity schedules. Douglas and Uphold (2014) systematically replicated this study using an iPod with the application First Then Schedule instead of a paper-based schedule. These studies can be particularly helpful to students, as it is similar to writing down assignments in a planner to complete, or entering appointments into an online calendar.

**Technology**

As technology has advanced, so has research on computer-based activity schedules. Touch screen devices have been used as an activity schedule modality for multiple purposes with individuals with ASD. Burckley, Tincani, and Fisher (2015) taught a young adult with ASD to retrieve and purchase items in various stores using a tablet-based activity schedule with embedded video models. Cheung, Schulze, Leaf, and Rudrud (2016) taught two school-aged children with ASD to order and purchase items from a simulated bakery in a school setting, which later generalized to an actual bakery in the community, using an iPhone-based activity schedule. Carlile, Reeve, Reeve, and DeBar (2013) taught school-aged children with ASD to engage in independent leisure activities using an iPod-based activity schedule that displayed pictures of activities to complete.
Giles and Markham (2017) compared acquisition of schedule following using book- and tablet-based activity schedules in three children with ASD. Both the book- and tablet-based scheduled included equivalent play activities on each page or screen to complete. The participant would either turn the page of the book to see the next activity, or swipe his finger across the screen to access the next screen with a different activity pictured. The participants were taught how to use each modality of activity schedule using a multiple baseline across participants’ design with an embedded alternating treatments design. None of the participants showed a marked difference in acquisition between the two modalities; they each learned how to follow both book- and tablet-based activity schedules independently in approximately the same number of sessions. The researchers then conducted a concurrent-chains preference assessment, which involved allowing the participants to choose which modality to complete an activity schedule at the beginning of 20 sessions. Two of the three participants showed a preference for the tablet-based activity schedule. This study was one of the few to directly compare a book-based activity schedule with another schedule modality. It also demonstrated another manner in which to display activity schedules that can still lead to independent schedule following and task completion in children with ASD.

While the activity schedule itself was not tablet-based, Chan, Lambdin, Graham, Fragale, and Davis (2014) used activity schedules to teach three adults with ID to access and close Angry Birds game on an iPad. The activity schedule used was a book that was placed next to the iPad for the participants to reference. All participants learned to access and close the Angry Birds application with the use of the activity schedule, and
completed the same behaviors when the activity schedule was withdrawn in a maintenance phase. That is, the stimulus control of setting up and closing the application shifted from the schedule to the naturally occurring cues on the iPad.

**Video-Embedded Activity Schedules**

One component that is sometimes included in technology-based activity schedules is embedded-video modeling. An intervention in its own right, video modeling involves a person watching a recording of either an adult, peer, oneself, or one’s point of view of completing actions rather than in vivo, followed by an opportunity for the person to complete the same actions (McCoy & Hermansen, 2007). With advances in easily accessible technology, video modeling has become a popular intervention. A strength of video modeling is that an individual can observe the behavior to be performed carried out in its entirety before performing it. That is, it is possible for an individual to watch the behavior to be carried out for the first time in a video model, and perform the same behavior immediately after without additional prompting or programmed reinforcement. This, however, depends on the individual’s abilities, the behavior to be performed, and the quality of the model.

Blum-Dimaya, Reeve, Reeve, and Hoch (2010) used an activity schedule and game-embedded simultaneous video modeling to teach four school-aged children to play the video game Guitar Hero II™. During baseline, participants were given the written instruction, “Play Guitar Hero.” No other prompts to play the game were given. None of the participants accessed the game during baseline. During intervention, the researchers implemented an activity schedule with 26 steps to access and close the video game.
When the game started, a video model displayed of which keys the participant was to push in a particular order. An experimenter provided physical prompts for the participant to match the behavior in the model. This prompting was systematically faded for all participants, while the model remained, as it was part of the video game. All participants independently accessed and played Guitar Hero II™, even after the activity schedule was systematically removed (page-by-page), and novel songs were introduced in the game. This study and Chan et al. (2014) are the only two activity schedule studies thus far to completely remove the activity schedule participants’ independent target behavior remain high.

Cihak (2011) directly compared picture- and video-based activity schedules on the independent transitions of three adolescents with ASD using an alternating treatments design. Results showed that both picture- and video-based activity schedules increased independent transitions between activities approximately equally, demonstrating the utility of both modalities. Spriggs, Knight, and Sherrow (2015) used an iPad-based activity schedule with embedded video models to teach four teenagers with ASD to complete academic (e.g., solve math equations) and vocational (e.g., data entry) tasks. After participants independently followed the schedule at criterion, the researchers replaced the video models with static pictures. The participants maintained the skills learned using video models when static pictures were displayed in their place.

One study used video-based activity schedules on a computer and matrix training to teach pretend play to a preschooler with ASD (Dauphin, Kinney, & Stromer, 2004). Matrix training is a procedure used to teach generative behavior by directly teaching
specific combinations of behaviors, with new combinations of behaviors emerging without direct training (Goldstein, Angelo, & Mousetis, 1987). Dauphin et al. directly taught the participant using graduated guidance after viewing a specific video model in the schedule to engage in vocal and play behaviors (e.g., putting a toy cookie near a toy bear’s mouth and saying, “Bear have a bite,” putting a cup near a toy rabbit’s mouth and saying, “Rabbit take a drink,” etc.). After reaching mastery criteria in schedule following and the trained vocal and play responses, the participant was shown novel combinations of vocal and play responses in the schedule (e.g., putting a cup near a toy bear’s mouth and saying, “Bear take a drink”). The participant demonstrated these new combinations of vocal and play responses upon viewing the model in the schedule alone; that is, without prompting. This study was pivotal in demonstrating that video enhanced activity schedules and matrix training could produce generative play in children with ASD. However, this study included only one participant, and only investigated independent play.

**Children with Autism Spectrum Disorder**

Krantz et al. (1993) and MacDuff et al. (1993) suggested research should examine children’s with ASD challenging behavior and independent transitions before and after the introduction of activity schedules, in addition to time spent on-task and on-schedule. This has been an area of interest, leading to enough studies to produce a systematic review on the topic of children with ASD (Lequia et al., 2012). The reviewers investigated several studies examining the positive effects of activity schedules on
independent transitions and challenging behavior reduction. This included J. M. Pierce, Spriggs, Gast, and Luscre (2013), who increased independent transitions for children with ASD during independent center activities in an elementary classroom setting using activity schedules. Watson and DiCarlo (2016) used activity schedules to teach a kindergartener with ASD to independently engage in classroom routines, (e.g., the morning routine of putting away materials, turning in homework, greeting the teacher, etc.). The use of activity schedules has also been shown to reduce self-injury (O’Reilly, Sigafoos, Lancioni, Edrisinha, & Andrews, 2005). Dooley, Wilczenski, and Torem (2001) found that the use of activity schedules and edible delivery for independent transitions increased independent transitions and decreased aggression in a preschooler with ASD. The literature has shown that activity schedules can promote general compliance and behavior reduction. Later research examined their use to aid children with ASD to demonstrate more advanced skills.

Scripts have been embedded within activity schedules to increase social interactions in older children with ASD. Stevenson, Krantz, and McMcLannahan (2000) measured four older children’s with ASD social interactions with their adult instructors when given activities to complete (e.g., puzzles). After observing no social interactions, the researchers implemented a photographic activity schedule depicting the activities to complete. After again not observing social interactions from the participants, the researchers implemented activities within the photographic activity schedule that depicted conversations with the instructors. These were in the form of Language Master cards, which are cards made to put through a machine to play an audio script. The
participant would then repeat the script, and continue a reciprocal conversation with the instructor before returning to the schedule. Researchers observed a dramatic increase in social interactions during the intervention and throughout fading of the Language Master scripts. During maintenance, during which Language Master cards were no longer present, all participants maintained high levels of social interactions with their instructors, most of which were unscripted.

**Play**

Activity schedules have shown to be useful in preschool settings with children with ASD. Play is one of the primary skill sets typically developing children in preschool demonstrate and learn to further develop. As most children with ASD show deficits in play skills, activity schedules can be modified to explicitly target independent play skills for preschoolers with ASD. Cuhadar and Diken (2011) taught three preschoolers with ASD to play with age appropriate toys (e.g., Mr. Potato Head) using activity schedules in a special education classroom. Massey and Wheeler (2000) implemented an activity schedule intervention with a child with ASD in an integrated preschool setting. The participant was able to engage in and transition to various center activities amongst his peers with the aid of an activity schedule after few teaching sessions. Morrison et al. (2002) found similar results with four preschoolers with ASD in an inclusion preschool. These participants were also taught to choose which activities to complete in their schedule, as the classroom centers involved choice of which activities to complete. While data were not collected on peer interaction in these studies, it is possible that this level of play could be directly targeted using this teaching format.
Teaching play to children with ASD using activity schedules is not limited to classroom and home settings. Liu and Breslin (2013) found that children with ASD performed better on the Movement Assessment Battery for Children – Second Edition (MABC – 2), used to identify impairments in motor disorders in children, when the motor activities were pictured on a vertical activity schedule strip rather than verbally described and directed by the assessors. This is important, as children with ASD may have inaccurately been diagnosed with motor impairments, when the issue lied in the instruction presentation.

Akers et al. (2016) implemented an activity schedule intervention to increase appropriate playground behavior in three preschoolers with ASD. During baseline, in which participants were told, “Go play” and did not receive any prompting or programmed consequences, participants either did not vary their behavior (e.g., riding on a tricycle the entirety of all sessions) or engaged in stereotypy (e.g., tossing wood chips, running on the bridge of the playground structure while engaging in vocal stereotypy). The researchers implemented an activity schedule with pictures of various structures of the playground (e.g., slide) or activities (e.g., tricycle). During intervention, the researchers used graduated guidance to prompt the participants to follow the playground activity schedule by attending to the pictures and completing the corresponding tasks. All participants rapidly met mastery criteria of schedule following and activity completion, and which generalized to novel playground activities.

Machalicek et al. (2009) also implemented an activity schedule intervention on the playground for three school aged children with ASD. The researchers incorporated
choice within the activity schedule; that is, the researcher verbally prompted the participants, “Show me what you will play today” and the participants selected pictures of activities they then completed on the playground. However, the researchers verbally prompted the participants to return to the schedule after a designated amount of time completing the activity, which limited the amount of independence the participants could demonstrate. Regardless, the independent completion of activities significantly increased with the introduction of the intervention, and challenging behavior significantly decreased. While Akers et al. (2016) and Machalicek et al. (2009) did not assess participant performance when other children were present, such as recess with one’s class, it is possible this intervention could be adapted to promote social play with peers on the playground and other play settings.

Cooperative Activity Schedules

Although activity schedules can include discriminative stimuli to interact with others, few studies have included multiple participants following the same schedule or set of schedules simultaneously. White, Hoffman, Hoch, and Taylor (2011) taught a pair of teenagers with ASD to cooperatively complete vocational tasks (e.g., replenishing kitchen supplies) using a joint activity schedule. The schedule consisted of a laminated paper with a written task analysis. During teaching sessions, one participant was prompted to read and cross off the first step of the schedule with a marker, then complete the corresponding task. Once the step was crossed out, the other participant was prompted to cross off the next item on the schedule and complete the corresponding task. The participants continued completing the task in an alternating order until all the items
on the schedule were completed. This procedure led to the participants independently completing three sets of complex vocational tasks using the joint schedule. This intervention is particularly socially valid, as individuals are often required to work on tasks with others in vocational settings.

A joint activity schedule has also been shown to be beneficial in promoting social interactions between peers. Betz et al. (2008) conducted the first study to include joint activity schedules. Three dyads of preschoolers with ASD participated. Each of the participants was fluent in playing interactive games (e.g., Don’t Break the Ice, Hungry Hungry Hippos, etc.) with peers, but did not independently initiate such play. The dyads did not engage with their peers more than 50% of 20 min. baseline sessions as measured by 20-s momentary time sampling. Six interactive games were available to the dyads in these sessions, with the only adult interaction being the initial instruction to “Go play.” The participants typically interacted with separate games by themselves during this time instead of playing the same game and interacting with each other. Because the participants were fluent activity schedule followers, Betz et al. conducted a schedule probe, in which a joint activity schedule depicting choices of games and the order of who should chose games to play together. The researchers did this to observe if an activity schedule alone could facilitate peer play. However, peer engagement remained low, similar to other baseline session measures, during these probes.

Betz et al. (2008) implemented a joint activity schedule and graduated guidance prompting using a multiple baseline across dyads design. The activity schedule included two pages with preselected activities, similar to MacDuff et al. (1993) for the participants
to play together, with the addition of a picture of one of the participants at the top of the page and the script “Let’s play ______.” This was a discriminative stimulus for the pictured participant to initiate playing the preselected game with his or her partner. Following the preselected activity pages were two pages that included a choice to be made between two pictures of other games. Again, one of the participants was pictured at the top of the page, signaling who was to choose which game to play by moving one of the pictured activities to the Velcro® area below their picture and initiate the activity.

Peer engagement increased to above 90% of intervals during intervention, while adult prompting decreased from up to 70% during the initial sessions to near-zero levels during the final teaching sessions. Peer engagement remained high and adult prompting remained low for all dyads during the resequencing phase, in which the researchers resequenced the order of the activity schedule pages. That is, the order of the preselected and choice pages differed in each of these sessions. The researchers then conducted a no schedule probe, which was identical to baseline sessions. Peer engagement dropped to baseline levels during these probes for all dyads. The resequencing phase and no schedule probe both strengthened the likelihood that the participants’ behaviors were controlled by the schedule, rather than other variables, such as the initial sequence of the activities. Finally, peer engagement and adult prompting returned to levels similar to the end of the teaching phase for two of the three dyads when novel interactive games were introduced. One dyad required some additional adult prompting due to disagreements between the two participants on how to play one of the games. Adult prompting quickly faded, though, as peer engagement in this dyad increased.
Betz et al. (2008) was the first study to promote play and social skills for more than one child using the same activity schedule. Brodhead et al. (2014) extended the literature on activity schedules by expanding on Betz et al. in two ways: First, the researchers taught preschoolers with ASD to play a complex, dynamic game (hide-and-seek) using activity schedules. This was different because it was a novel game to the participants, rather than games they already knew how to play, but did not initiate with their peers. Second, because hide-and-seek players have distinct roles, two individual, linked activity schedules were used, containing different statements and actions according to the distinct roles.

Three pairs of preschoolers with ASD participated in the Brodhead et al. (2014) study. During baseline, when no schedules were present and no prompts were delivered, the pairs were told to play hide-and-seek, with one participant playing the role of the seeker and the other playing the role of the hider, and being given 5 min. to play. None of the participants demonstrated independent hide-and-seek behavior during baseline. Because all participants were fluent activity schedule followers, the researchers conducted a schedule probe, in which the schedules were present, but no prompting was given. This was done for the same reason as Betz et al. (2008). Again, none of the participants demonstrated independent hide-and-seek behavior during these schedule probes.

The researchers then implemented the intervention, consisting of the linked activity schedules, as well as physical graduated guidance for the majority of the hide-and-seek behaviors, with the exception of the scripted statements, which were verbally
prompted. The pages on each of the two schedules alternated between hider and seeker. The seeker page included the written script “Go hide,” and a visual prompt to count to 20. Under the counting prompt was the written script, “I found you!” which the seeker would remove from the schedule and affix it to a plastic watch he or she wore with Velcro®. The seeker then took this script and a strip depicting two possible hiding locations, and searched for the hider in the locations. When the seeker found the hider, he or she read the script “I found you!” and both participants returned to the schedule. The hider page included a picture of the location where the hider should hide, along with the written script, “Oh no!” which the hider would take and affix to his or her own plastic watch with Velcro®. The hider would remain in the location until the seeker arrived and said, “I found you”, when the hider said the scripted phrase, “Oh no!” and return to the binders with the seeker. The participants would then each turn the page of their respective schedules, and on the next page the roles would reverse. The participants continued to play until they each played the role of the hider and seeker twice.

All six participants demonstrated the mastery criteria of at least 80% independent hide-and-seek behaviors across three consecutive sessions within 10 sessions. This responding remained high after researchers systematically faded the scripts, resequenced the order of who would be the hider and seeker first, and included novel hiding locations. The researchers also conducted a no schedule probe after the participants achieved mastery criteria to determine if the control of hide-and-seek behaviors had transferred to the naturally occurring cues in the environment. This did not appear to be the case, however, as none of the participants engaged in hide-and-seek behaviors in the probes.
These probes did assist in demonstrating experimental control, though, as it appeared that the activity schedules and prompting caused the increase of hide-and-seek behaviors.

Brodhead et al. (2014) introduced linked activity schedules as a method to teach complex social game play. Akers, Higbee, Gerencser, and Pellegrino (2018) extended this work in two ways: First, they included typically developing peers as play partners, rather than other children with ASD. As it is a goal for children with disabilities to be in the least restrictive environment and be included with their typically developing peers, this extension is important to the inclusion literature when targeting play and social skills. Second, this study was one of few studies to fade the activity schedule. Chan et al. (2004) and Blum-Dimaya et al. (2010) removed the schedule in accessing a video game and iPad application; however, Akers et al. was the first study to systematically fade the schedule for which the target behaviors were part of a dynamic game that could include many variations of play, rather than accessing and later closing the same video game or application.

Three preschoolers with ASD (denoted “target children”) each participated in groups with three typically developing peers (denoted “peer participants”). The peer participants later rotated due to scheduling issues, but the groups always included one target child and three peer participants. During baseline, the researcher told all participants “Play hide-and-seek. One of you will be the seeker, and the others will be the hiders,” and recorded all participants for 10 min. without prompting or programmed consequences. The target children showed low levels (between 0% and 25%) of independent hide-and-seek behaviors during baseline sessions, including a generalization
session on the playground, as well as a schedule probe session, in which the activity schedules were present, but no prompting was delivered.

The intervention consisted of the presence of the activity schedules and physical graduated guidance delivered by the experimenters for all members of the group (i.e., target children and peer participants) to use the schedules. The activity schedules included a hider schedule, which included pictures of various hiding locations in the common area of play that the participants playing the role of the hiders would remove and hide in the corresponding locations. These pictures of hiding locations also included a written script at the bottom for the participants to say when found by the seeker, varying between “Oh no,” “Ahh man,” and “Dang it.”

The seeker binder consisted of pages with the picture of who would be playing the role of the seeker, followed by the written scripts “My turn,” “Go hide,” 20 numbered circles to prompt the seeker to count to 20, and “Ready or not, here I come.” The seeker would then turn the page and remove the seeker strip, which included pictures of locations where hiders could potentially hide. The seeker would go to the first pictured location, and no hider was there, move a frowning face icon on the strip to the pictures location, indicating that location had been checked, and continue to the next pictured location. If a hider was in a checked location, the seeker would move a picture of the corresponding hider to the picture of the location, indicating the hider had been found, and read a written script located at the bottom of the hider’s picture. These scripts varied between “found you,” “see you,” and “got you.” The seeker’s turn ended when he or she found all three other members of the group. Each participant played the role of the seeker
once; therefore, a full game consisted of four rounds of hide-and-seek.

The target children independently engaged in hide-and-seek game play at criteria after relatively few (i.e., 9 to 13) teaching sessions. The researchers systematically faded the scripted statements, followed by physical components of the schedule (e.g., removing the hider binder, removing the seeker strip, etc.). Two of the three participants’ schedules were faded to only a one-page picture cue of the order of who would play the role of the seeker. All other hide-and-seek behaviors occurred independently. The remaining participants’ schedules faded to the point of only the picture of the seeker on one page of the seeker binder, followed by a seeker strip on the next page with pictures of the hiders to cue him when he found all three hiders, as at further fading steps he returned to the seeker schedule after he had found only two of the three hiders.

In addition to fading schedule components, the researchers removed all varied scripts, which led to appropriate varied vocal responding in various statement opportunities for all participants. One participant even emitted novel appropriate statements (e.g., “Oh, rats” when found). This appropriate varied responding is of particular interest, as it can be difficult to teach children with ASD to vary their behavior without specific reinforcement for varying (Wolfe, Slocum, & Kunnavatana, 2014). This, combined with the faded schedules, resulted in hide-and-seek play that appeared natural and dynamic. Finally, independent hide-and-seek play remained high in a two-week follow up at the furthest schedule-fading step, as well as during a generalization probe on the playground. This study was the first to use group activity schedules for children with ASD and their typically developing peers to teach cooperative play skills.
The research thus far on promoting sociodramatic play between children with ASD and their typically developing peers is promising but sparse. In addition, the use of cooperative activity schedules with children with ASD has shown promising results in its first studies. Using activity schedules with embedded scripts taught using graduated guidance may lead to similar results promoting other kinds of play in addition to group games, such as hide-and-seek and board games. Sociodramatic play is a complex and dynamic type of play that is common for typically developing preschoolers to demonstrate in many settings, including school. It is also a medium through which other skills, such as social skills and knowledge of community helpers, are taught in a preschool setting. Cooperative activity schedules with embedded scripts could be used with preschoolers with ASD to promote sociodramatic play with peers. This cooperative play could also lead to more opportunities for socialization for the preschoolers with ASD and their peers, including inclusion in the general education classroom setting. It is special education professionals’ jobs to teach children with ASD to engage in socially appropriate behaviors and learn in the least restrictive setting. The proposed intervention may be another tool to achieve this goal.

**Purpose and Research Questions**

The purpose of the current study is to investigate if we can teach young children with ASD to engage in sociodramatic play with their typically developing peers using linked activity schedules with embedded scripts and graduated guidance prompting. We also plan to investigate how we can fade the schedule and continue to observe appropriate levels of sociodramatic play between the young children with ASD and their typically
developing peers. Specifically, our research questions were as follows.

1. To what extent will linked activity schedules with embedded scripts implemented with graduated guidance increase engagement in sociodramatic play in preschoolers with ASD with their typically developing peers?

2. To what extent will this intervention increase percent of independent scheduled play behaviors in children with ASD with their typically developing peers?

3. To what extent will script fading within the intervention increase participants’ varied vocal responding during sociodramatic play?

4. To what extent can the linked activity schedules be faded and participants continue to engage in appropriate levels of sociodramatic play?

5. To what extent will engagement in sociodramatic play maintain at the highest fading step during 1- and 2-week follow-up sessions?

6. To what extent will overall social play with typically developing peers increase in young children with ASD after the intervention?
CHAPTER III

METHOD

Participants

Target Participants

We recruited eight preschool-aged children with ASD (i.e., “target participants”) from a university-based preschool for children with ASD. We obtained informed consent from all target participants’ parents. These participants demonstrated the following inclusion criteria: They were fluent activity schedule followers, as demonstrated by following an activity schedule involving playing with toys with at least 90% independence across three consecutive days. All participants were able to repeat up to four-word sentences. They demonstrated some spontaneous pretend play skills (e.g., pretend to eat a toy piece of food) and contextual pretend play statements (e.g., “I’m cooking” while near a play kitchen set), but they did not direct these behaviors toward their peers, nor did they display these behaviors at similar levels of their typically developing peers. In other words, the participants did not have a history of spontaneously initiating play actions, statements, or questions to peers in a play setting. We gathered this information from recent scores on the Verbal Behavior Milestones and Placement Program (VB-MAPP; Sundberg, 2008) and case manager report.

Five target participants were excluded from the study. Two were excluded due to high rates (equal or higher than those of their peers) of interactive behaviors with peers during baseline. One was excluded due to poor articulation of the few words spoken
during baseline. We decided that if the researchers, who had a history of interacting with the participant, had difficulty deciphering what the participant said, the typically developing peers would have as much or more difficulty, and may thus not interact with the participant. We piloted the study with the original method using auditory scripts (described further in the Method section) with one participant, and observed complications with this script modality. Thus, we excluded this participant and modified our procedures. Finally, we excluded one participant due to unexpected behavior around the peer participants. Although he occasionally responded to his peers in his preschool, when the peer participants made statements toward him, he stopped moving, became wide-eyed, and at times required several prompts to respond vocally, which was often in the form of a whisper. This was also the case for any interactions in which he was scheduled to initiate toward the peer participants.

Thus, three participants with ASD participated in the entirety of the study. Bruce was 4 years old at the time of the study. He attended a university-based preschool for children with autism, in which he received one-on-one Applied Behavior Analysis (ABA) therapy 20 hours per week for 7 months. He also attended a special education preschool in a group setting 12 hours per week for 6 months. Bruce performed in Levels 2 and 3 of the VB-MAPP. He emitted two- to four-word phrases several times per day, including mands (e.g., “I want the toy”), tacts (e.g., “There’s a dog”), and simple intraverbals (e.g., saying, “Bruce” when asked “What’s your name?”) with adults, although his articulation was sometimes difficult for novel listeners to recognize. He demonstrated audio-visual discriminations (i.e., receptive labeling), imitated most adults’ actions when told,
followed adult’s one-step instructions, and occasionally responded to peers with actions (e.g., giving a high-five when a peer approached him and said, “Give me five”), but did not seek out peers with whom to play or otherwise communicate. He engaged in solitary pretend play with play sets (e.g., a Batman cave toy with figurines), and made contextually appropriate sound effects when playing, but did not frequently spontaneously comment to peers when playing near them. He did show interest and explored most novel toys when presented.

Tobias was 4 years old at the time of the study, and had a diagnosis of separation anxiety disorder in addition to ASD. Tobias attended a university-based preschool for children with autism, where he attended a social skills group consisting of three to six children with ASD 12 hours per week for 7 months. One of these 12 hours per week was spent in the typically developing peers’ preschool with the other social skills group members and support from the group staff to follow group instruction during music time and free play. In other words, Tobias had previous contact with the peer participants, although he rarely independently interacted with them. He had also received one-on-one in-home ABA services 10 hours per week for 2 months. Tobias performed primarily in Levels 2 and 3 of the VB-MAPP. Similar to Bruce, he engaged in mands, tacts, and intraverbals. He also engaged in several mands for information (e.g., “What’s that?” “Where did he go?” etc.). Also similar to Bruce, he demonstrated audio-visual discriminations, although he had difficulties identifying letters and numbers. He also followed adult’s one-step instructions, and occasionally responded to peers with actions (e.g., giving a high-five when a peer approached him and said, “Give me five”), rarely
spontaneously sought out peers to communicate, aside from his older brother. Tobias required prompts from the teacher to attend to the relevant social skill group activities, and occasionally engaged in vocal stereotypy in the form of saying nonsense words when alone and not completing specific tasks. Tobias engaged in solitary and parallel pretend play with play sets, and occasionally commented, but did not frequently spontaneously comment to peers when playing. He also showed interest and explored most novel toys when presented.

Hazel was 4 years old at the time of the study. She attended a university-based preschool for children with autism, where she attended the same social skills group as Tobias 12 hours per week for 7 months. She thus also participated in one hour per week of music time and free play in the typically developing peers’ preschool with the other social skills group members and support from the group staff. She also attended a special education preschool in a group setting 6 hours per week for six months. Hazel, overall, performed in Level 3 of the VB-MAPP; in fact, she was advanced for her age in most academic and language tasks. Hazel performed in the lower Level 2 of the social domain of the VB-MAPP. She engaged in solitary pretend play and pretend play with adults, but only when she dictated the actions of the adult. For example, when playing picnic with an adult, she told the adult what to eat, what the adult liked, and when the adult was done. Although this is not necessarily atypical for young children, Hazel engaged in more intense oppositional behaviors when the adult did sometime contrary to her instruction (e.g., saying, “No!” and discontinuing play). Hazel did not readily respond to peers aside from denying play and did not seek them out during play. For these reasons, Hazel
primarily worked on flexibility and sociability in her preschool settings.

**Peer Participants**

We also recruited 13 typically developing preschool-aged children attending a university-based preschool to be the peer participants (see Table 1). We obtained informed consent from all peer participants’ parents, as well as consent to check the participants out of their preschool setting and go to the autism preschool setting (located on the same floor of the same building) during research sessions. One peer participant was excluded due to infrequent attendance. Four additional peer participants were excluded because they participated with the piloted target participant using the original method. Because they had been exposed to a form of the intervention, we excluded these peer participants so all peer participants in the completed study did not have prior exposure to any form of the procedures, so as not to potentially influence target participant responding during baseline. This left eight typically developing preschool aged children to serve as peer participants. One of these participants only participated in baseline sessions due to his family moving out of town during the study. Another participant also moved out of town with his family after participating in both baseline and treatment sessions.

Two peer participants participated in each session with a participant with ASD. Due to scheduling and attendance, any of the peer participants could participate with any of the target participants. However, once a peer participant participated in a schedule probe session, that is, was exposed to part of the intervention, he or she did not participate in initial baseline sessions with other target participants, so as not to
Table 1

*Peer Participant Information*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age</th>
<th>Sessions completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer 1</td>
<td>Male</td>
<td>5</td>
<td>68</td>
</tr>
<tr>
<td>Peer 2</td>
<td>Female</td>
<td>4</td>
<td>59</td>
</tr>
<tr>
<td>Peer 3</td>
<td>Female</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>Peer 4</td>
<td>Male</td>
<td>4</td>
<td>52</td>
</tr>
<tr>
<td>Peer 5</td>
<td>Female</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Peer 6</td>
<td>Female</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Peer 7</td>
<td>Male</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Peer 8</td>
<td>Male</td>
<td>4</td>
<td>13</td>
</tr>
</tbody>
</table>

potentially influence target participants’ behaviors during baseline. Per the request of the director of the university-based preschool, we did not provide any preferred items or incentives to the peer participants for participating, although they could play with unrelated toys in the common area of the preschool if there was a short delay (e.g., if one of the participants needed to use the bathroom).

**Setting**

We conducted all sessions in a common area of a university-based preschool for children with ASD. This area is approximately 5 m by 3 m and included two small tables and chairs. The area also included a small bench built into the wall, and shelving and cabinets that held unrelated toys, although this area was covered so as not to distract the participants from the relevant play materials. We conducted up to four sessions per day per target participant, up to 5 days per week. We separated sessions involving the same target participants by at least 20 min.
Materials

We used play materials related to a restaurant scenario, as it is a common sociodramatic play scenario for preschoolers to complete, and it can include three distinct roles (diner, waiter, and chef). Play materials included a bin on one table containing a plate and three entre food items (i.e., a slice of pizza, spaghetti, and a chicken drumstick) present during all sessions. Also present during all sessions were a cloth napkin and a smock on one table, and a chef’s hat on the other table. Finally, a green laminated restaurant ticket order sheet, a pink laminated sheet labeled “menu,” and a laminated sheet of a small tan serving tray were present on the built-in bench during all sessions. During the intervention and schedule fading steps 1-5, three copies of the ticket order sheet, menu, and tray pictures were present in small containers, with the participants’ pictures displayed on each container (see Figure 1). However, during baseline and the final fading schedule step (6), only one copy of each sheet was present without the containers. During the schedule probe and the intervention, the diner’s activity schedules were on the menu sheets, the waiter’s activity schedules were on the serving tray sheets, and the chef’s activity schedules were on the ticket order sheets (see Figure 2).

These activity schedules were linked. That is, the completion of particular activity schedule behaviors for one participant signaled the initiation of another participant’s activity schedule behavior. On each activity schedule was a vertical series of pictures, scripts, and icons representing the play vocalizations and actions in which the participant playing that role should engage. We initially used Mini-Me recorders to play audio scripts, labeled with a picture of the item the interactive play partner wore, indicating the
peers playing the role the participant should direct the script. For example, a Mini-Me recorder with a picture of a smock on it served as a cue that the participant should orient to the person wearing the smock (i.e., the participant playing the role of waiter) when repeating the script.

We initially used audio scripts instead of textual scripts for two reasons: First, we
thought it will allow the participant to orient toward or look directly at the person they are
talking to while speaking, rather than looking down at a textual script while reading.

Second, the use of audio scripts reduces the amount of reading or pretraining required for
each participant. After piloting the intervention with one target participant, however, we
encountered issues specific to audio scripts. First, using audio scripts increased the
overall time of the session, as each participant was required to press the button, listen to
the recording, and repeat the script. In addition, if the participant did not repeat the script
or engage in a similar contextual interactive vocalization following the initial recording, a
research assistant prompted the participant to press the Mini-Me recorder to listen to the
script again, followed by providing a full vocal prompt. This added time to interactions,
which halted the flow of the play scenario. Second, although the target participant did not
press the peers’ Mini-Me recorders, he frequently repeated the audio scripts of his peers.
This led to vocal interactions that did not follow a contextual play scheme. For example,
when the target participant played the role of the diner, and a peer participant playing the
role of the chef played an audio script that said “Coming right up!” meant to be directed
toward the peer participant playing the waiter, the target participant repeated “Coming
right up!” This lead to the peer participants pausing, skipping the scripts assigned to
them, and a general scene of vocalizations that did not appear contextual. It appeared that
the target participant’s echoic responding overgeneralized to any audio script, rather than
only the audio scripts intended for that participant. This echoing response that made the
target participant a good candidate for the intervention ironically was so strong that it
hindered progress in interacting with his typically developing peers. Third, the pictures of
the item on the Mini-Me recorders did not appear to be discriminative stimuli to direct vocalizations to the participants wearing the corresponding item for both the target and peer participants. The research assistants frequently prompted the participants to walk to or face the appropriate participant when pressing the Mini-Me recorders and repeating the scripts.

Due to the reasons listed above, we changed the script modality to textual rather than audio scripts, which were displayed under the actual pictures of the participants to whom the script should be directed, rather than a picture of the item the participant to whom the script should be directed was wearing. In doing so, we sacrificed the three multiple exemplars of each script to only one script for each interaction. We did this because, had we kept three multiple exemplars of each script, we would have to pretrain 30 different textual scripts to preschool aged children, which did not seem developmentally appropriate. We instead selected a total of the same 10 two- to four-word phrases to be used by the participants during each round of the play scenario. We continued to collect data on any of the participants’ vocalizations that were either pre-taught scripts used in a novel yet contextual part of the play scenario, or completely novel yet contextual vocalizations said to one another during the play scenario.

The activity schedules also contained icons designed to cue play actions in addition to vocalizations. For example, after being given a food item and commenting on the food, the diner’s next activity schedule component was a picture icon depicting eating (see Figure 2). This served as a cue for the diner to pretend to eat the food item. Some icons signaled the participant to engage in two interactive play actions. For example, an
arrow icon pointing toward the picture of the diner signaled the waiter to take the food item from the chef and deliver it to the diner (see Figure 2).

**Response Definition and Measurement**

Trained research assistants collected data via recorded video. A separate research assistant filmed each participant, as the participants often moved throughout the common area such that all participants could not be captured in the same video recording throughout the session.

As sociodramatic play is more dynamic than other behaviors targeted in the activity schedule literature, our primary dependent variable was percent engagement in the sociodramatic play scenario using a 20 s momentary time sampling measure (see Appendix A). We defined engagement as engaging in interactive play behaviors, including vocalizations toward peers and engaging with the play materials with peers in a manner related to the restaurant scenario, or completing behaviors that were part of the activity schedule. Examples of engagement included the giving food to another participant, putting on the waiter’s smock, and talking to another participant about the food. Engagement also included the participant waiting appropriately for his or her turn according to the activity schedules. For example, the role of chef included the participant going to the food area, putting on the chef’s hat, and waiting for the waiter to approach with the diner’s order. We scored this appropriate waiting (e.g., sitting at the food area table, looking at the food, the schedule, or ahead toward the other participants) as independent engagement. We recorded if the participant was prompted as a separate
measure than engagement. Prompted engagement was defined as the researcher having his or her hands on the participant to guide him or her to engage in the scheduled behaviors, or vocally prompting him or her to say a scripted statement. Because we utilized full physical and vocal prompting, the likelihood that we observed a prompted behavior without prompting occurring during the time sample moment was low. We also recorded if the participant was unengaged. We defined unengagement as engaging in behaviors other than those specified in engagement and prompted measures. Examples of unengagement included taking food to the opposite end of the play area than one’s peers and pretending to eat by oneself, talking to a peer regarding a topic other than the restaurant play scenario, and watching peers engage in play but not participating in the play in any way. We also included stereotypy that hindered participation in the play scenario as unengaged. This was specific to Tobias, as Hazel and Bruce did not engage in stereotypy that differed from what is socially appropriate (e.g., tapping fingers on the table and quietly humming while waiting for their turn). Tobias occasionally made noncontextual sounds and statements that competed with carrying out scheduled behaviors and appeared stigmatizing compared to the behavior of his peers. Thus, if Tobias engaged in this vocal stereotypy during a time sample moment we scored his behavior as unengaged.

Our secondary dependent variable was percent of independently completed scheduled behaviors (see Appendix B). Because some of these scheduled behaviors could only be completed with the activity schedules present, we measured this only during schedule probes, treatment, fading, and maintenance sessions. We measured independent
schedule completion to observe if the participants learned the components of the schedule we programmed. See Table 2 for an overview of the scheduled behaviors for each role.

Each participant played all three roles (diner, waiter, and chef) during intervention sessions. This role order was randomly assigned each session. We did this so the participants did not potentially memorize and play the roles in the same order each session, as this would not appear like natural play.

Table 2

Scheduled Behaviors

<table>
<thead>
<tr>
<th>Waiter</th>
<th>Diner</th>
<th>Chef</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrieve schedule from bin</td>
<td>Retrieve schedule from bin</td>
<td>Retrieve schedule from bin</td>
</tr>
<tr>
<td>Attend to smock picture</td>
<td>Attend to napkin picture</td>
<td>Attend to chef’s hat picture</td>
</tr>
<tr>
<td>Go to diner table</td>
<td>Go to diner table</td>
<td>Go to chef table</td>
</tr>
<tr>
<td>Put on smock</td>
<td>Lay napkin on lap</td>
<td>Put on chef hat</td>
</tr>
<tr>
<td>Attend to script</td>
<td>Attend to script</td>
<td>Attend to script</td>
</tr>
<tr>
<td>Ask diner food order</td>
<td>Tell waiter food order</td>
<td>Confirm food order</td>
</tr>
<tr>
<td>Attend to arrow icon</td>
<td>Attend to script</td>
<td>Touch food picture</td>
</tr>
<tr>
<td>Attend to script</td>
<td>Thank waiter</td>
<td>Retrieve food</td>
</tr>
<tr>
<td>Tell chef food order</td>
<td>Attend to eating icon</td>
<td>Attend to script</td>
</tr>
<tr>
<td>Attend to arrow icon</td>
<td>Pretend to eat food</td>
<td>Tell waiter food is ready</td>
</tr>
<tr>
<td>Take food from chef</td>
<td>Attend to script</td>
<td>Remove chef hat</td>
</tr>
<tr>
<td>Go to diner table</td>
<td>Comment on food</td>
<td>Return to home base</td>
</tr>
<tr>
<td>Give food to diner</td>
<td>Attend to script</td>
<td>Put schedule in tray</td>
</tr>
<tr>
<td>Attend to script</td>
<td>Say goodbye to waiter</td>
<td></td>
</tr>
<tr>
<td>Tell diner food has arrived</td>
<td>Remove napkin</td>
<td></td>
</tr>
<tr>
<td>Attend to script</td>
<td>Return to home base</td>
<td></td>
</tr>
<tr>
<td>Say goodbye to diner</td>
<td>Put schedule in tray</td>
<td></td>
</tr>
<tr>
<td>Attend to arrow icon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take food from diner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk to chef table</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put food into bin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove smock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return to home base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put schedule in tray</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Some of the scheduled play behaviors included interactive play vocalizations and actions. For the diner this included: (a) requesting an item from the menu, (b) thanking the waiter for the food (c) pretending to consume the item, (d) commenting on the taste, and (e) saying goodbye to the waiter. For the waiter these behaviors included: (a) asking what the diner would like to eat, (b) telling the order to the chef, (c) bringing the item to the diner, (d) telling the diner the order has arrived, (e) saying goodbye to the diner, and (f) taking the food from the diner and putting it back in the bin. For the chef these behaviors included: (a) confirming the order, (b) retrieving the food from the bin and giving it to the waiter, and (d) telling the waiter the order is ready.

We programmed for and measured other play behaviors that were not necessarily interactive, but could help facilitate interactions. For example, we programmed for and measured attending to (i.e., pointing or looking) pictures or icons that signaled a corresponding action. We initially prompted the participants to point to the icon, as it is difficult to physically prompt participants to look at an icon otherwise. However, as the intervention continued, the participants looking at the picture or icon counted as attending. In addition, we programmed for each participant to put on an item corresponding to his or her role at the beginning each role rotation (i.e., a smock, a napkin, or a chef’s hat).

Finally, we measured vocalization variation. We programmed for variation of what the diner ordered and what the waiter told the chef to make between three foods. We also measured if the participants continued to say all the vocalizations after the scripts were faded or emitted novel yet appropriate vocalizations at any point during the
intervention. We measured variation by counting the number of times a participant emitted each vocalization throughout all sessions.

Research Design

A nonconcurrent multiple baseline design across target participants with an embedded reversal design was used to evaluate the effects of using activity schedules to teach children with ASD to engage in sociodramatic play with typically developing peers.

Interobserver Agreement and Treatment Integrity

An independent observer conducted interobserver agreement (IOA) in at least 33% of sessions for each participant across all phases. See Table 3 for a summary of IOA and treatment integrity. We calculated point-by-point IOA by dividing the number of agreements divided by the number of agreements and disagreements and multiplying this number by 100 to yield a percentage. We collected IOA on 35% of total sessions, averaging 92.4%, with a range of 67-100%.

Independent observers also collected data on research assistants’ treatment integrity for at least 33% of sessions for all participants and across all phases (see Appendix C). Treatment integrity data were collected using a checklist to determine if: (a) activity schedules were present (or not present during baseline and the no schedule probe), (b) the activity schedules were correctly arranged (i.e., the scripts were randomly assigned and at the correct fading level, and the role order was randomly assigned, and the schedules were the correct fading level), (c) the research assistant told the participants
Table 3

Interobserver Agreement and Treatment Integrity Summary

<table>
<thead>
<tr>
<th>Participant</th>
<th>% Collected</th>
<th>Mean IOA %</th>
<th>IOA Range %</th>
<th>Mean TI %</th>
<th>TI Range %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruce</td>
<td>34.9</td>
<td>90.8</td>
<td>67 – 100</td>
<td>99.0</td>
<td>85.7 – 100</td>
</tr>
<tr>
<td>Tobias</td>
<td>34.2</td>
<td>93.8</td>
<td>84 – 100</td>
<td>96.7</td>
<td>85.7 – 100</td>
</tr>
<tr>
<td>Hazel</td>
<td>35.9</td>
<td>91.7</td>
<td>64.4 – 100</td>
<td>100.0</td>
<td>100</td>
</tr>
<tr>
<td>Peer 1</td>
<td>35.3</td>
<td>90.7</td>
<td>71.4 – 100</td>
<td>99.0</td>
<td>85.7 – 100</td>
</tr>
<tr>
<td>Peer 2</td>
<td>33.3</td>
<td>92.7</td>
<td>83.3 – 100</td>
<td>99.4</td>
<td>85.7 – 100</td>
</tr>
<tr>
<td>Peer 3</td>
<td>33.3</td>
<td>91.9</td>
<td>82.1 – 100</td>
<td>99.0</td>
<td>85.7 – 100</td>
</tr>
<tr>
<td>Peer 4</td>
<td>34.6</td>
<td>91.0</td>
<td>71.4 – 100</td>
<td>98.4</td>
<td>71.0 – 100</td>
</tr>
<tr>
<td>Peer 5</td>
<td>35.0</td>
<td>92.4</td>
<td>75.7 – 100</td>
<td>100.0</td>
<td>100</td>
</tr>
<tr>
<td>Peer 6</td>
<td>33.0</td>
<td>90.9</td>
<td>84.6 – 100</td>
<td>100.0</td>
<td>100</td>
</tr>
<tr>
<td>Peer 7</td>
<td>33.0</td>
<td>95.0</td>
<td>90.1 – 100</td>
<td>100.0</td>
<td>100</td>
</tr>
<tr>
<td>Peer 8</td>
<td>38.5</td>
<td>97.1</td>
<td>85.7 – 100</td>
<td>100.0</td>
<td>100</td>
</tr>
</tbody>
</table>

to “play restaurant” at the beginning of the session, (d) the research assistant did not provide praise during the session, (e) the research assistant provided physical prompts from behind the participant, (f) the research assistant followed the prompting procedure for scripts. We also collected treatment integrity on Tobias’ BST booster sessions if the research assistant (a) completed the BST sequence in order, (b) reinforced attending and correct implementation depending on the BST component being conducted, (c) completed error correction in a manner depending on the BST component being conducted if Tobias made an error. If a treatment integrity score dropped to or below 67% in a session (i.e., two or more components carried out incorrectly), the first author retrained the research assistant on maintaining treatment integrity. Treatment integrity averaged 98.9%, with a range of 71.4% - 100%.
Procedures

The first author trained all research assistants to conduct research sessions with fidelity for all phases using Behavioral Skills Training (BST; Parsons & Reid, 1995). She did this by describing the procedures, modeling the procedures, having the research assistants practice the procedures with each other, and providing feedback. Initial training completed when the research assistants conducted the necessary session components with at least 90% accuracy when practicing with the first author and other research assistants.

Pretraining

We conducted script pretraining for all target and peer participants, as none of the participants had histories with this form of teaching. After we moved from audio to textual scripts, we conducted textual script training and textual script fading with all participants. We taught each participant to read 10 different color-coded scripts in the restaurant scenario (see Table 4). We did this by presenting one of the color-coded phrases in front of the participant and told him or her, “Read.” If the participant correctly read the script, we provided praise and marked the response as correct. If the participant read the script incorrectly or did not respond within 5 s, we re-presented the script and the instruction followed immediately by a full vocal prompt. After the participant responded to the vocal prompt, we re-presented the script and the instruction to give the opportunity for the participant to respond correctly without prompting. The mastery criterion for each script was independently reading the script during three consecutive opportunities.

We conducted textual script fading with each participant by presenting an
unrelated script (i.e., “Green limes are sour”) and told the participant, “Read.” After the participants reached the same mastery criterion, we presented the same script with one word faded (i.e., “Green limes are ____”) with the same instruction, with the target response being “Green limes are sour.” Script fading training completed when the participant emitted the original response with one word faded in three consecutive opportunities.

We also pretrained the participants to receptively and expressively identify the three foods present during sessions. We conducted receptive identification pretraining by presenting the three toy foods on a table in front of the participant and tell them to touch or point to the food item we name. Correct receptive identification resulted in praise. Incorrect receptive identification resulted in re-presenting the learning opportunity with a gestural (point) prompt to the correct food, followed by another opportunity to engage in the response independently. We conducted expressive identification pretraining by holding a food item in front of the participant and asking him or her, “What is it?” Correct expressive identification resulted in praise. Incorrect expressive identification resulted in re-presenting the learning opportunity with a full vocal prompt to engage in

Table 4

**Textual Scripts**

<table>
<thead>
<tr>
<th>Waiter</th>
<th>Diner</th>
<th>Chef</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you want?</td>
<td>I want (picture of food item)</td>
<td>Coming right up</td>
</tr>
<tr>
<td>One (picture of food item)</td>
<td>Thank you</td>
<td>Food is ready</td>
</tr>
<tr>
<td>Here you go</td>
<td>Mmm yummy</td>
<td></td>
</tr>
<tr>
<td>See you later</td>
<td>I’m done, bye</td>
<td></td>
</tr>
</tbody>
</table>

We also pretrained the participants to receptively and expressively identify the three foods present during sessions. We conducted receptive identification pretraining by presenting the three toy foods on a table in front of the participant and tell them to touch or point to the food item we name. Correct receptive identification resulted in praise. Incorrect receptive identification resulted in re-presenting the learning opportunity with a gestural (point) prompt to the correct food, followed by another opportunity to engage in the response independently. We conducted expressive identification pretraining by holding a food item in front of the participant and asking him or her, “What is it?” Correct expressive identification resulted in praise. Incorrect expressive identification resulted in re-presenting the learning opportunity with a full vocal prompt to engage in
the correct response, followed by another opportunity to engage in the response independently.

Finally, we pretrained the participants to match pictures of the smock, napkin, and chef hat to the actual items. We did this by laying out the actual smock, napkin, and chef hat in front of the participant, then handed a picture of one of the items to the participant and told him or her, “Match.” Correct matching resulted in praise. Incorrect matching resulted in re-presenting the learning opportunity with a gestural (point) prompt to the correct item, followed by another opportunity to engage in the response independently. The mastery criterion for each of these responses was the same as the mastery criterion for the script pretraining: independently engaging in the correct response during three consecutive opportunities.

**Play Assessment**

We conducted one 10-min play session after receiving consent from the participants’ parents and before all pretraining and experimental sessions to further measure the participants’ social play behaviors. We also conducted an identical play session after the conclusion of all experimental and maintenance sessions to assess if general social play increased following treatment. We conducted these sessions in the same common area as all experimental sessions. The materials present during these sessions were four unrelated toy sets with which all target participants were familiar. Materials included a doctor kit, a figurine toy set, a bowling set, and a sand table. During these sessions, we told the participant with ASD and two peer participants, “You can play with whatever toys in this space that you want. Go play.” We recorded all participants’
social play using Parten’s (1933) play definitions using a 20-s momentary time sampling procedure. During each interval, we marked each participant’s behavior as unoccupied (not playing), onlooker (watching other children play), solitary (playing alone with toys different than those of the other participants), parallel (playing independently but with the same materials as and near the other participants), associative (playing with the other participants without specific division of roles or one determined goal), or cooperative (playing with the other participants to achieve a common goal, or dramatizing situations with division of roles). We calculated and visually analyzed the percent of each play category for each target participant in the pre-study and post-study sessions.

**Baseline**

We instructed the peer participants before the initial baseline session that it was okay to play with whomever they wish during sessions, but they cannot directly prompt the target participant (e.g., the peer participant could not tell the target participant, “Tell me you want pizza”). We conveyed this to the peer participants by saying, “You’re going to play restaurant with some other kids. You can play and talk with each other, but you can’t force anyone to do anything that they don’t want to do.” We chose this specific wording because this was one of the classroom rules in their preschool. Peer participants never dictated to the target participants what to do during baseline, although they typically discussed with the other peer participants what they were doing or were going to do.

Research assistants led the target participant and two peer participants to the common area, where they told them, “It’s time to play restaurant, go play” at the
beginning of each session. Baseline sessions were 10 min following the research assistant’s instruction. We also implemented a termination criterion of 2 consecutive min of the target participant not being engaged according to our engagement measure. We did not deliver prompts during baseline unless participants attempted to leave the research area or engage in unsafe behavior (e.g., climbing on the tables, throwing items), in which case a research assistant gave the instruction, “Remember to keep your bodies safe.” We chose this wording because it was one of the peer participants’ preschool classroom rules. If unsafe behaviors continued, we lightly physically blocked the behavior and delivered the same instruction. We transcribed what all participants said related to the restaurant scenario during all baseline sessions (see Appendix D).

**Activity Schedule Probe**

We conducted a baseline session with the activity schedules present after we observed steady state responding for the target participant. Aside from the activity schedules being present, this session was identical to other baseline sessions. We conducted this probe to observe if the presence of activity schedules alone (rather than activity schedules plus graduated guidance prompting) facilitated sociodramatic play between the target and peer participants. If the target participant’s behavior did not significantly change from other baseline sessions, we continued to the intervention phase.

**Activity Schedule Teaching**

The beginning of intervention sessions was identical to baseline sessions. The research assistant told the participants, “It’s time to play restaurant, go play.” We then
taught all target and peer participants to use the activity schedules using physical prompting from behind. A different research assistant prompted each of the participants, so each participant had his or her own prompter. We gave each participant up to 3 s to emit each scheduled response. If a participant made an error or did not begin to emit a response within 3 s, we physically prompted the response from behind the participant. We taught script use by initially physically prompting the participant to touch the script. If the participant did not say the script, we physically prompted the participant to touch the script again while giving a full vocal prompt (i.e., saying the entire script for the participant to repeat). We continued this prompting until the participant correctly repeated the script.

The participants were taught to go to the area with their individualized bins holding their schedules (i.e., home base), retrieve the first schedule, attend to the role depicted on the schedule, go to the matching item to wear for that role, and put the item on. The interactions started with the waiter asking the diner what he or she wanted to eat. The diner then gave his or her order. The waiter then gave the order to the chef, who confirmed it, retrieve the food item and plate from the food bin, gave it to the waiter, and told the waiter that the food was ready. The waiter then gave the food to the diner, and told the diner that the food had arrived. The diner thanked the waiter, pretended to eat the food, and commented on how it tasted. The diner then said he or she was done, and said goodbye to the waiter. The waiter said goodbye to the diner, and put the food and plate back into the bin. See Figure 3 for an example of this sequence. All participants then returned to home base, put their completed schedule pages into individualized trays.
located below the bins, retrieved the next schedule page from their bin, and repeated the rotation with each participant playing a different role. The participants then returned to home base, placed their completed schedule sheets in the trays, retrieved their final schedule sheets from their bins, and repeated the rotation a third time with each participant playing a different role. Finally, all participants returned to home base to return their final completed activity schedule sheets to their trays, signaling the end of the session.

We began to fade all scripts after one session of the target participant independently following the scripts with at least 89% accuracy, including attending to the scripts and saying them. In other words, if a participant required prompting to touch the script after not looking at the script or saying the script when it was his turn, this prompt counted against the independent script percentage. We did this by removing one word at a time from the end of the phrases and replacing it with an underline (e.g., instead of a script reading, “Thank you” it read, “Thank ____”). After all words were faded from the scripts was a fading step that only included the colored background of the scripts without

<table>
<thead>
<tr>
<th>Waiter:</th>
<th>What do you want?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diner:</td>
<td>I want pizza.</td>
</tr>
<tr>
<td>Waiter (to Chef):</td>
<td>One pizza.</td>
</tr>
<tr>
<td>Chef:</td>
<td>Coming right up! (Plates pizza.) Food is ready.</td>
</tr>
<tr>
<td>Waiter:</td>
<td>(Takes pizza from Chef, gives pizza to Diner.) Here you go.</td>
</tr>
<tr>
<td>Diner:</td>
<td>Thank you. (Pretends to eat pizza.) Mmm yummy! I’m done, bye!</td>
</tr>
<tr>
<td>Waiter:</td>
<td>See you later.</td>
</tr>
</tbody>
</table>

*Figure 3. One scripted rotation between roles.*
underlines. The colored portion at the bottom of the pictures were then removed in the final script fading step. The activity schedule teaching phase ended after the target participant completed at least 90% of the activity schedule independently across three consecutive sessions with the scripts completely faded.

We made several modifications to Tobias’ teaching procedures based on his response levels and error patterns. We implemented these modifications based on what would be done clinically if a student did not make progress in activity schedule completion, and worked from least to most intrusive changes to the teaching. After session 20, we conducted two booster sessions (not included in the graphs) in which the research assistants errorlessly prompted all of his and both peer participants’ actions. That is, they immediately prompted all steps of the sequence for all participants. We included the peers in this modification to expose Tobias to a seamless sequence without errors, with the hope that he later would be more likely to independently engage in the scheduled behaviors. After session 23, we implemented a different version of this modification, in which we conducted two “teach” sessions (not included in the graph), or sessions in which we errorlessly prompted Tobias, followed by a “test” session (included in the graph), in which we conducted our standard prompting (i.e., teach-teach-test). We did not errorlessly prompt the peers during these teaching sessions, as they were performing at high levels of independence at that time.

At session 26, we discontinued the teach-teach-test sequence and introduced programmed reinforcement. We used data from Tobias’ one-trial multiple stimulus without replacement (MSWO; Carr, Nicholson, & Higbee, 2000) conducted with small
food items at the beginning of the day. During the research sessions, the research assistant prompting Tobias silently delivered this food item from behind him on a modified fixed interval 10 s schedule. In other words, after 10 s, if Tobias completed the next step in the schedule independently, the researcher handed him a small food item from behind. For example, after a 10 s interval, if the next step for Tobias to complete was to put on the napkin, and he did this independently, the research assistant delivered the food item into his hand from behind. If, however, he required prompting to put on the napkin, the research assistant did not deliver food item, and the next interval continued.

At session 33, we altered the manner in which we delivered food items from an interval schedule from the research assistant to a fixed ratio 1 schedule within the physical activity schedule. That is, we affixed the food item after each pictured item on the activity schedule. After completion of each step that involved a pictured discriminative stimulus on the schedule, Tobias could consume the food. The research assistant initially prompted Tobias to take the food item off the schedule and consume it after completing the corresponding step. The research assistant faded these prompts when Tobias began consuming the items on his own. We allowed Tobias to eat these items immediately after completing a scheduled step or, if he engaged in a sequence of scheduled behaviors in a row, consume the group of edible items after this sequence, or at the end of the session. We allowed this because we did not want to slow his behaviors by immediately making him pause to consume the food items after each step if he was about to independently complete the next scheduled behavior.

Finally, after session 38, we discontinued food delivery and conducted booster
sessions in which a research assistant conducted a modified BST (Parsons & Reid, 1995) with Tobias on how to perform all the steps of the schedule, although he demonstrated consistent errors with particular behaviors (e.g., the first scripted statements as the waiter and diner, saying goodbye as the waiter, going to his individualized bin containing his schedules). BST typically involves providing instructions, modeling the behaviors, having the individual rehearse the behaviors, and providing feedback. Considering Tobias’ young age, we programmed for additional modeling and feedback throughout the BST booster sessions. We divided the BST booster sessions by each role, starting with the waiter.

The research assistant began by providing Tobias instructions on the steps the waiter would do, following by modeling, with two other research assistants playing the other roles. For example, she said, “The waiter is the first person to talk, and they ask the diner what they want” before saying to the research assistant playing the diner, “What do you want?” Throughout this explanation, she provided praise and small preferred food items for attending to her on a variable interval 1 min schedule. She then modeled the entire waiter sequence without instructions, and provided praise and a small preferred food item for attending at the end of the sequence.

Following this, the researcher had Tobias practice the sequence as the waiter with the other research assistants playing the roles of the diner and chef. The research assistant provided feedback to Tobias during this practice in the form of praise and a small preferred food item for completing steps independently that he historically did not complete, and corrective feedback when he made errors. This corrective feedback
involved both vocal and physical prompting. For example, if Tobias put his completed sheet in the incorrect tray, the research assistant said, “Remember to put the schedule in your tray under your bin,” and physically guided him to do so.

After this rehearsal, the research assistant had Tobias complete the waiter sequence with prompting identical to traditional treatment sessions and no programmed reinforcement. If he completed this sequence with 100% independence, the BST session for that role was completed. The research assistant completed this same training with the diner and chef roles, with breaks in between each role. After reaching the mastery criterion for these roles, we conducted sessions in which Tobias played all three roles with research assistants and prompting identical to treatment sessions. The mastery criterion for these sessions was three consecutive sessions with at least 90% percent independent schedule completion across two days.

**Reversal**

After the target participant met the initial mastery criteria in the activity schedule teaching condition, we conducted a no schedule probe, or a reversal session identical to baseline, to determine if the target participant could engage in sociodramatic play at rates similar to the intervention under the control of the play materials and peers’ actions alone. Similar to baseline, we ended the session after 10 min, 2 min of the target participant not demonstrated engagement, or if the participants played each of the three roles. If the target participant was engaged at least 80% of the session, we continued to run identical sessions until the target participants’ engagement either stabilized at these high levels, in which case we would move to the maintenance phase, or if his or her
engagement significantly dropped, in which case we conducted a schedule fading phase.

**Schedule Fading**

We systematically faded the activity schedules to the point that the target participant could independently engage in sociodramatic play with the least amount of support as possible. See Table 5 for a summary of the fading steps. The first fading step was removing the picture at the top of each schedule that matched the item he or she wore when playing that role, such that the type of schedule (i.e., pink menu, green ticket order sheet, brown tray printout) controlled which role he or she played. The eating icon on the diner schedule and the food array icon on the chef schedule were then removed. All arrows were then removed from the waiter schedule. The pictures of the participant playing the role of the waiter were then removed from the diner and chef schedules, followed by removal of the pictures of participants playing the roles of diner and chef from the waiter schedule. During this fading step (5), the actual schedule sheets did not contain any pictures or icons, and were located in the individual bins at home base. In other words, the participants only used the relevant play materials without cues on them.

Table 5

*Scheduling Fading Steps*

<table>
<thead>
<tr>
<th>Step #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pictures of the smock, napkin, or chef hat removed from each schedule</td>
</tr>
<tr>
<td>2.</td>
<td>Eating icons removed diner schedule; food icons removed from chef schedule</td>
</tr>
<tr>
<td>3.</td>
<td>Arrow and bin icons removed from waiter schedule</td>
</tr>
<tr>
<td>4.</td>
<td>Participants’ pictures removed from chef and diner schedules</td>
</tr>
<tr>
<td>5.</td>
<td>Participants’ pictures removed from waiter schedule</td>
</tr>
<tr>
<td>6.</td>
<td>Baseline conditions</td>
</tr>
</tbody>
</table>
and the only thing programmed in these sessions was the order of the participants’ roles. We moved to the next schedule fading step after the target participant independently engaged in at least 90% of scheduled behaviors in one session. We returned to the previous fading step of a target participant independently engaged in significantly less than 90% of scheduled play behaviors in one session. We continued fading as much as time allowed.

**Follow-Up Probes**

We conducted two follow-up sessions after 1 and 2 weeks of the target participant demonstrated appropriate sociodramatic play at the highest fading step. These sessions were identical to the last session conducted in the schedule fading phase, with the exception that we did not provide prompting. We did this to assess if sociodramatic play maintained after a period of time without teaching.

**Play Assessment**

We conducted a second play assessment identical to the play assessment conducted before baseline.
CHAPTER IV
RESULTS

Figure 4 shows engagement and schedule completion data sets for the three target participants.

Bruce

Bruce’s results are pictured in the first panel of Figure 4. Bruce was engaged 33% of the first baseline session in that he exchanged food items and pretended to eat them with his peers. During the majority of baseline, however, Bruce ran from one area of the play area to another, or put play materials over his head (e.g., the container containing the food and plate) and pretended to run into the tables and chairs. At one point in baseline, Bruce put a napkin over his head and said “Oooh” as if he was a ghost. These appeared to be attempts to interact with his peers, although he rarely said actual words to them. The peers frequently talked to each other regarding Bruce’s actions (e.g., “What is he doing?” and “That’s weird”), but rarely interacted with Bruce. Bruce’s and the peer participants’ engagement did not increase, nor did they begin to engage in scheduled behaviors (aside from Bruce putting on the chef’s hat) during the schedule probe.

Bruce’s engagement and schedule completion rapidly increased with the introduction of prompting with the activity schedules. We faded the scripts in sessions 14, 15, 16, 18, 19, and 20. He required eight more sessions to reach the criteria of completing at least 90% of the schedule independently across three consecutive sessions. Twice during these sessions, he completed over 90% of the schedule independently
Figure 4. Percent of independent engagement and schedule completion for Bruce, Tobias, and Hazel. * denotes errorless booster sessions, ** denotes the teach-teach-test sequence, # denotes food item delivery from the research assistant, † denotes food items within the schedule, and ¥ denotes BST booster sessions. Arrows denote script fading. Numbers 1, 2, 3, 4, and 5 denote schedule fading.
across two consecutive sessions, but his next performance dropped below 90%. Bruce required 19 total sessions to achieve the mastery criterion.

We then conducted a reversal to baseline session with Bruce. His performance and those of his peers reverted to those during baseline. Bruce did approach the peer participants, smiled, and said some unintelligible phrases, but also laid on the ground and ran around the tables while the peer participants talked about other topics. We immediately reintroduced the intervention, and Bruce’s independent engagement and schedule completion immediately recovered. We then began fading schedule components. Bruce quickly progressed through fading, completing five fading components in six sessions. We conducted a second reversal to baseline session. Again, Bruce’s engagement returned to previous baseline levels. He spent the majority of the session running around the peer participants, exchanged silly faces with them, and laughed with them, but did not say anything intelligible or engage in any behaviors related to the restaurant scenario. We reintroduced intervention under the most advanced fading step, which was the roles of all participants prescribed by being presented in personalized bins, but without any schedule components on the menus, ticket order sheets, and tray pictures, and quickly observed stability. In other words, the play materials themselves, as well as the order in which they were displayed, evoked the play behaviors. We conducted follow-up probes at this fading step without prompting 1 and 2 weeks after the completion of the final fading phase. Bruce completed all scheduled behaviors during both follow-up probes. He and the peer participants also imitated each other using different sounding voices (e.g., robot, deep tone) throughout the session, and
frequently laughed together at these instances.

Bruce’s play assessment data are presented in Figure 5. Before baseline began, Bruce engaged in 90% parallel play with two typically developing peers. This was mainly playing with the figurine toy set at the same time as his peers. Although Bruce occasionally observed his peers’ actions, he rarely initiated any play action or statement toward his peers. After the last maintenance probe, Bruce engaged in more solitary play than any other form of play. He spent more time interacting with the doctor set compared to his peers, who spent the most time interacting with the toy figurine set. However, Bruce made more initiations to his peers during the post-assessment compared to the pre-assessment, which included approaching them with the doctor tools and attempting to use them on the peers (e.g., give his peer a shot). However, his peers rarely responded to these initiations, and Bruce would continue interacting with the doctor set.

![Figure 5. Bruce’s play assessment results.](image-url)
Tobias

Tobias’ results are depicted in the second panel of Figure 4. During baseline, Tobias frequently watched and stood near the peer participants, but rarely vocalized. He did imitate the peer participants when they retrieved food, pretended to eat the food, and at times exchanged food items, during sessions 4 and 5. He spent the majority of baseline, though, watching the peer participants interact with each other. This continued during the schedule probe.

Tobias’ engagement rapidly increased with the introduction of activity schedule teaching, but his independent schedule completion did not increase as rapidly as Bruce. Tobias frequently required prompting to attend to scripts and initiate any sequence of vocalizations and actions. After eight treatment sessions, we implemented two errorless prompting booster sessions (not graphed) before session 21, as noted by the asterisk on the graph. We observed an almost 20% increase in independent schedule completion in the session after these booster sessions, but the next two sessions resulted in independent schedule completion similar to that before the modification. Thus, we implemented a different version of this modification, teach-teach-test, as indicated by the double asterisks on the graph at session 24. Again, we observed an initial increase in independence schedule completion in session 24, but an immediate drop to pre-modification levels in session 25.

We then hypothesized that Tobias’ lower performances could be an issue of lack of reinforcement. That is, the progression and completion of the schedule, along with peer interactions, did not function as reinforcement for independent schedule completion.
To address this potential issue, we introduced programmed preferred items for independent schedule completion during session 26, denoted by the pound symbol on the graph. We introduced a variation of a fixed-interval preferred item delivery. While this lead to a moderate increase in independent schedule completion, his performance plateaued at 70% independence. Tobias also began engaging in competing behaviors that interfered with schedule completion. Specifically, he began to turn around to look at the research assistant and held his hand out, as though preparing to receive a food item. Occasionally when he did this, it led to him not attending to his peers’ behaviors, thus requiring prompting to engage in his next scheduled behavior. While it was promising to see that these food items were indeed preferred, and Tobias had contacted part of the reinforcement contingency in that completing scheduled behaviors resulted in food item delivery, it interfered with his learning overall.

We introduced a new modification involving preferred edible delivery that was not directly delivered by the research assistant at session 33, denoted by the dagger on the graph. Before the session began, we affixed a small preferred edible identified earlier as described previously directly onto the schedule after each icon denoting a scheduled behavior. We hypothesized that the edible items would serve not only as reinforcement for scheduled behavior completion, but also potentially the sight of them on the schedule could serve as a discriminative stimulus in addition to the icons signaling that reinforcement was available for engaging in scheduled behaviors.

While Tobias’ independent schedule completion initially increased to 95% within three sessions of this modification his performance later dropped back to 70%. The last
three sessions under this modification (36, 37, and 38) were all on a downward trend. We ran three sessions despite this trend because Tobias completed sessions 36 and 37 on a Monday. Historically, Tobias completed fewer schedule components independently on Mondays, possibly due to not coming in contact with the intervention over the weekends. We thus decided to run another session with this modification on a Tuesday and, when we observed a further drop in performance, and no consumption of the food items, we discontinued this modification.

We conducted the final modification, BST booster sessions, with Tobias before session 39, denoted by the yen sign on the graph. Tobias required one instruction with modeling and one model for each role from the research assistant. Tobias met this mastery criterion during the first three sessions. The entirety of these BST booster sessions took 46 min 18 s across two days. Tobias’ independent schedule completion increased to the activity schedule teaching mastery criterion in 14 sessions following these BST booster sessions. This includes all six script fading steps at sessions 40, 44, 45, 47, 50, and 51.

We then conducted a reversal to baseline conditions during session 60. Tobias and his peers immediately retrieved the menu, ticket order sheet, and tray sheet, and completed the components of the schedule. After first retrieving the ticket order sheet, Tobias said, “I got this one!” followed by him and his peers discussing which roles they would play next. They arranged amongst each other to play each of the roles in the three rotations. Tobias’ demonstrated 100% engagement during this session.

We decided to continue running sessions under baseline conditions to either
stability of high engagement, or to the point where a reintroduction of the activity schedules was needed due to engagement significantly below the 80% criterion. During session 61, the participants (including the same two peer participants as in session 60) began a rotation as in session 60, with Tobias playing the diner role. The peer participants then retrieved and delivered a food item that did not correspond with Tobias’ order as a joke, and Tobias joined in by saying, “Hey, that’s not pizza!” and laughing. During the next rotation, when Tobias played the waiter role and the peer participant retrieved the food that did not correspond with the order again, he said, “No!” and laughed again with his peers. The peer participant playing the chef then delivered the food to the diner directly, which led to each participant grabbing a different food item from the bin and running it to the dining table. This transitioned to a sort of chase game between all three participants, and ended with them singing together. Because the chase game and singing did not relate to the restaurant scenario, we ended the session after 2 min of Tobias not being engaged, resulting in 55% engagement. We ran one more session under baseline conditions, and in the middle of the first rotation, the peer participants (one of whom had participated in the previous two sessions) began laughing and jumping around the table. After waiting as the chef for approximately 1 min, Tobias joined the peer participants at the other table, where they began tossing the food items in the air. The session ended after 2 min of these behaviors, resulting in an engagement score for Tobias of 33%.

We decided to reintroduce and fade the activity schedule, but in an expedited fashion by skipping the first four steps of fading and immediately implementing the step that is immediately before baseline conditions, in which the individualized bins are
present that dictated the order of the roles, but no icons were on the actual activity schedules. We did this because we saw that Tobias and his peers were able to complete the entire play sequence appropriately once during baseline conditions, and might simply require the order of role play to be prescribed to continue to carry out the entire sequence. This appeared to be the case, as Tobias’ and his peers’ engagement and independent schedule completion increased to above 90% for the first three sessions of this expedited fading.

Following stability at the most advanced fading step before baseline conditions, we ran an additional session under baseline conditions to observe if the expedited fading lead to appropriate restaurant play without the role order cues. Again, after one rotation, Tobias’ peers began to toss the play materials in the air and lay on one of the tables. Tobias initially joined, but later said that he wanted to return to his social skills group. Tobias demonstrated engagement during 50% of the session.

Due to this initial low engagement measure during the second reversal to baseline, we reintroduced the highest fading step and observed engagement and schedule completion stability for Tobias and his peers after three sessions. We conducted a 1-week follow-up at this fading step, and observed 100% engagement without prompting. We were unable to conduct a 2-week maintenance probe due to time constraints.

Tobias’ play assessment data are presented in Figure 6. Before baseline began, Tobias engaged in 50% onlooker play and 43% parallel play with his peers across all four toys. In other words, Tobias followed his two peers to one toy, watched, them play, then silently joined playing next to them without vocalizing or otherwise interacting with
them. This continued to the remaining toy sets. After the maintenance probe, Tobias engaged in primarily (77%) associative play with one peer, while the other peer engaged with other toy sets but occasionally commented to the other peer. Nearly all the associative play between Tobias and his peer occurred with the toy figurine set. The peer typically initiated a play sequence, and Tobias often imitated and elaborated on the peer’s initiation. For example, the peer once said, “it’s nighttime, it’s time for him to go to bed” while laying the play figurine down. Tobias then said, “Yeah, he’s going to bed. Now this one is sitting down” while placing another figurine on a chair. Occasionally, Tobias completed different play actions than that described by his peer, and the peer told him that he was supposed to do something else. Tobias sometimes complied, and other times disagreed (e.g., “No, he’s doing this”). Disagreements never continued further than this, though, and this play continued for the remainder of the session.

*Figure 6.* Tobias’ play assessment results.
Hazel

Hazel’s data are depicted in the bottom panel of Figure 4. Hazel typically either sat by herself on the other side of the play area from her peers and either watched them play or interacted with the play materials by herself during baseline. During session 3, she asked the peer participants if they would like to come to her restaurant, and exchanged some food items before the peers began to play by themselves again. Neither she nor the peer participants increased their engagement or engaged in scheduled behaviors during the schedule probe.

Similar to Bruce, Hazel demonstrated a rapid increase in engagement and independent schedule completion with the introduction of activity schedule teaching. In fact, she frequently said, “I didn’t need any help!” to the research assistants after sessions in which she demonstrated particularly high independent schedule completion. She reached mastery criterion after 13 teaching sessions, with script fading implemented during sessions 19, 20, 22, 23, 24, and 25.

We conducted a reversal to baseline conditions following Hazel’s completion of activity schedule teaching during session 28. Similar to Tobias, Hazel and her peers rotated through the restaurant roles and demonstrated high levels of engagement. Hazel and her peers actually engaged in four rotations during this session, as the second rotation included the repetition of the participants’ roles, and one of the criteria for session termination was each participant playing each role once. Also similar to Tobias, we continued running sessions under baseline conditions. While Hazel retrieved the menu and walked to the diner’s table at the beginning of session 29, the peer participants laid
on the bench and pretended to sleep. Hazel initially attempted to involve the peer participants in the restaurant scenario (e.g., “We’re gonna do it like we always do. We gotta pretend.”). When the peer participants did not join, she attempted to play out the scenario by herself. The peer participants then attempted to move and step on the play materials, to which Hazel responded with trying to put the items away and scold her peers (e.g., “These are not for you to step on”). She finally sat next to the peers while they talked to each other, and continued to remind them what the classroom rules were if they were broken (e.g., “That’s gross! That’ll make your body sick!” when the peers used “bathroom words” that were not allowed to be said in class). Hazel demonstrated 50% engagement during this session.

We ran an additional session under baseline conditions to observe if Hazel’s peers would join her again in restaurant play. Although they did engage in restaurant play, during the rotation in which Hazel played the chef, instead of responding to the waiter when told the food order to retrieve, she left her table and walked to the other side of the play area, when the peer participant followed her and repeated the order, she moved to another area. This transitioned into a sort of chase game between Hazel and the peer participants, and terminated after 2 min of Hazel not engaging in interactive behaviors related to the restaurant. Although she displayed slightly higher (i.e., 64%) engagement than the previous session, it was still below the 80% criterion, and she was the participant to initially stray from the restaurant scenario. Thus, we ended the baseline phase after session 30.

Similar to Tobias, we conducted expedited fading with Hazel, and began with the
fading step closest to baseline conditions. That is, there were no programmed schedules, and the only prescribed component of the session was the order of the participants’ roles. Hazel and her peers’ engagement and independent schedule completion immediately recovered to over 90% during the three initial fading sessions. During an additional reversal to baseline during session 34, Hazel and her peers played through one rotation, then sat down together, with Hazel saying, “Now we wait until the teachers tell us what to do.” After some seconds of sitting, the two peer participants began to play through a sort of restaurant scenario. Hazel sat next to them, but instead of participating, she watched them play through her hands shaped like glasses or binoculars. The session ended after Hazel did not engage in interactive behaviors for 2 min, resulting in 47% engagement. Because this was lower than her engagement measures during the first reversal to baseline sessions, we re-implemented sessions at the previous fading step, and immediately observed engagement recovery and high independent schedule completion. Hazel continued to demonstrate 100% engagement and independent schedule completion during the 1- and 2-week follow-up probes at this fading step.

Hazel’s play assessment data are displayed in Figure 7. During the pre-assessment session, Hazel spent the majority of the session observing her peers from the opposite side of the common area, but rarely engaged in play on her own. During the post-assessment session, she spent the majority of the session engaging in solitary play, that is, playing with a different toy in a different area than her peers. However, she frequently looked toward her peers when playing when they made statements to each other. When
she was both engaging in solitary play and observing her peers interacting with other toys, we scored her play as solitary.

Peer Participants

Figure 8 shows engagement and schedule completion data sets for the peer participants. Each panel represents the target participant with whom the peer participants played, and each data point is the average of the two peer participants who participated in that session.

During all baseline sessions with all peer participants, regardless of the target participant, the peer participants engaged in some sort of play or talk about something other than the restaurant scenario for the majority of the session. This included acting out different play scenarios (e.g., house), talking about something they had played with...
Figure 8. Percent of average independent engagement and schedule completion for Bruce’s, Tobias’, and Hazel’s peers. * denotes errorless booster sessions, ** denotes the teach-teach-test sequence, # denotes food item delivery from the research assistant, † denotes food items within the schedule, and ¥ denotes BST booster sessions. Arrows denote script fading. Numbers 1, 2, 3, 4, and 5 denote schedule fading.
previously, and using the play materials for other purposes unrelated to the restaurant scenario (e.g., using the menu and ticket order sheets as skates). This is in comparison to the target participants, who either played by themselves both related and unrelated to the restaurant scenario, or observed the peer participants play or talk.

**Bruce’s Group**

Bruce’s group’s data are depicted in the top panel of Figure 8. Bruce peers followed a similar pattern to Bruce during baseline. They engaged in the restaurant scenario with each other the most during the first session, although it was during less than half of the session. Their engagement quickly decreased to near-zero levels. Upon implementation of the intervention, their engagement and independent schedule completion increased to over 80% during the first teaching session. Bruce’s peers performed more variably throughout the teaching phase compared to Bruce, including a general downward trend at the end of the phase. This is because during some sessions, one of the two peers required much more prompting than the other, leading to a lower average performance in both engagement and independent schedule completion.

Bruce’s peers’ performances more closely mirrored Bruce’s performance in all phases following the original teaching phase. Their engagement reverted to baseline levels during the first reversal to baseline, followed by an immediate increase in engagement and independent schedule completion with the reintroduction of the intervention, which remained high during schedule fading. Engagement again dropped to initial baseline levels during the second reversal to baseline, and quickly recovered again with the reimplementation of the activity schedule at the highest fading step. These
performances maintained during 1- and 2-week follow-up probes.

**Tobias’ Group**

Tobias’ group’s data are depicted in the second panel of Figure 8. Tobias’ peers’ engagement levels mirrored Tobias’ during baseline. Also similar to Tobias, his peers’ engagement and independent schedule completion increased at a slower rate than Bruce’s peers. However, after three teaching sessions, their performances rose to above 70%. Moreover, their independent schedule completion was over 90% from sessions 33 to 53, when Tobias continued to require procedural modifications. During the first reversal to baseline, Tobias’ peers initially completed all role rotations in the first session, and spent more time engaging in play unrelated to the restaurant scenario in the following two sessions, resulting in a downward trend in engagement similar to Tobias. Also similar to Tobias, their engagement and independent schedule completion quickly increased to criterion at the highest fading step during expedited schedule fading, and again after displaying low engagement during a second reversal to baseline. Finally, Tobias’ peers’ engagement and independent schedule completion remained high during a 1-week follow-up.

**Hazel’s Group**

Hazel’s group’s data are depicted in the bottom panel of Figure 8. Hazel’s peers engaged in the restaurant scenario in no more than 10% of each baseline session. Similar to Hazel, their engagement and independent schedule completion quickly increased during the teaching phase. Similar to Bruce’s peers’, Hazel’s peers’ performances were
more variable during this phase, due to one of the peers requiring much more prompting than the other in some sessions. Although they participated in all roles, Hazel’s peers’ engagement was slightly lower than Hazel’s during the first session during the first reversal to baseline, followed by 0% engagement in the next session due to the peers engaging in play unrelated to the restaurant scenario. Following a third session with engagement measures below criterion, their performances quickly increased during expedited schedule fading. Their engagement dropped slightly again during the second reversal to baseline probe, followed by quick recovery and maintenance during the reimplementation of the highest fading step and follow-up probes, mirroring Hazel’s performance.

Script Fading

Target participants’ unscripted play statements and actions completed at least twice throughout the study are displayed in Table 6. Bruce engaged in the most unscripted behaviors throughout the study. This included both emitting scripted statements originally taught for one role while playing other roles at contextually appropriate times (e.g., saying “coming right up” as the waiter, when it was originally taught to be used as the chef), and emitting novel yet contextually appropriate statements (e.g., adding “That’s it” before stating “I’m done, bye” as the diner). He also emitted contextually appropriate sounds (e.g., eating sounds and hiccups as the diner), and added “please” or the peer’s name to the end of vocalizations. Other novel and contextually appropriate statements he emitted once included “Excuse me” when he bumped into a
Table 6

*Unscripted Play Behaviors Completed More Than Once*

<table>
<thead>
<tr>
<th>Unscripted behavior</th>
<th>Number of times exhibited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruce</td>
<td></td>
</tr>
<tr>
<td>“That’s it, I’m done, bye”</td>
<td>23</td>
</tr>
<tr>
<td>Made eating sounds</td>
<td>17</td>
</tr>
<tr>
<td>Pushed plate toward the waiter as the diner</td>
<td>16</td>
</tr>
<tr>
<td>Pushed plate toward the waiter as the chef</td>
<td>14</td>
</tr>
<tr>
<td>“I want (food), please”</td>
<td>4</td>
</tr>
<tr>
<td>Changed food order as diner</td>
<td>4</td>
</tr>
<tr>
<td>“Coming right up” as waiter</td>
<td>4</td>
</tr>
<tr>
<td>Added peer’s name at the end of a vocalization</td>
<td>2</td>
</tr>
<tr>
<td>“You’re welcome”</td>
<td>2</td>
</tr>
<tr>
<td>“That’s it, good job, bye”</td>
<td>2</td>
</tr>
<tr>
<td>Tobias</td>
<td></td>
</tr>
<tr>
<td>“I want (food)” as waiter</td>
<td>23</td>
</tr>
<tr>
<td>“See you later” as diner</td>
<td>10</td>
</tr>
<tr>
<td>Made eating sounds</td>
<td>5</td>
</tr>
<tr>
<td>“Here you go” as chef</td>
<td>4</td>
</tr>
<tr>
<td>“Goodbye”</td>
<td>4</td>
</tr>
<tr>
<td>Pushed plate toward the diner as the waiter</td>
<td>4</td>
</tr>
<tr>
<td>Pushed plate toward the waiter as the chef</td>
<td>2</td>
</tr>
<tr>
<td>“You’re welcome”</td>
<td>2</td>
</tr>
<tr>
<td>Hazel</td>
<td></td>
</tr>
<tr>
<td>Made eating sounds</td>
<td>7</td>
</tr>
<tr>
<td>Pushed plate toward the waiter as the diner</td>
<td>6</td>
</tr>
<tr>
<td>Pushed plate toward the waiter as the chef</td>
<td>3</td>
</tr>
<tr>
<td>Repeated “See you later”</td>
<td>3</td>
</tr>
<tr>
<td>“You’re welcome”</td>
<td>3</td>
</tr>
<tr>
<td>Repeated “What do you want?” after no response</td>
<td>2</td>
</tr>
</tbody>
</table>

peer when walking to home base, and “Oh, hi” when the waiter approached him when playing the chef. Bruce also engaged in unscripted additional play actions, including pushing the plate of food toward the waiter when playing the diner and chef when the
waiter did not pick up the plate right away.

Tobias also engaged in unscripted behaviors, although less so than Bruce. The majority of Tobias’ unscripted behaviors were emitting scripted phrases originally taught for one role in other roles at contextually appropriate times (e.g., saying, “Here you go” as the chef). Like Bruce, Tobias said, “You’re welcome” as the waiter after being thanked by the diner, and made eating sounds when pretending to eat the food as the diner. Although he never pushed his finished plate toward the waiter when playing the role of the diner, Tobias occasionally pushed the plate toward the diner when playing the role of the waiter after he delivered the food if the diner did not take the food right away. Finally, he emitted some novel phrases only once during the intervention, including pointing to the food the chef was looking for and saying, “There’s the chicken” as the waiter, and saying, “Fresh pizza!” as the chef.

Hazel engaged in the fewest unscripted behaviors, although she engaged in both unscripted vocalizations and other actions. Similar to Bruce and Tobias, she made eating sounds as the diner, and said, “You’re welcome” after the diner thanked her for the food. Also similar to the other target participants, Hazel pushed the plate of food toward the waiter when playing the diner and chef when the waiter did not immediately pick up the plate. Finally, she occasionally repeated scripts if the peer participants did not initially respond to her first emission of the scripts.

The peer participants typically did not vary or emit novel vocalizations during activity schedule teaching and fading phases, although they engaged in far more vocalizations during baseline sessions. Common unscripted behavior included saying
“coming right up” as the waiter, adding the words “please” and the peers’ names to the ends of vocalizations, and saying, “you’re welcome” after the diner thanked them for the food. Additionally, the peers occasionally commented to each other about how to say the scripts (e.g., “Let’s say it in a quiet voice this time”) and which scripts were assigned to whom (e.g., “No, you don’t say that, I do.”).
CHAPTER V
DISCUSSION

This study examined the utility of activity schedules with embedded scripts and prompting to increase sociodramatic play, an understudied area of play in activity schedule literature, between young children with ASD and their typically developing peers. We observed a dramatic increase in engagement with the introduction of the intervention compared to baseline in all participants. We also observed that the intervention lead to a rapid increase of independent schedule completion for two participants. Bruce and Hazel required fewer than 20 teaching sessions to reach our initial teaching criterion, including completing six script fading steps. One participant, Tobias, reached the criterion with procedural modifications. In addition, similar to Akers et al. (2018), we faded the schedules to the point of all scheduled play behaviors being removed from the schedule, and only the order of the roles was programmed. In other words, all participants’ play behaviors were controlled only by the play materials and the participants’ presence. Finally, we continued to observe appropriate sociodramatic play between the target and peer participants at this advanced fading stage and without prompts during 1-week follow-ups for all three participants, and 2-week follow-ups for Bruce and Hazel.

A limitation to our findings is that, while Tobias’ engagement rapidly increased to over 80% with the introduction of activity schedule teaching, and he required several modifications to reach the independent schedule completion mastery criterion. Thus, we cannot say that activity schedules with embedded scripts and prompting alone lead to our criterion of responding for all three participants. Further, we cannot say for certain if it
was one of the modifications, or some sort of combination and history with the modifications that lead to Tobias’ schedule completion increase to criterion. Although we did discontinue the previous modification when we began another (e.g., we discontinued placing food items on the physical schedule when we conducted BST booster sessions), it is still possible that the history of all the modifications lead to a greater increase than if we had completed the BST booster sessions alone. On the other hand, it may have been possible that the BST modification alone could have led to Tobias’ schedule completion to criterion had we started with this modification first. We did not do this because the BST sessions changed the fundamental nature of teaching activity schedules, that is, more than graduate guidance prompting. The BST sessions involved vocal instructions, modeling, and vocal feedback, in addition to graduated guidance prompting when needed during practice. The BST sessions were also required the most additional time, although it totaled less than an hour. Nevertheless, these modifications weaken the robustness of our findings.

This is the first study using activity schedules, and one of the only studies in general, to teach sociodramatic play to children with ASD. We taught preschoolers with autism to play three distinctive roles within a common sociodramatic play scenario (i.e., restaurant). This is important because we taught the target participants to engage in a form of perspective taking, in that they were taught to engage in behaviors that a person in that role would typically engage in, and these behaviors generally came under the control of the roles themselves (e.g., a waiter asking a diner what he or she would like to eat, rather than a diner asking a waiter what he or she would like to eat). We did this for
three distinctive roles. This speaks to the generality of behaviors the target participants engaged in within the same play scenario. Further, due to the pool of peer participants who participated, the target participants engaged in sociodramatic play with a variety of peers. This is also a key finding, as preschoolers are often expected to play with a variety of peers, including family members, classmates, novel peers at a neighborhood playground, etc. However, we only taught play within one sociodramatic play scenario. Further, we did not examine how teaching sociodramatic play in one scenario affected behavior in other sociodramatic play scenarios (e.g., playing firefighters, car mechanics, etc.). Future research could examine the generality of sociodramatic play to these different scenarios when taught several general interactive play behaviors. For example, researchers could teach the vocal responses “here you go” and “what do you need?” and observe if they generalize to contextually appropriate situations in these different play scenarios. In addition, researchers could examine to what extent these play behaviors would generalize to the same play scenarios carried out with novel peers. In other words, researchers could examine if the play behaviors taught would be socially acceptable to other peers (i.e., would lead to the peers joining in play) who did not contact training.

Engagement

This is the first activity schedule study of which we are aware to observe high rates of appropriate responding during at least one reversal to baseline session. Both Tobias and Hazel and their peers engaged in over 80% engagement during the first session of the initial reversal to baseline session. During both these sessions, the target
and peer participants engaged in the scheduled role-play rotations. During later baseline sessions, though, this shifted from appropriate restaurant play engagement to other play such as chasing games.

The use of engagement as the primary dependent variable in the current study is a strength for capturing more complex play, including sociodramatic play. Similar to Betz et al. (2008), who also measured appropriate play using momentary time sampling, we were able to count appropriate play that we did not specifically program within the intervention as independent engagement in appropriate sociodramatic play. This is critical for complex, dynamic play, as this sort of play encompasses exceedingly more play actions than what we programmed within the activity schedule. While we used independent schedule completion measures to determine criterion for progressing through teaching and fading phases, we did not use these when determining progression during reversal to baseline sessions. Had we used independent schedule completion to make these decisions, our data would have indicated that Tobias and Hazel engaged in sociodramatic play only during the first session of the first reversal to baseline phases. However, because we utilized the engagement measure during this phase, we observed a more complete picture of the participants’ sociodramatic play behaviors. It was still critical to measure independent schedule completion, though, to observe if our teaching procedures were effective. This measure led us to observe that Tobias did not reliably initiate play sequences, especially when it involved vocally initiating or responding to his peers. This measure also indicated which procedural modifications resulted in more independent initiation of play sequences for Tobias.
A possible limitation to this study is how we defined engagement specifically involving the restaurant scenario. During baseline, the peer participants frequently moved away from the restaurant scenario while continuing to play appropriately together. For example, the two peer participants once climbed under a table and pretended they were in different settings. While we did not count this as engagement, as it was not relevant to the restaurant scenario, it is common appropriate and spontaneous peer play. In addition, during one of the reversal to baseline sessions, Hazel attempted to play restaurant with the peer participants, but the peer participants played something else together. Instead of joining them, Hazel interacted with the play materials by herself. Paradoxically, Hazel’s play behaviors during this time appeared the least natural of the reversal to baseline sessions. During the next baseline session, the peer participants played restaurant, and Hazel responded to their vocalizations to her as the chef by walking away from them, shifting the group’s behavior to a sort of chase game. While they were all laughing and interacting with each other, their behavior was not measured as engaged, as the chasing game did not relate to the restaurant scenario. Later, during a reversal to baseline session with Tobias, the play shifted from the restaurant scenario to a chase game. While at times this behavior was inappropriate (e.g., at one point, Tobias and the peer participants threw the food items at each other), it overall appeared to be appropriate preschooler group play. However, because it was not related to the restaurant scenario, their behavior in those moments did not count as engaged. Future research should examine more inclusive ways of measuring engagement with peers to include these forms of play. This could also involve having two engagement measures: one regarding the specific play scenario, and
another involving more spontaneous play unrelated to the scenario. As one of the defining characteristics of ASD is rigid, repetitive behaviors and interests, and a common issue in teaching individuals with ASD is teaching variation and spontaneity, it appears necessary to include and promote these variations of play whenever possible.

**Script Fading**

Although we taught only one script for each interaction, all three target participants emitted novel yet contextual additional interactive behaviors during teaching and fading. This is similar to the findings by Akers et al. (2018), although they taught multiple exemplars of each script to use during hide-and-seek. In addition, the target and peer participants engaged in several novel interactions with each other during reversals to baseline conditions. This involved joking about how they emitted scripts (i.e., Bruce and his peers changing their tones of voices and laughing), jokingly doing the opposite of what was requested (i.e., Tobias and his peers retrieving the incorrect food items), and disagreeing about how to play (i.e., Hazel and her peers). All these interactions varied, and all are developmentally appropriate for preschool-aged children. Further, the variations of these play behaviors expanded on the taught behaviors more than those observed in the Akers et al. (2018) study due to the nature of the play scenarios. During hide-and-seek, the participants could vary their behaviors, but they still corresponded to the more stringent rules of hide-and-seek. During a sociodramatic play scenario, many different interactions could occur, as long as they were somehow related to the relevant scenario. Thus, there is more potential for unscripted yet appropriate behaviors.
An interesting component of the scripts that led to varied appropriate responding from both the target and peer participants was the pictures of various food items at the end of the diner script “I want (item)” and waiter script “One (item).” We included three food items (chicken, spaghetti, and pizza) as part of the play materials, and randomly programmed the full scripts to include a different food item each session. When we initially faded the scripts, this included fading the picture of the different foods. We observed all participants to use sentences with the three foods. During some sessions, Bruce and Tobias may have been observationally learning, in that they often ordered the same items as peers earlier in the session. Other times, Bruce said one order, paused, then changed his food order as a diner, which is a natural occurrence in typical play. Hazel appeared to differ her order from those of her peers when she was the last participant to play the role of diner. Only twice did participants order an item not included in the play materials, and both these times it was a peer participant who made up a word. The peer participant was then prompted to say one of the three foods on both occasions. Research has shown the use of multiple exemplars during teaching can lead to appropriate varied responding in children with ASD (Marzullo-Kerth, Reeve, & Reeve, 2011). It is possible that teaching the multiple exemplars of food requests led to appropriate varied vocal responding. Utilizing pictures was a relatively easy way to use multiple exemplars without pretraining a reading response. This is advantageous for programming for individuals who do not read or discriminate different texts with color cues.

A possibly more interesting component of the pictured foods in the scripts was appropriate listener responding when playing the waiter and chef roles when the scripts
were faded. After the pictures of the food were faded, the waiter must repeat the diner’s order to the chef without that specific visual discriminative stimulus. Additionally, the chef must retrieve and plate the corresponding food. We observed all participants almost always repeated the correct food when playing the waiter after this portion of the scripts was faded. Moreover, the participants almost never made an error when retrieving the corresponding food as when playing the role of the chef. There was an icon on the chef’s schedule that included the three food items, and research assistants initially prompted the participants to touch the corresponding food’s picture, then retrieve the corresponding food from the bin. What we observed, however, is that both target and peer participants frequently skipped this step and immediately retrieved the corresponding food. This was not counted against them, as this picture and step were programmed into the schedule to assist in facilitating correct food retrieval. A generic food or plate picture, or potentially no additional picture cue, may have sufficed to promote correct food retrieval. It regardless made the process of fading that component of the schedule easily completed during the schedule fading phase.

There was an instance during activity schedule teaching in which peer participants retrieved and delivered a food item that did not correspond to what Tobias ordered. When Tobias received the food, he paused, said, “Wait,” looked at the peer participant, and then repeated his original food order. The peer participants then retrieved the corresponding food item. This was an interaction that is a common occurrence during peer play, and speaks to Tobias’ congruity in responding and self-advocacy with his peers. During a later reversal to baseline session, all participants joked about retrieving a food item that
did not correspond with what the diner ordered. During each rotation, the participants playing the waiter and chef whispered to each other to retrieve a different food and, when they delivered it, the participant playing the diner said “No!” and all the participants laughed. This continued during each rotation. Both of these incidents are important because children behaving in opposition to what their peers expect is a common occurrence that frequently leads to additional amiable interactions, yet researchers and interventionists would typically not program for it. This is an area that can be examined further in future research.

Similar to Akers et al. (2018), we found that both target and peer participants continued to engage in script attending behavior (i.e., pointing, looking at the sheets) after the scripts were faded. One peer participant even shifted her pointing behavior to touching the schedule with her elbow when repeating scripts after we faded the scripts. Although peer participants also engaged in this responding, it overall may appear odd to an individual watching who was not aware of the original teaching procedures. Future researchers should investigate other ways of teaching how to attend to scripts.

Another limitation regarding script fading was our criterion to fade. We counted both initially attending to the script by looking or pointing to the script, in addition to reading the script, in our script reading independence score. Sometimes participants, particularly Tobias, required prompting to attend to the script, but he correctly read the script after being prompted. Had we included only script reading as opposed to script attending and reading for our script scores, we may have been able to fade the scripts quicker. However, we cannot be certain if Tobias would respond to the naturally
occurring events. In other words, even with the scripts faded using this different calculation, Tobias may have still required prompting to emit the scripts. Future research could investigate different criteria for script fading and observe if this leads to quicker acquisition of independent emitted scripts.

**Schedule Fading**

Another new finding in activity schedule research is that we were able to complete expedited fading with Tobias and Hazel, as we observed some levels of engagement during reversal to baseline sessions. Essentially, these target participants only required one fading step to go from the most intrusive visual cues on the schedule, aside from scripts, to the least intrusive visual cues before baseline conditions. This shows that activity schedule fading could be a quick and beneficial practice for interventionists when teaching children with ASD to engage in play behaviors. We did not attempt this expedited fading with Bruce. Because he engaged in little appropriate sociodramatic play during the reversal to baseline probe, we implemented the five-step schedule fading process. However, it is possible that Bruce could have performed at similar levels as Tobias and Hazel had we conducted expedited fading with him as well. We cannot say for certain, though, which is a potential limitation of the study.

A potential reason why participants’ engagement dropped between the final fading step and reversal to baseline sessions is the way we created the participants’ home base and the fading steps. From the final fading step to reversal to baseline, we removed the three copies of each schedule, individualized bins, and trays in which to put the
completed schedules. This may have been too much of a change compared to other fading steps. Future researchers could investigate if different schedule arrangements could lead to increased appropriate play behaviors when all components of the schedules are faded. This could include more individualized schedules for each participant rather than a home base that all participants are required to go to in order to retrieve their next schedule. A home base may be optimal for certain scenarios, such as hide-and-seek, as demonstrated by Akers et al. (in press), but it is more common for children to go directly between different areas of a pretend play center when switching roles than going to a home base first. Further, the participants could be taught specific behaviors of organizing the play scenario and deciding who would play each role. For example, all the play materials could be in one location of the play area, and the participants could play whichever role corresponded to the play materials they retrieved and set up to begin the play scenario. After one round of the game play, the participants could rotate roles based on the location where they physically completed the round. For example, the participant playing the waiter role could rotate to playing the chef role, as he or she would end the round putting the food back into the bin near the chef. The participants could also be taught a general rule of asking to play certain roles, which would more closely resemble typical sociodramatic play.

Peer Participants

While target and peer participants demonstrated low rates of engagement during baseline, the behaviors between these two participant groups differed. During baseline,
the target participants typically watched the peer participants or handled the play materials by themselves, while the peer participants often interacted with each other, although the subject of their interactions often drifted from the restaurant scenario to other scenarios, such as building with the materials, tossing the materials to each other, and talking about other toys or events at their preschool. This was especially the case during later baseline sessions, possibly because they were exposed to a history of no consequences from the researchers for engaging in activities that were different than the restaurant scenario. Once we introduced the intervention, though, both target and peer participants’ engagement rapidly increased to above 80%, including staying on the restaurant scenario topic. The peer participants’ engagement included a substantial increase in overall interaction with the target participants. These increased interactions with target participants continued to some extent in the reversal to baseline phases for Tobias and Hazel, and continued for all participants during schedule fading and follow-up probes. This is a promising finding that activity schedules could increase overall peer initiations to children with ASD. The peer participants also anecdotally showed interested in the activity schedules, and even discussed with each other their roles (e.g., saying “Wait, I say that!”).

Due to unexpected peer participant behavior during baseline and some reversal to baseline conditions (i.e., playing with each other, but not necessarily on topic), future researchers should examine further how sociodramatic play appears with typically developing peers before intervening on the sociodramatic play of peers with ASD. The researchers could then use this sample when programming play behaviors and
determining mastery for children with ASD. For example, researchers could observe three peer participants playing together for a given amount of time, and transcribe their play behaviors. The researchers could then program play behaviors related to the specific play scenario, general play behaviors not necessarily related to the play scenario, and possibly general imitation behaviors for the target participants to perform with the peer participants. This may lead to more natural appearing, flexible general play, which could potentially generalize to other scenarios. Our strict programming related to the restaurant scenario alone may have been the reason the Bruce and Hazel did not show large gains in more social play types during the social play post-assessments.

Similar to Akers et al. (2018), we taught peer participants in the same way that we taught two of the three target participants, that is, with activity schedules and graduated guidance prompting. It is likely that the peer participants could already engage in general role-play behaviors, but they were not at strength during baseline sessions. Upon introducing the intervention, we observed a marked increase in sociodramatic play engagement in the peer participants. This replicates the findings of Akers et al. (2018) that activity schedule teaching using graduated guidance prompting can be a universal design for preschool aged children in teaching play. Future research could examine the extent to which this teaching procedure can increase other behaviors for this population, thus potentially decreasing total teaching time to teach children with ASD and their typically developing peers. Further, although the peer participants’ volunteerism to participate in each session could indicate acceptable social validity of the procedures, we did not take formal social validity measures. Future research should also formally access
the social validity of the procedures in a modified fashion with peer participants, as well as formally assess the social validity with participants’ parents and teachers.

An interesting finding is that, overall, peer participants did not vary their scripted behaviors during treatment and fading, but greatly varied their behavior during reversal to baseline conditions. It is possible that the peer participants were more rule governed with respect to any visual aids that dictated the play sequence. Future research could additionally look into other ways to promote variability in peers’ play during intervention sessions, so there is not as much of a contrast between intervention and reversal to baseline sessions.

**Future Directions**

The current study contributed to the literature on the use of cooperative activity schedules to promote play between children with ASD and their typically developing peers. Teaching this particular kind of play is an area that is not rigorously studied within the field of Applied Behavior Analysis, although it is a socially significant area to be addressed. Future research should examine intervention modifications described earlier, as well as other interventions to increase sociodramatic play between children with ASD and their typically developing peers. For example, further examinations of video modeling are warranted to compare the effectiveness, efficiency, and generality of teaching these play skills compared to using activity schedules. In addition, as BST was a component of the intervention that increased Tobias’ performance, investigating a modified BST for young children as the sole intervention for increasing sociodramatic
play in children with ASD is warranted. Not only could this intervention be tested with children with ASD, the intervention could be tested alone with peer participants on how to engage in complex play with children with ASD. This could be particularly beneficial, as some typically developing peers may be unsure or afraid of how to interact with children with ASD. Further, components of multiple interventions, such as video-enhanced activity schedules, could be investigated to utilize the best components of each intervention.

This intervention is likely beneficial to a select group of individuals. While we analyzed data regarding the target participants’ play skill levels using the VB-MAPP and a modified play assessment, and the target participants were fairly similar in skill levels, there appeared to be prerequisites that were not adequately assessed. It is possible that the intervention was not the best fit for Tobias due to issues with attending to relevant stimuli, particularly social interactions. Also, other children with ASD who did not engage in our predetermined perquisites, for example, never being exposed to activity schedule interventions, could have also benefitted from the intervention. More advanced play assessments should be investigated to determine which interventions would be best fit for individuals who demonstrate deficits in social play with typically developing peers. These assessments, combined with additional interventions for increasing social play between children with ASD and their typically developing peers, could lead to a critical improvement in behavioral intervention for children with ASD.
REFERENCES


APPENDICES
Appendix A

Engagement Data Sheet (Baseline and Intervention)
Group Engagement

At the moment of each designated time, mark if the participant is engaged, prompted, or unengaged.

*Note: As soon as the research assistant says, “Go play,” the session has officially started. It may be easier to write this time from the camera next to the “:00” so you know when to collect the participant’s behavior each minute. Add 20s and 40s, respectively, to find out the other two times per minute to check the participant’s behavior.

**Engaged:** Engaging in interactive play vocalizations or actions, or completing behaviors that are part of the schedule (including waiting appropriately for their turn when the other two participants are interacting).

**Prompted:** When a research assistant has his or her hands on the participant, or is vocally prompting the participant according to script protocol.

**Unengaged:** Engaging in behaviors other than those specified for engagement or prompting.

<table>
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<th>:00</th>
<th>:20</th>
<th>:40</th>
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<td>E P U</td>
<td>E P U</td>
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<td>1</td>
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<td>E P U</td>
<td>E P U</td>
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<td>E P U</td>
<td>E P U</td>
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<td>E P U</td>
<td>E P U</td>
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<table>
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<th>Percent Engaged</th>
<th>Percent Prompted</th>
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</thead>
<tbody>
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<td>/ =</td>
<td>/ =</td>
<td>/ =</td>
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Appendix B

Schedule Data Sheet (Intervention)
Dissertation Intervention Data Sheet

<table>
<thead>
<tr>
<th>Participant:</th>
<th>Session Start Time:</th>
<th>Script Fading Step:</th>
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</thead>
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<tr>
<td>Session:</td>
<td>Session End Time:</td>
<td>Schedule Fading Step:</td>
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<tr>
<td>Date:</td>
<td>Total Session Time:</td>
<td>Percent Independent Overall:</td>
</tr>
<tr>
<td>Peers:</td>
<td>Rate Per Min Interactive Play Vocalization:</td>
<td>Percent independent Script:</td>
</tr>
<tr>
<td>Data Collector:</td>
<td>Rate Per Min Interactive Play Action:</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Time Stamp:</th>
<th>Waiter Schedule</th>
<th>Diner:</th>
<th>Chef:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Goes to home base</td>
<td>Attends to picture</td>
<td>Gets waiter schedule</td>
</tr>
<tr>
<td></td>
<td>Attends to script</td>
<td>Tells chef food order(^V) Said:</td>
<td>Takes food from chef(^A)</td>
</tr>
<tr>
<td></td>
<td>Says goodbye to diner(^V) Said:</td>
<td>Attends to arrow icon</td>
<td>Takes food from diner(^A)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time Stamp:</th>
<th>Diner Schedule</th>
<th>Waiter:</th>
<th>Chef:</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Goes to home base</td>
<td>Attends to picture</td>
<td>Gets diner schedule</td>
</tr>
<tr>
<td></td>
<td>Attends to eat icon</td>
<td>Pretends to eat food(^A)</td>
<td>Attends to script</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Time Stamp:</th>
<th>Chef Schedule</th>
<th>Waiter:</th>
<th>Diner:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Goes to home base</td>
<td>Attends to picture</td>
<td>Gets chef schedule</td>
</tr>
<tr>
<td>Plates food on table(^A)</td>
<td>Attends to script</td>
<td>Tells waiter food is ready(^V) Said:</td>
<td>Removes chef hat</td>
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</table>
Appendix C

Treatment Fidelity Data Sheet
Treatment Integrity Data Sheet

Data Collector: ___________ Participant: ________________
Researcher: _______________
Session Date: _____________ Session Type: _____________ Session Number: ______

Directions: Mark whether the researcher correctly completed each component.

1. Activity schedules were present (or not present during baseline and the no schedule probe).
   Yes  No  N/A

2. The activity schedules were correctly arranged (i.e., the scripts and role order were randomly assigned, the scripts and activity schedules were at the correct fading level).
   Yes  No  N/A

3. The researcher told the participants to “play restaurant” at the beginning of the session.
   Yes  No  N/A

4. The researcher provided physical prompts from behind the participant.
   Yes  No  N/A

5. The researcher followed the prompting procedure for scripts.
   Yes  No  N/A

6. The researcher followed the prompting procedure for scripts.
   Yes  No  N/A

7. The researcher did not provide praise during the session.
   Yes  No  N/A

Treatment Integrity Percentage: Total (# of yeses/7) = ___/___ *100 = ____%
Appendix D

Transcription Data Sheet (Baseline)
Baseline Data Sheet Primary / IOA (circle)

<table>
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<th>Participant:</th>
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</thead>
<tbody>
<tr>
<td>Session:</td>
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<tr>
<td>Date:</td>
<td>Total Session Time:</td>
</tr>
<tr>
<td>Peers:</td>
<td>Rate Per Min Interactive Play Vocalization:</td>
</tr>
<tr>
<td>Data Collector:</td>
<td>Rate Per Min Interactive Play Action:</td>
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</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Interactive Play Vocalization</th>
<th>To Whom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Interactive Play Action</td>
<td>To/From Whom</td>
</tr>
</tbody>
</table>


CURRICULUM VITAE

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EDUCATION

Ph.D., Utah State University, Logan, UT,
  • Disability Disciplines (Applied Behavior Analysis specialization)
  • Advisor: Thomas S. Higbee
  • Dissertation: Promoting sociodramatic play between children with autism and their typically developing peers using activity schedules
M.A., California State University, Fresno, 2012
  • Psychology (Applied Behavior Analysis specialization)
  • Advisor: Marianne Jackson
  • Thesis: The effects of goal setting, public posting and verbal feedback on the on-court behavior of high school tennis players
B.A., California State University, Fresno, 2009
  • Psychology (Applied Behavior Analysis specialization)

PROFESSIONAL CERTIFICATION AND TRAINING

Board Certified Behavior Analyst – Certification number: 1-12-12650
Utah Licensed Behavior Analyst – Reference number: 9578162-2506

PROFESSIONAL MEMBERSHIPS

Association of Behavior Analysis (ABAI)
Utah Association of Behavior Analysis (UtABA)

LEADERSHIP POSITIONS

Utah Association of Behavior Analysis
  • Student Representative (August 2017 – July 2018)
Disability Disciplines Doctoral Program, Utah State University
  • Doctoral Student Representative (August 2017 – August 2017)
SCHOLARSHIPS, HONORS, AND AWARDS

Utah State University

- Fredrick Q. Lawson Fellowship (Spring 2017)

California State University, Fresno

- Edward V. Tenney Award Scholarship (Spring 2009)
- Louise B. Wilson Scholarship (Spring 2005)
- California Governor’s Scholarship (Fall 2005)

TEACHING EXPERIENCE

Utah State University

- Teaching Assistant: Graduate Level course in Applied Behavior Analysis (Fall 2016)
- Co-instructor: Undergraduate Level course in Special Education (Fall 2015)
- Teaching Assistant: Undergraduate Level course in Special Education (Spring 2015)
- Teaching Assistant: Graduate Level course in Applied Behavior Analysis (Fall 2014)

California State University, Fresno

- Teaching Assistant: Graduate Level course in Applied Behavior Analysis (Fall 2012)

BOOK CHAPTERS


PUBLICATIONS

PUBLICATIONS (UNDER REVIEW)


PUBLICATIONS (IN PREPARATION)


INVITED PRESENTATIONS


PRESENTATIONS (CONFERENCES)

the Utah Multi-Tiered System of Supports Conference, Salt Lake City, UT.


**PRESENTATIONS (COMMUNITY)**


**PRESENTATIONS (INTERNATIONAL GUESTS)**


**PRESENTATIONS (GUEST LECTURES)**


• Pellegrino, A.J., & Reinert, K.S. (October, 2017). *Understanding Behavior: General strategies to promote success.* Guest two-part lecture for Master’s level Speech and Language Pathology students and faculty. Utah State University, Logan, UT.


lecture for undergraduate special education students. Utah State University, Logan UT.


**PROFESSIONAL EXPERIENCE**

**Cache County School District (August 2017 – June 2018)** Consultant

- Introduced and supervise two kindergarten – second grade hybrid model classrooms providing one-on-one, small and large group instruction for children with developmental disabilities

- Train teachers and paraprofessionals in to implement discrete trial instruction and small group instruction

- Program curricula

- Train teachers to conduct the VB-MAPP and match programming curricula to results

- Develop behavior plans

**Nebo School District (July 2016 – July 2017)** Consultant

- Introduced and supervised a second – fifth grade hybrid model classroom providing one-on-one, small and large group instruction for children with Autism Spectrum Disorders

- Supervised a kindergarten – first grade hybrid model classroom providing one-on-one, small and large group instruction for children with Autism Spectrum Disorders

- Supervised a preschool autism model classroom providing one-on-one instruction

- Trained teachers and paraprofessionals in to implement discrete trial instruction and small group instruction

- Programmed curricula

- Trained teachers to conduct the VB-MAPP and match programming curricula to results

- Developed behavior plans

**Granite School District (July 2015 – July 2016)** Consultant

- Introduced and supervised a fourth – sixth grade hybrid model classroom providing one-on-one, small and large group instruction for children with Autism Spectrum Disorders

- Supervised two hybrid model classrooms (kindergarten and first – third grade) providing one-on-one, small and large group instruction for children with Autism Spectrum Disorders
Spectrum Disorders
- Supervised two preschool autism model classrooms providing one-on-one instruction
- Trained teachers and paraprofessionals in to implement discrete trial instruction and small group instruction
- Programmed curricula
- Developed behavior plans

- Managed and monitored one-on-one clients’ and social skills groups clients’ cases
- Programmed curricula
- Developed behavior plans
- Trained and supervised instructors
- Conducted parent trainings and observations

Futures Behavior Therapy Center (October 2012 – June 2014) Behavior Analyst
- Managed and monitor one-on-one, inclusion kindergarten and preschool, and social skill groups clients’ cases
- Programed curricula
- Developed behavior plans
- Trained and supervised behavior therapists and teachers

Central California Autism Center (January 2008 – August 2011) Clinical Supervisor
- Managed and monitored one-on-one clients’ cases
- Programmed curricula
- Developed behavior plans
- Trained behavior therapists

- Worked one-on-one with students with disabilities
- Trained, observed, and provided feedback to staff working with students with disabilities