4

Establishing Repertoires of Pretend Play in Children with Autism Using Video Modeling

Rebecca MacDonald

Social skills emerge very early in the lives of typically developing children. It is as if they are prewired to discriminate other humans from inanimate objects. They seek out attention from people in their environment and respond to others with focused and deliberate eye contact. ***Social referencing*** is one of the earliest social behaviors seen in young children. In the presence of an unfamiliar face, children as young as 10 months will look at a familiar adult, like a parent, for cues. If the parent shows disapproval, the child may cry or discontinue the interaction, but if the parent shows approval, the child will smile.

Joint attention is also an early social marker in young typical children. Joint attention involves an interaction between two people and an event in the environment. One of the first forms is responding to the social initiations of a caregiver. A child who is reading a picture book with a parent may look at pictures in the book as the parent points to images on each page. The child may then look up at the parent for approval or "joint" engagement. Children show these skills even before language emerges. The social response of the parent is enough to maintain this interaction as they read the whole book together. Another form of joint attention involves noticing a change in the environment and gaining the attention of a parent to "share" this event. Imagine that a bird flies into a window of your home. The typical child looks up at the bird, perhaps squeals with excitement, and then looks in the direction of the parent. Again, it is the reaction of the parent that maintains this interaction.

Social behavior of others serves as a powerful reinforcer for typical children; however, this is not so for children with autism. Children with autism who are faced with the same social interactions may look away or seem unresponsive to these social overtures. Play is one of the primary contexts for the development of social skills for typical children. Both interaction with toys and interactions with other people serve to help shape the complexity of play and language. Children with autism can lose out on those early opportunities to develop social skills if they do not engage in play with others.

Pretend play is one of the hallmarks of early childhood social behavior, yet children with autism rarely engage in play that has pretend qualities. Typically developing children tend to develop play skills in a sequence that builds on their language and knowledge of the world. Coincidently, play and joint attention emerge in the same developmental timeframe and both are linked to language in typically developing children. Deficits in joint attention and symbolic or pretend play have been identified as critical to the prognosis of children with autism (Kasari, 2002). Pretend play involves transforming objects or situations into make-believe ones. It has been postulated that pretend play or symbolic play serves several functions in typically developing children. It allows them to practice what they experience, to solve problems on their own and in their own way, gives them experience in mastering tasks, and allows them to experiment with new roles (Lifter, 2000).

Pretend play is characterized by a variety of behaviors, including using objects as if they were something else (use of play dough to make cookies), attributing properties to an object that it does not have (using a banana as a telephone), and using absent objects as if they were present (stirring imaginary soup). Interestingly, the taxonomies outlining the sequence in which children develop these play skills are the same across cultures.

Play in Children with Autism

Children with autism, on the other hand, tend to engage in play that is repetitive or stereotypic, and play that is indiscriminate or immature. Their actions with objects are simple and lack a symbolic quality. While typical children are learning to play by watching their peers, children with autism are not learning from these models, regardless of the density or frequency of these opportunities. These deficits are most apparent in the lack of spontaneous play.

Children with autism can learn to "pretend" to drink from a cup, or "pretend" to lick an ice cream cone through object imitation and discrete trial training, but this does not necessarily lead to their own production of untrained creative play with novel toys in new settings across different adults and peers.

Thus, the challenge is to teach these children play skills that will result in the emergence of previously unreinforced "creative" and spontaneous play.

Why Is Play Important?

There are many reasons why play is important to the social and language development of children with autism. First, if play has an odd quality to it, such as mouthing puzzle pieces, it sets the child apart from the other children. Second, if the child is unable to reciprocate invitations to play because of language or social deficits, he or she is less appealing as a playmate. In this case, it takes work on the part of a typically developing child to sustain the play, which makes play more effortful than fun. Finally, children with autism miss out on how children relate to each other, which serves as the basis for learning about cooperation, empathy, and collaboration. Play provides a medium for acquiring all of these social skills.

Teaching pretend play skills to children with autism has been related to improvements in both receptive and expressive language, thus lending support to the relationship between the emergence of play and language development. However, Kasari, Freeman, and Paparella (2006) found that teaching play skills may not result in a concomitant change in joint attention. Conversely, teaching children joint attention may not result in the emergence of more elaborate pretend play. While these two skills are important to a child's social development, they each require specific training in children with autism.

Building Blocks of Play

The building blocks of play are best summarized by the work of Lifter (2000). The taxonomy offered by Lifter is summarized in Table 1. Children first learn to manipulate toy materials in a simple manner. They learn to act on objects in specific ways, such as banging a toy hammer. They then learn how to combine materials to create something new, such as putting puzzle pieces together to make a picture or putting beads on a string to make a necklace. Once these early foundational skills have been acquired, children can begin to learn pretend play skills.

Pretend play involves a variety of skills that require children to use their imagination. Children can pretend to feed a baby doll, pretend that a block is an airplane, or pretend a small figurine is walking or talking. Pretend play can occur alone or in the context of playing next to a peer (e.g., parallel play). Children typically include some narration in their play. Pretend play also is thematic in nature and serves as a way for children to act out scenarios that they have experienced in their real lives, such as visiting a doctor.

Socio-dramatic play is arguably more complex and clearly more challenging to teach. Socio-dramatic play requires that children assign roles to themselves and their peers, share materials, take turns, and reciprocate verbal exchanges. Most importantly, it involves persistence or the ability to carry out a play theme from beginning to end. Examples of socio-dramatic play are preparing a meal using a kitchen play set, or pretending to put out a fire with a firefighter outfit and tools. Socio-dramatic play with peers is the most complex form of pretend play.

Lifter argues that teaching play using a developmental sequence will result in more rapid acquisition and increased generalization of these skills (Lifter, Ellis, Cannon, & Anderson, 2005).

Table 1. Developmental Play Assessment Play Categories (Lifter, 2000)

1. Indiscriminate act on object (bang toy)
2. Discriminate act on object (squeeze stuffed toy)
3. Presentation combination (puzzle piece in puzzle)
   - Pretend self (pretend to feed self)
4. Physical combination (string beads to make necklace)
5. Child as agent (pretends to feed doll)
6. Single scheme sequence (pretends to feed 2 dolls)
   - Substitution (pretends banana is phone)
7. Doll as agent (walks/talks for doll)
8. Multi-scheme sequence (feeds doll, brushes doll's teeth, puts to bed)
9. Socio-dramatic/thematic fantasy play (assign roles to self and others)

Teaching Play Using Behavioral Procedures

A variety of behavioral teaching procedures have been examined to teach play skills to children with autism, including discrete trial training, pivotal response training, and in-vivo modeling using play scripts.

Pivotal response training (PRT) incorporates the behavioral procedures of prompting and reinforcement with teaching procedures drawn from the developmental literature such as following the child's lead. Teaching occurs in a naturalistic setting using child preference during ongoing play to facilitate social interactions. PRT has been shown to be effective in establishing socio-dramatic play skills with adults and peers, and acquired play skills have been shown to generalize across toys and play partners.

In-vivo modeling using play scripts also has been shown to be effective in establishing socio-dramatic play with peers. Goldstein and Cisar (1992) used socio-dramatic scripts to teach typically developing children to engage in thematic play with a child with autism using three play sets, including a pet shop, a carnival, and a magic show. Teaching play using thematic scripts resulted in increases in theme-related social behavior for all children. Jahr, Eldevik, and Eikeseth (2000) found that when verbal rehearsal is added to in-vivo modeling children engaged in more sustained cooperative play. Based on these studies, modeling appears to be a promising procedure for teaching play to children with autism.

What Is Video Modeling?

Video modeling typically involves presenting a videotaped sample of child or adult models engaged in a specific series of scripted actions and/or verbalizations. The videotaped model is shown one or two times and then the child is directed to perform the scripted behaviors. Video modeling is emerging as an effective instructional technique to teach a variety of social skills, including play skills, to children with autism. Charlop-Christy, Le, and Freeman (2000) taught children to play games such as tag, Red Rover, and card games using video modeling. Video modeling has also been used to increase verbal statements during play with siblings and to teach children to initiate play with others. LeBlanc et al. (2003) used video modeling to teach perspective taking to children with ASD, and Scattone (2008) has used a combination of video modeling and social stories to teach social pragmatics in the context of conversations.

Video modeling has been used to establish complex pretend play sequences using a variety of play activities such as having a tea party, or playing with a pirate ship (MacDonald, Clark, Garrigan, & Vangala, 2005). Generalization of toy play across materials can be facilitated using video modeling. Children with autism have also shown increases in reciprocal pretend play with typically developing peers using video modeling. Children acquired sequences of scripted verbalizations and play actions quickly and showed an increase in reciprocal verbal interactions and cooperative play.

Clearly, video modeling is a promising avenue for teaching play skills to children with autism. Long sequences of play can be established relatively quickly using video modeling, and this training often results in generalization across a variety of materials, people, and settings. However, a limitation of these procedures is that children do not usually engage in spontaneous, untrained or "creative" play as the result of video modeling. A variety of strat-

egies are emerging as effective for expanding on the play taught using video modeling. Roberts, MacDonald, and Ahearn (2007) found that embedding a "substitutable loop" in the script increased the length and variability in play. Using this strategy, which is discussed further below, different characters were used across video models and characters were available that were never trained, which resulted in children using both trained and untrained characters in their play.

MacManus and MacDonald (2010) have shown that combining matrix training with video modeling can result in generative recombinative play across play set materials. These procedures are described in more detail in the section on "Strategies to Increase Variability in Play" later in this chapter.

Why Does Video Modeling Work?

Video modeling is based on the premise that children can learn through the observation of a model. Observational learning has its roots in Bandura's Social Learning Theory (1977). The elements necessary for observational learning to occur include: 1) attention, 2) retention, 3) production, and 4) motivation.

Corbett and Abdullah (2005) offer an explanation for how these elements are related to the unique benefits of video modeling for children with autism. ***Attention*** requires observation of a model and focus on the specific aspect of the model that is relevant. In video modeling, the video offers a restricted field of focus and therefore only the relevant features of the instructional model are present for the child to attend to. ***Retention*** requires that the child remember the model. In video modeling, there is repeated exposure to a model, both within a learning opportunity as well as through repeated exposure across learning opportunities.

Production is when the child actually imitates the behavior he or she observed being modeled. In video modeling, the child is required to imitate the model and practice these behaviors. This results in the behavior becoming well established in the child's repertoire. ***Motivation*** involves the concept of reinforcement. It is argued that the video medium is inherently reinforcing to children with autism and therefore children are more likely to watch videos and imitate the behavior seen in the video. A behavioral analysis of the reinforcing function of video modeling remains to be thoroughly explained.

Advantages of Video Modeling

There are many advantages of using video modeling to teach children with autism:

1. The use of video technology allows a teacher to demonstrate a model in a variety of settings that would be difficult to recreate in a classroom; for example, shopping at a store.
2. The teacher can prescribe and control the modeling procedures, such as showing a model from the point of view of the child. Then the videotape can be reviewed and edited until the specific desired scene is created.
3. Video modeling provides opportunities for repeated observations of the same model, therefore increasing the procedural integrity of instruction.
4. The edited video clips can be shown on a variety of media sources, from laptop computers and TVs to iPods, and can be reproduced to be used with many children.
5. As mentioned earlier, videos are often a preferred medium for our children, resulting in a preference for video instruction.
6. Finally, video modeling is cost effective because it reduces the need for teachers' individual teaching and efficient because children learn quickly using video modeling.

NECC Play Curriculum

Over the past five years, we at the New England Center for Children (NECC) have developed a comprehensive video modeling curriculum to teach play skills to children with autism. Using our knowledge of the emergence of play in typically developing children, we have structured our curriculum around four levels of play. These levels of play follow a developmental sequence. The curriculum is available to parents and professionals through a web-based product called NECC Preschool Playroom at www.NECCautismplay.com (see Figure 1).

The first level of play is ***toy construction,*** involving manipulation of toy pieces to create a new structure such as Mr. Potato Head. This level includes both simple construction and more complex construction tasks using K'nex. The second level of play is ***toy play,*** which involves a simple sequence of actions and vocalizations with characters or toys, such as making a sandwich. The third level of play is ***pretend play.*** At this level, children learn longer and more complex sequences of play that may involve talking for characters or pretending to be someone such as a doctor. The fourth level of play is ***sociodramatic play*** with a peer. At this level, children learn to take roles and engage in reciprocal social exchanges as they pretend to prepare a meal in the kitchen or order a hamburger from McDonald's.

Figure 1. NECC Preschool Playroom Website

The goal is to establish a large repertoire of play skills with a wide variety of toys. Toys that are mastered through video modeling can then be played with in other settings, including home and the classroom. Children who progress through the whole curriculum are exposed to the major types of play defined in the play taxonomies developed by developmental psychologists over the years.

Teaching Procedures

The steps involved in teaching play using video modeling include: 1) developing scripts, 2) making the video model, 3) baselining performance on the play script, 4) teaching the play script, 5) evaluating performance without the video model, and 6) evaluating generalization of performance across people, settings, and toys.

Script Development

The scripts are developed based on observing typically developing children play. The children are videotaped playing with the toys for which a script is being developed. Then we watch the video of typical play and write down the children's actions and play statements. This information is then used to develop play scripts.

There are a variety of factors to consider when developing play scripts for a specific child (Table 2).

- The ***language level*** as measured by the child's mean length of utterance may influence the vocalizations incorporated into the script.
- The child's ***fine motor skills*** are important to consider in selecting materials to use during play. Large, chunky, easy-to-manipulate materials are better suited for children who have low tone or poor fine motor skills.
- Another variable is the presence and topography of any ***interfering behavior*** such as stereotypy or other challenging behaviors that may impede learning a particular script. For example, if Velcro is a medium that is associated with repetitive touching and uninterruptible rigid routines, avoid any toys with Velcro.
- It is also important to consider the ***level of social behavior*** already in the child's repertoire. Does the child have the skills to participate in play with a peer?
- Finally, consider the ***length of the script***. Would your child do better with short scripts with a few actions and vocalization or does he or she have the skills to learn a longer play sequence?

You should modify the actions and statements made by the typical children to fit the level of curriculum that fits the child you are teaching.

Table 2. Things to Consider When Developing a Play Script

- Mean Length of Utterance (MLU)
- Fine Motor Skills
- Level of play (cause-effect, symbolic)
- Interfering behavior: stereotypy or other challenging behaviors
- Social Skills: solitary or cooperative play
- Length of script: Mastery of shorter scripts first, then increase length and complexity

The top half of Table 3 shows an example of the scripted actions and vocalizations for two typical children playing with a baking set. The types of actions include stirring, eating, and turning the mixer. All of these behaviors use the materials for play and are thematic in nature. Examples of vocalizations include: "First we need to stir it"; "Now we mix it"; and so on. Sometimes sound effects are paired with their actions. Typically, these vocalizations involve narrating the play that is occurring, and when two children are playing together

they also involve regulating the play of their peer; for example, "Now we have to make something." The right column in Table 3 shows an example of a script we developed based on the behavior of these typical children.

Table 3. Example of Using Play of Typical Children to Develop a Script

OBSERVATION OF A TYPICAL CHILD		
Objects	**Action**	**Vocalizations**
		"Now we have to make something"
Bowl and spoon	Put spoon in bowl and stir	"First we need to stir it"
Rolling pin	Roll on carpet	"First we need to roll it"
Bowl and spoon	Put spoon in bowl and stir	"Now we mix it"
Scale	Pick up scale	"Now we have to look at the time"
Blender and bowl	Put bowl under blender and push blender down	"/vvvvvvvv/, ding" "It's ready"
Blender	Lift up blender	"It's all done"
Bowl	Pick up bowl	"Can I have all of it?"
Bowl	Bring bowl to mouth	"Okay thank you [slurp]"

SCRIPT		
Objects	**Action**	**Vocalizations**
		"Let's make dessert"
Rolling pin	Roll on table	"Roll it"
Bowl and spoon	Put spoon in bowl and stir	"Mix it up"
Blender and bowl	Put bowl under blender and push blender down	"/vvvvvvv/, ding" It's ready"
Bowl	Picks up bowl	"I want some"
Bowl and spoon	Spoon in bowl and then to mouth	"Yum-yum" "It's good"
Bowl and spoon	Put down	"All done"

Making the Video Model

When creating the video model, always videotape from the perspective of the child. Set up the materials as they would appear to the child when he or she begins to play. Begin videotaping with a view of all the materials from a

distance. This can also include the person who is acting out the script (Figure 2, left). Then zoom in on the actual materials so that the child gets a closer look (Figure 2, right). If a main structure such as a barn or boat is used, the main structure is placed directly in front of the child and all other materials (figures/objects) are placed to the side of the structure. Many of the toys currently available make sounds. Be careful to remove the batteries so that all noises need to be generated by the children. Finally, edit the video and create a file that shows the full video model two times consecutively.

Figure 2. Example of Video Modeling Video: Whole Scene (left), Focus on Toys (right)

Baseline

Before introducing a specific script, take baseline to assess the child's current skill level. If the child already plays appropriately with the materials, then training would not be necessary. Set up all of the necessary materials on the table or floor (depending on the specific play activity and the individual child). Have the data sheet for the play script you are assessing available. Then bring the child to the toys and say, "It's time to play." Stand behind the child, being sure to stay out of his or her direct view. Do not provide any additional instructions or prompts and allow the child to play for between 2 to 4 minutes (depending on the complexity of the activity). Record the child's performance on the data sheet and determine whether the activity requires training.

Training

Many of the procedures used during training are exactly the same as those used during baseline. Again, print out the data sheet and set up the toy, then bring the child to the computer/DVD player and say, "It's time to watch a video." It is best to set up the toys near the video viewing area so the child can reference the toys while watching the video (Figure 3). Have the child watch

the video model all the way through two times. Then bring the child to the toy and say, "It's time to play." Stand or sit behind him or her and allow 2 to 4 minutes to complete the play task. When the time is up, praise him or her for playing, regardless of how much of the play scenario was completed. It can take as few as three viewings or as many as ten exposures to the video model before the child will be completely independent.

Figure 3. Example of Child Watching the Video Model (left) and Looking at Toys (right)

If the child makes errors on the same step three consecutive times, provide prompting using physical guidance only (avoid verbal instruction) to correct the error. Do not allow errors to occur more often, particularly in toy construction, as they will be more difficult to correct over time.

Mastery Probes

Once your child has completed the play scenario with 100% accuracy (toy construction) or 80% accuracy (all other levels) with the video, then present the task without the video. When the child performs at the accuracy level prescribed for that level on two consecutive sessions, he or she has met mastery criteria on that toy and play script. You can then have the child play with the toys with other people and in other settings. In addition, you can evaluate performance on the play script with toys that are similar but not exactly the same. For example, if you are teaching Mr. Potato Head, you might assess performance on Mrs. Potato Head and Carrot Head.

Evaluating Performance

To evaluate performance, data should be collected each time a session is run. Data are recorded on a data sheet that includes all scripted behaviors (actions and vocalizations), as well as the date, person who is running the session, and type of session—probe or training (Figure 4). While the child is playing, record a + in the box next to that behavior for each correctly per-

Figure 4. Sample Tractor Script Data Sheet

Tractor

DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Objects	**Action**	+/-	**Vocals**	+/-
Pig	Pick up pig		"Oink Oink"	
	Put pig in tractor			
Cow	Pick up cow		"Moo"	
	Put cow in tractor			
Duck	Pick up duck		"Quack Quack"	
	Put duck in tractor			
Farmer	Pick up farmer			
	Put farmer in tractor		"Let's go"	
Tractor	Tractor drives away			
Total	/ 9		/ 4	

formed step in the sequence and a – for each incorrect step. Note that actions are listed on the left side of the data box and vocalizations are listed to the right side of the actions. These behaviors should be scored separately.

Following are guidelines for scoring play scenarios. Actions and vocalizations must be performed with the appropriate materials for them to be scored as correct. For example: picking up a cow and saying "moo" is correct, but picking up a cow and saying "oink" would not be a correct vocalization. However, for many play sequences the specific actions and vocalizations do not have to be performed in the exact order displayed on the video. Record each action and vocalization as correct whenever it occurs during the play session. You can score approximations or elaborations of the vocalizations within the play script as correct. You want some variation in the child's play. If he or she uses other characters or materials appropriately but not as shown in the video script, you should make note of this. Again, more variation in play is better.

Prerequisite Skills for Video Modeling

Several skills have emerged as critical prerequisites for learning using video modeling. Attending to a video and imitation skills have been postulated as logical prerequisites (Weiss & Harris, 2001); however, these variables have not been systematically evaluated. McCoy and Hermensen (2007) suggest that the length of the video may influence attending to the model, proposing that a shorter model may increase attending and therefore influence the successfulness of video modeling. In addition, memory could play an important role in learning using video modeling. Observing and imitating a model requires that the child remember the observed actions for the duration of the video and the period of time between the video and the task. In a study of more than 30 children, we found that the delayed imitation of actions with objects and delayed matching of objects to pictures were highly correlated with the ability to imitate an eight-step video model (MacDonald, Dickson, Robinson, & Ahearn, 2010). In addition, Robinson (2009) found that when children were taught these delayed matching and imitation skills, their ability to learn using video modeling improved.

We recommend the following skills be present in a child's repertoire for video modeling to be an effective teaching procedure for a child. They include: generalized motor imitation, attending to a video, 3 second delayed match-to-sample, and 3 second delayed imitation of actions with objects (Table 4).

Table 4. Prerequisite Skills for Video Modeling

- Generalized motor imitation
- Imitates actions with objects
- Delayed imitation of actions with objects
- Motor skills
- Picture to object matching
- Delayed picture to object matching
- Attending to video

Instructional Adaptations

Although the presentation of the video modeling script is usually all that is needed for children to acquire the play skills, modifications to the teaching procedures are required in some cases.

Prompting: Mazurski & Bourret (2007) demonstrated that learning occurred more rapidly when video modeling was combined with prompting. Prompting may be necessary to facilitate learning if a child is making repeated errors on the same step. Prompting or pre-teaching may also be necessary if a child is unable to perform one of the steps in the task because of his or her motor skills. For example, in teaching a superhero script with Batman and the Joker, part of the play involved putting a battering ram in the hero's hand. This proved difficult for a number of children and was therefore prompted.

In some cases, prompting only the first step in the chain can be helpful. For example, one student engaged in repetitive play during baseline and established a routine that he then continued to follow even during training. When prompted on the first step, he then demonstrated the rest of the steps in the play sequence. The addition of a reinforcement contingency at the end of the training trial may also facilitate learning; however, we have found this not to be necessary in most cases.

Segmented Video Modeling: Another modification that has been successful in helping children learn is the use of segmented video modeling. This involves editing the video into smaller segments. This allows the child to learn one step of the chain at a time. Tereshko, MacDonald, and Ahearn (2010) used a segmented video modeling procedure to teach children eight steps in building toy monsters using Mega Blocks. The videos were edited to show one step, then two steps and so on. All children were able to learn to build these monsters using this procedure. Interestingly, these children did

not have delayed matching in their repertoire but were able to learn using a segmented model strategy.

Watching the Video While Completing a Task: Another modification is to show the video model simultaneous with the child performing the action. Ryan, Mahoney, Braga-Kenyon, and Kara (2009) found this to be a very effective procedure to motivate a child with autism to brush his teeth.

Video Prompting: Other research has suggested that video prompting can be an effective procedure to facilitate learning (Sigafoos et al., 2005). Video prompting involves showing the child one step in the chain and teaching to mastery before moving on to teach the next step in the chain. Video prompting would be an appropriate adaptation for play that involves motor chains, such as constructing a character with K'nex, or Legos.

While many children with ASD learn quickly using just video modeling, it may be necessary to adapt the procedures using the above modifications.

Teaching Using the NECC Preschool Playroom Curriculum

Toy Construction

Toy construction is the simplest level of play. Children learn to manipulate play materials in order to make new toy constructs; for example, using bristle blocks to make a car. This level most closely represents Lifter's early developmental play level involving physical combination of materials. Typically developing children often use manipulatives to create characters or structures that they then use in imaginative ways. For example, they might use interlocking manipulatives to make a pretend bracelet that squirts water. Learning to interact appropriately with play materials and create a variety of novel constructs from manipulatives is an important step in the development of play.

In this level, a child will imitate an adult modeling how to build structures using manipulatives. Toy construction includes toys such as Mr. Potato Head, K'nex materials, or play dough. The child must be able to perform simple motor imitation and be able to manipulate the specific materials for the toy you select.

Within toy construction, there are two levels: simple and complex. In simple construction, the child imitates constructing a basic play item. Simple construction typically includes imitating constructive toys where there are limited possibilities for incorrect responses, such as Mr. Potato Head.

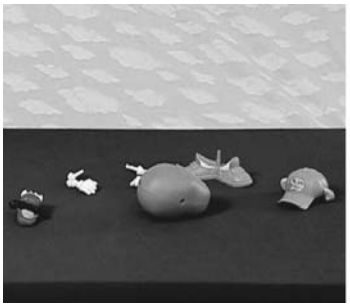
Video Model: The video model includes a view from the child's perspective of an adult building the toy structure being taught. The adult models the construction at a slow, even pace. The video model is created so that

the camera zooms in on the specific manipulation of the pieces. The whole sequence is shown, including playing with the toy once it is constructed; for example, driving a car that has been created from Lego blocks.

Performance Evaluation: In play construction, we evaluate performance using a task analysis detailing the sequence of steps needed to construct the play item. In Figure 5 you can see the task analysis for Mr. Potato Head. There are 6 steps in this sequence and they can be done in any order. Data are taken on the child's independence in completing each step of the chain. On the bottom of every data sheet there is a picture of how to set up the pieces of the play item, and on the right, a picture of the end form.

Figure 5. Mr. Potato Head Data Sheet

Mr. Potato Head



DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Pick up body						
Insert face into body						
Insert arm 1 into body						
Insert arm 2 into body						
Insert body into shoes						
Insert hat on top						
Make him walk						
Total						

Baseline: Begin by evaluating how the child plays with the manipulatives prior to training. Present the materials in an array on a table, including a picture of the completed toy structure, and tell the child to play. Allow him or her 2 to 4 minutes to play with the materials, and when the time has elapsed, announce that play is all done. Typically, children with autism may mouth the toys or manipulate them in stereotypic ways. We do not redirect their behavior, as stereotypy typically drops out once the child learns how to play appropriately with the toy materials. Observe the child's behavior and note on the data sheet any parts of the task analysis that he or she completes correctly.

Teaching: Again set out the materials in an array on the table, including a picture of the completed toy structure, but this time, have the child watch the video before he or she plays with the materials. Say, "It's time to watch a video" and have the child watch the video model all the way through two times. Prompting the child to attend to the video may be required. Then present the toy materials to the child and say, "It's time to play. Let's build a _____." Stand or sit behind the child and allow 3 to 4 minutes to complete the play task. If the child attempts to leave the play area, redirect him or her back to the toy and say "Let's keep playing." Record the child's performance on the task analysis data sheet. When the time is up, praise the child regardless of how much of the play he or she completed correctly.

Mastery Probes: When the child has completed the task analysis with 100% accuracy two times, have the child play with the materials without showing him or her the video. The child has met mastery on the toy when he or she is able to build the construct two times with 100% accuracy without the video model.

Generalization: If there are toys that have the same number of pieces and a similar construction format, you can probe to see whether the child can manipulate similar materials and create similar toy structures. As the child has more experience playing with the toy materials, he or she will learn to build a variety of structures using these materials.

Adaptations: If the child has difficulty following the entire sequence, consider reducing the length of the video model. As mentioned earlier, one strategy for reducing the length of a video model is to start with one step and increase systematically to the full chain of steps (Tereshko et al., in press). Another strategy is to edit the video to show blocks of three actions at a time. Once the child is independent with those beginning steps, then show subsequent steps of the chain. If the child has difficulty due to a fine motor requirement, you may need to select constructive toys with larger parts.

Simple Construction: At the level of simple construction, five or fewer steps are required to build the construct. The pieces should be relatively easy to manipulate and can include toys such as bristle blocks, play dough, and Mega Blocks. These typically require little hand strength and simple dexterity.

Complex Construction: At this level, more complex structures are created and the materials require more strength and dexterity to manipulate. K'nex toys are a good example of this type of play. They have a variety of different shaped pieces and it requires persistence and strength to pop them into place. In addition, they lend themselves to building a variety of structures. For example, K'nex Fish Eyed Friends is a collection of fins, tails, and ocean eyes that can be used to create many different fish-like characters. The set comes with pictures of different fish you could make. We use pictures along with video modeling to teach variations of toy construction.

More complex manipulatives often come with diagrams and pictures for the child to imitate. Ideally, children should learn to build constructions from the guide that comes with the toy, like the figures on the K'nex fish box. You can also increase actions with the object once it's constructed. This is easier to do when you have more materials. For example, in the Lincoln Log barn toy, once the barn is constructed, the horse can gallop over to the fence and eat the hay.

Generalization to Picture Activity Schedule: Once a child has mastered a particular construction toy, his or her play skills can be maintained through a photo activity schedule. A photo activity schedule is an effective strategy to help children sequence their independent play.

You can include a picture of the newly taught construct into a child's photo activity schedule. The child points to the picture in the schedule, retrieves the toy materials, and builds the toy structure without the video model. After it is completely constructed, he or she can play with the toy and then take it apart and put it away. Then the child moves to the next activity in his schedule independently. This is an excellent way to increase sequenced independent play and to generalize these learned play skills to home.

Toy Play

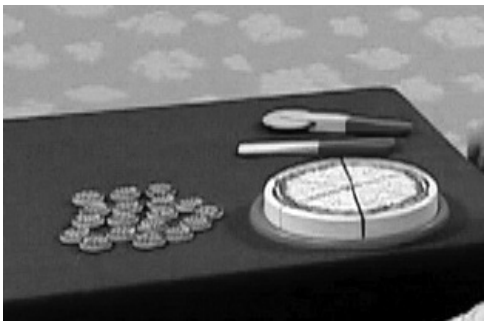
Toy play involves simple one-step actions paired with sounds or simple one-word utterances. Beginning play sequences at this level consist of five to seven simple/discrete steps. Each step is paired with a simple sound or word. Using a toy tractor, we teach a child to pick up an animal, make the noise the animal makes, and put it in the tractor (see Figure 4). With this type of toy there is little room for error because the child performs the same action with each figure (e.g., pick up character and put in the tractor). A sound is paired with each animal or character.

We begin with scripts that contain an average of five actions paired with very simple vocalizations and gradually increase the number of actions up to between nine and fifteen. We begin with simple sounds and gradually increase to three- to four-word utterances. An example of a more complex script

is making a pizza, in which the child is the actor in making and eating the pizza (see Figure 6). There are multiple actions, cutting, putting on the pepperoni, and eating. Short phrases are introduced to narrate the child's play. There is a clear sequence to the play: make the pizza, cut the pizza, and eat it. The play also has a pretend quality to it.

Figure 6. Pizza Script Data Sheet

Pizza



DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Objects	**Action**	+/-	**Vocals**	+/-
Pepperoni, whole pizza	Pick up pepperoni, one at a time			
	Put pepperoni on pizza, one at a time		"Pepperoni"	
Pizza slicer	Pick up pizza slicer			
	Cut out one piece of pizza (two slices)		"Cut pizza"	
Pizza server	Pick up pizza server		"Eat"	
	Use server to pick up cut slice of pizza			
	Put pizza slice on table			
Pizza slice	Pick up pizza slice with hands			
	Pretend to take a bite		"Yummy"	
Total	/ 9		/ 4	

In pretend play, two types of play are taught: doll as agent and child as agent, as described below.

Doll as Agent Toy Play: This type of play involves the child manipulating the characters as if they were animate. It includes walking and talking for dolls or characters. Toys that lend themselves to this type of play typically have figurines that can be manipulated. One example is using a Fisher Price airplane that includes a pilot and several passengers (Figure 7). We teach the child to talk for the characters as they board the plane and then have the plane fly. This involves picking up the characters, placing them in the correct seat on the plane, and talking for that character.

Child as Agent Toy Play: This type of play differs from the last because the child now acts on the materials as if he or she were part of the play scene. An example could include having a tea party (see Figure 8). At the party, the child makes the tea, pours the tea, puts in sugar and milk, and then drinks the tea. All along, the child is narrating his play with the tea set by describing what he is doing while he is playing.

Baseline: Again, begin by evaluating how the child plays with the toy set prior to training. Present the materials in an array on a table or floor, but do not include a picture of the play set. Tell the child to play and allow him or her play with the materials for two to four minutes. Observe the child's play actions and vocalizations and record on the data sheet. When the time has elapsed, tell him or her that play is all done.

Teaching: Again, set out the materials in an array on the table as in baseline but this time have the child watch the video before playing with the materials. Say, "It's time to watch a video" and have the child watch the video model all the way through two times. Then present the toy materials to the child and say "It's time to play with the _____." Stand or sit behind the child and allow three to four minutes to complete the play task. Do not prompt or correct the child in his play unless he makes the same error on three consecutive play sessions. Record the child's performance on the task analysis data sheet, and when the time is up, praise him regardless of how much of the play he completed correctly.

Mastery Probes: When the child has completed the task analysis with 80% accuracy two times, have him play with the materials without showing him the video. He has met mastery on the toy when he is able to follow the script two times with 80% accuracy without the video model.

Generalization: Generalization at this level of play typically involves substituting materials or playing with similar toys. In the pizza example, generalization is built into the play set because a variety of toppings are included, such as pepperoni, mushrooms, and peppers. Having a tea party is a more generic play experience, so present the child with a different tea set to see if he

Figure 7. Airplane Script Data Sheet

Airplane

DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Objects	**Action**	+/-	**Vocals**	+/-
Pilot	Put on plane		"Let's fly"	
Luggage	Put on plane		"Suitcase"	
Person 1	Climb up stairs		"Get on"	
	Put in seat		"Sit down"	
Person 2	Climb up stairs			
	Put in seat			
Plane	Close door			
	Fly		"Fly"	
Total	/ 8		/ 5	

Figure 8. Tea Party Script Data Sheet

Tea Party

DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Objects	**Action**	+/-	**Vocals**	+/-
Teacup, saucer, spoon, tray	Take cup/ saucer/ spoon off tray		"I'll have tea"	
Spoon	Take spoon out of cup			
Teapot	Take teapot off tray			
	Pour tea into cup		"Pour it"	
Milk dish	Pick up milk dish			
Milk dish, teacup	Pour milk into cup		"Add milk"	
Spoon, teacup	Stir tea with spoon		"Stir it in"	
Sugar bowl	Take sugar bowl off tray		"Now sugar"	
	Open lid of sugar bowl			
Sugar bowl, spoon, teacup	Scoop sugar from sugar bowl into cup 1 time			
	Scoop sugar from sugar bowl into cup 1 time		"Two scoops"	
Spoon, teacup	Stir tea with spoon		"Stir it again"	
Teacup	Drink from cup			
	Put cup down on table		"Delicious"	
Total	/ 14		/ 8	

or she can generalize the new skills to a similar type of play set. In addition, probe to make sure that the child can play appropriately with the materials in different settings, such as in his or her home.

The scripts at the toy play level increase in complexity from simple five-step actions paired with sounds to gradually longer play sequences that introduce longer verbal statements. However, play at this level continues to look very scripted. Although the scripts are based on watching typical children play, the scripts are still simplified. The goal of this level is to teach children to follow longer play sequences and to begin to narrate their play. This prepares them for the later levels of the curriculum, in which play begins to look more natural.

Pretend Play

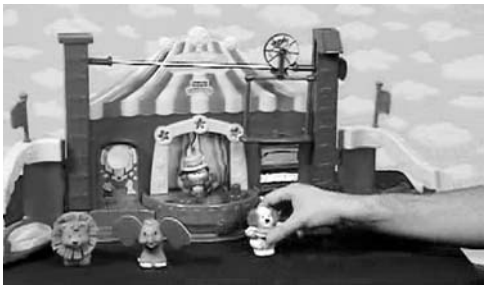
Pretend play involves longer and more elaborate play sequences. Children learn to act out pretend scenarios such as a doctor well check visit, or a circus show. The scripts follow a story line and include both actions and vocalizations. They often include some type of dramatic problem, such as a fire in the building or a toothache. As described earlier, these scripts are based on observing typical children play. Both generic (e.g., a doctor kit) and unique (e.g., Fisher Price grill) commercially available play sets can be used.

Children should be able to complete all of the play scenarios at the toy play level and have beginning conversation skills in their daily speech prior to entering this level of play. All training and evaluation procedures are identical to the toy play level; the major difference is that the play is more complex, as illustrated below. Scripts range from 15 to 30 actions paired with 15 to 30 vocalizations. These play scenarios take longer to complete and provide more opportunities for extended play beyond the script provided. As with toy play, the scripts are organized by doll as agent and child as agent play.

Doll as Agent Pretend Play: At the pretend play level, doll as agent play involves the child manipulating and talking for multiple characters. Figurines such as Little People dolls take on roles; for example, the master of ceremony at the circus or the pirate on the pirate ship. The characters talk to each other, they move around a base structure such as the pirate ship, and they manipulate other materials, such as by driving a car or swinging on a trapeze. The storylines are thematic in nature. On the pirate ship, the characters are looking for gold using a telescope and a map. At the garage, a customer has a flat tire and the attendant changes the tire. An example of the circus script at this level is in Figure 9. We have found that children learn these play scripts quickly and are able to recall the play scenarios over time even if they have not had direct access to the play sets.

Figure 9. Circus Script Data Sheet

Circus



DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Objects	**Action**	+/-	**Vocals**	+/-
Monkey	Move through curtains		"Step right up to the world's most amazing animal show."	
Dog	Move to tightrope		"I'm Poofy the Poodle."	
Lion	Move to side of stage		"Roar."	
Elephant	Move elephant to center stage		"I'm Peanuts, watch me dance."	
	Make elephant dance by moving blue lever			
Monkey			"First, we have Lionie climbing the ladder to the high dive"	
Lion	Climb ladder		"Wow, this is very high."	
	Jump down		"Splash."	
Monkey	Kiss lion		"Great Job!"	
Dog	Move on trapeze		"Weee, this is scary."	
Monkey	Move to seesaw		"Now, Peanuts will make me fly through the air."	
	Fly through the air and back to stage			
Lion	Move behind stage		"I'm very strong. Roar."	
Monkey			"Thanks for coming to our show. Good-bye everyone."	
Total	/ 12		/ 12	

Children's toys often come with a video of a play scenario using the toys. The characters in these videos are often claymation figures that talk and move independently and are animated versions of the toys. In a recent study, we examined whether children with autism were able to follow and imitate using these commercially available videos (Palechka & MacDonald, 2010). We developed our own videos in which an adult's hand moved the characters and talked for the characters using the actual materials that were available during play (see Figure 10). We found that two of the three children learned more rapidly from the instructor-created video. While the commercially available videos are an inexpensive way to teach play, they do not show the child how to make the characters perform the actions in the script. Having the adult's hand manipulate the materials may be an important feature of instructor created videos. We recommend making your own videos to teach play.

Figure 10. Instructor-Created Video Screenshot

Child as Agent Pretend Play: Child as agent play at the pretend play level is most similar to dramatic play in that the children themselves take on roles and act out a thematic event such as firefighters putting out a fire. In this example, the child puts on a firefighter vest and a badge, calls for help using a walkie talkie, and squirts water on the fire with a fire extinguisher. The whole sequence is accomplished using a script that contains 17 actions and 16 accompanying vocalizations (Figure 11). Because we observed typical children play before developing these scripts, we are able to teach children the language of typical child play.

When developing a script for baking, we built in the phrases that the typical children used when they played with the baking set, as well as the sound effects and manipulation of the materials. In the doctor play script, we again included the language used by the typical children. Children with au-

Figure 11. Firefighter Script Data Sheet

Pretend Play Script

DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

	Firefighter		**Student**	
Objects	**Action**	+/-	**Vocals**	+/-
Jacket	Put on		"I'm a fireman"	
Badge	Put in pocket		"Here's my badge"	
			" Oh no - a fire!"	
Walkie-talkie	Push button		"Come right away!"	
Mask	Put on mask		" I need a mask"	
			Breathing sounds	
Fire extinguisher	Hold fire extinguisher		"I need this!"	
Door	Push on door		"The door is stuck!"	
Axe	Knock on door		"Open!"	
Fire extinguisher	Pump		"This squirts water"	
Walkie-talkie	Hold to mouth		"It's big"	
Fire extinguisher	Pump			
Child	Jump		"Yeah!"	
			"The fire is out!"	
Mask	Take off		"I did it!"	
Total	/ 12		/ 14	

tism often require direct instruction in how to play with toys and what to say. We have found this scripted play to be an efficient way to give these children play skills they need to engage in play in a typical classroom or home setting with other children.

At this level, play may still be solitary or parallel. Just because children have the language and play skills to play with toys does not mean they will interact with their peers during play. This too must be taught.

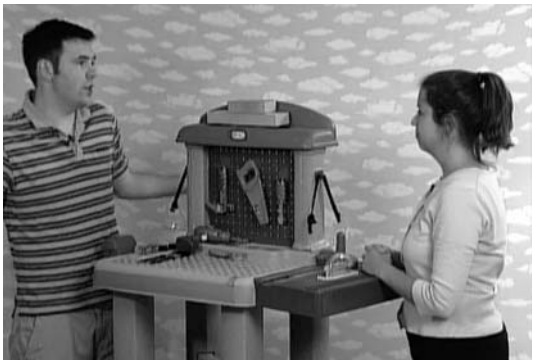
Socio-dramatic Play with a Peer

Once children with autism have repertoires of play with a variety of different toys, they are ready to use these play skills in the context of their peers. During socio-dramatic play with peers, children learn how to assume roles and take turns in play. Using video modeling, we can teach children how to respond to their peers' actions and verbal comments, as well as how to initiate thematic play that is interactive. For example, when using a tool bench play set, the child learns to offer suggestions for what to build and to take turns with the materials.

When starting to teach cooperative play with peers, it is best to select a typical peer as a play partner. Our research has shown that using video modeling in which two children watch a video of two adults engaged in cooperative play has resulted in increases in reciprocal social interactions (MacDonald et al., 2009). Children learn to play with toys in a collaborative manner by taking turns, sharing, and working toward the same goal, be it pretending to make a birdhouse or to cook a hamburger on the grill.

Making the Video Model: The video model for this level is different from the other levels because there are two adult models, and the set up of materials is different because now two children are playing with the materials. The video modeling scripts are designed so that each child is assigned a character role; for example, in the airport video modeling script, the roles include

Figure 12. Tool Bench Picture of Adults as Models



a pilot and a passenger. The video model is set up so that the adults modeling the play are on the side of the set that is associated with their assigned character role. Also the character or materials associated with their character are on that side of the scene. The models act out the script for their character.

The video model first shows the whole scene including both adults (Figure 12), then zooms in on the character who is speaking or acting. The actions and vocalizations at this level are similar to those at the pretend play level except now there are two people engaging in cooperative play with the materials.

Performance Evaluation: Performance is evaluated using a data sheet that has the scripted actions and vocalizations for both characters, as seen in Figure 13. The script for one character is on the left and for the second character on the right. Data are taken on the child's independent performance on each action and vocalization in the script. Data are also noted for each unscripted action or vocalization performed by the child.

Doll as Agent Socio-dramatic Play with a Peer: In this type of play, each child takes on the role of a different character as if they were animate. Now the children manipulate the characters so they are talking to each other and engaging in social interactions. An example of a script at this level is the pirate ship (Figure 13). The characters act together to find the treasure by talking to each other and helping each other.

Child as Agent Socio-Dramatic Play with a Peer: This type of play differs from the last because the child now acts on the materials as if he or she were part of the play scene. An example could include pretending to cook on a grill. The children take turns cooking and preparing the food, including turning on the grill, turning the burgers, and sharing the ketchup. The play script ends with both children eating the food they just prepared together.

Baseline: During baseline sessions, the play set materials are arranged as they are in the video model. The materials needed for each character are positioned on the side of the play set associated with each specific character role. The children are prompted to sit or stand in front of the play set on the side associated with the character role assigned to them. The instruction "It's time to play" is given, and the children are allowed to play for four to five minutes. As in prior levels, an adult stands just behind the children but does not give any additional instructions or physical prompts. This ensures that the toy, rather than the adult, controls reciprocal play.

Teaching: During teaching sessions, the materials are set up in the same manner as baseline, except a VCR is set up with two chairs in front of it. Children are directed to sit in the chair on the side associated with their assigned character. They watch the video model play script two times and then are directed to the play materials and told, "It's time to play." Allow four

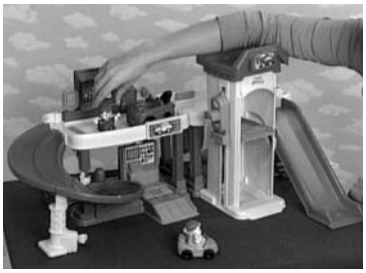
Figure 13. Pirate Script Data Sheet

Pirate Pretend Play Script

DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Captain Script

Objects	**Action**	+/-	**Vocals**	+/-
Captain	Open gate		"I'm looking for pirates to sail with me"	
	Walk up stairs to landing		"Come aboard, Pirate"	
			"I should drive"	
			"I'm the captain"	
	Turn wheel		"Vroom"	
			"Arrr. What do you see?"	
			"Fire the cannon!"	
	You drop the anchor		"Drop the anchor"	
	Point to map		"Let's look at the treasure map!"	
	Walk over to parrot		"Parrot, find the gold!"	
			"Maybe that is where the treasure is buried."	
	Turn Wheel		"Here we go"	
Total	/ 7		/ 12	



Pirate Script

Objects	**Action**	+/-	**Vocals**	+/-
Pirate			"I'm a pirate"	
			"OK"	
	Walk up stairs to landing		"Can I drive the ship?"	
	Sailor to crow's nest		"I'll look for other ships"	
			"A ship!"	
			"Over there!"	
	Get ball and load cannon		"1, 2, 3"	
	Jump on cannon switch		"Boom!"	
			"Aye Aye Captain"	
	Drop anchor			
	Sit in chair		"Wow! There is the gold."	
			"Let's send the parrot to find it."	
Parrot	Fly parrot		"Caw, Caw, Caw"	
	Land on white perch		"I see an island over there."	
Pirate	Hook anchor back up to ship		"I'll get the anchor"	
	Pirate to crow's nest		"We'll be rich!"	
Total	/ 10		/ 15	

Figure 14. Boat Script Data Sheet

Boat

DATE	
TEACHER/PARENT	
TRIAL TYPE (Probe, Training)	

Captain Script

Objects	**Action**	+/-	**Vocals**	+/-
Man			"Let's ride the boat"	
Lady	Go to man		"Everybody in"	
Lady	Put tools under purple house		"I'll get the tools"	
Man	Put flag on boat		"I'll get the flag"	
Man			"The animals go down here"	
Lady			"Get the bear"	
Bear	Go up ramp into boat		"ROAR"	
Lady	Close ramp			
Man	Open green door		"Don't forget the food"	
	Put food below		"Here you go"	
	Close green door			
	Put on boat			
Lady	Get on boat		"Let's go"	
Boat	Drive boat			
Man			"Wait!"	
			"We forgot the _____"	
Lady			"Oh no!!"	
Lady	Open ramp		"C'mon _____"	
Animal	Go up ramp into boat		*"Animal sound"*	
Lady	Close ramp		"Now we're ready"	
Boat	Drive boat			
Total	/ 15		/ 15	

minutes to play with the toys with the adult standing behind the children. No prompts or reinforcement are typically needed. When the time has elapsed, praise the children for playing regardless of their level of accuracy in following the modeled script. As in the pretend and toy play levels, once the children are performing at about 80% accuracy, have the children play with the toys without showing the video model.

Criteria for Selecting Typical Peers: We have found that selecting typical peers who have specific skills can increase the success of children with autism as they learn to participate in cooperative play (Table 5). Older children tend to be more patient and will wait for the child with autism to engage in the play script or will prompt him or her to perform the next action or vocal statement. Selecting a child who is flexible and cooperative is important. A typical peer who is assertive in play and who will engage in sustained attention to activities is critical because this peer will be facilitating the cooperative play. In addition, selecting a typical peer who has good social skills is important, because he or she will model unscripted appropriate social interactions and play skills for the child with autism. Finally, consider a child who is interested in helping and who is willing to participate in this new way of playing with toys.

Table 5. Criteria for Selecting Typical Peer

- Older than child with autism
- Flexible and cooperative
- Assertive in play
- Sustained attention to activities
- Socially competent
- Interest in helping; willing participant

For children who engage in stereotypic manipulation of toys, teaching play skills using video modeling can result in the development of a large repertoire of play skills. Parents often say they have a house full of toys but their child does not play with any of them. Video modeling offers an efficient and effective way to give children exposure to appropriate play with toys because children tend to learn quickly from video modeling. When selecting what to teach, focus on toys that are more generic in nature, as they lend themselves to better generalization. For example, most commercially available doctor kits include the same instruments but they might be different colors. Teaching a child with autism to play with a Fisher Price doctor kit should easily transfer to a different doctor kit with the same instruments.

Strategies to Increase Variability in Play

One concern in using scripts to teach play is that the scripts might interfere with the emergence of unscripted or novel play. Children with autism tend to learn the script and do not have the skills to extend their play beyond the script. There are, however, a number of empirically validated strategies available to help children generate more novel play following video modeling instruction (Table 6).

Table 6. Strategies to Increase Variability in Play

- Multiple scripts with same materials
- Extra materials available
- Substitutable loops
- Matrix training

Multiple Scripts with the Same Materials: The easiest strategy to generate more novel play is to teach multiple scripts with the same toys. The materials are the same for each script but the storyline is different and therefore the characters have different actions and vocalizations. Each script can build on the earlier script. For example, the first script might involve boarding the pirate ship (all characters start off the ship) and traveling to an island to get the treasure, while the second script could start with all the pirates on the ship and saving a pirate who fell in the water. Using this strategy, the children learn a variety of storylines and different ways of manipulating the characters or interacting with the toys. Given enough of these examples, children may start to generate new play.

Extra Materials Available: Another simple strategy is to make available extra materials that are never part of the video modeling script. For example, we have found that having extra toy food items available when teaching a script that includes a snack bar results in children using these untrained toys. Extra materials should include items that easily could be included in the theme of the play, such as foods at a snack bar, or vehicles at a garage. The mere presence of these additional materials can be enough for children to use them in their play.

Substitutable Loops: For some children, merely the presence of extra materials is not enough to generate novel play. A more systematic strategy for introducing extra materials involves use of a "substitutable loop" in which the script has a subscript embedded in it. This subscript consists of actions and

vocalizations for which any number of characters or materials could be substituted. The video model shows several characters performing the substitutable loop, or using specific materials in the substitutable loop and materials are available during play that were never shown in the video model.

A simple example of this strategy was demonstrated by Roberts et al. (2007) using doll as agent play. A script was developed using a boat and animals (Figure 14). In this example, the script involved animals walking on a boat and included a loop that started with "Oh no, we forgot the _____," as indicated by the shaded boxes in Figure 15. Three animals were shown performing the scripted loop in three different video modeling scripts on alternate days. A variety of other animals were available along with the training animals, but these animals were never shown in the video model. Roberts found that the children played with all of the animals using the substitutable loop, even the animals they were never trained to use.

Figure 15. Boat Substitutable Loop Model

(Shaded boxes indicated trained animals and open boxes indicate untrained animals)

Actions/ Vocal in Loop	Sheep	Bird	Alligator	Giraffe	Cow	Dog
"We forgot the _____"						
Walk on boat						
Make animal sound						

This strategy can also be used with the child as agent play. In this case, the child assumes a role in the script and manipulates different materials within the substitutable loop. Young (2005) used this strategy to teach ordering and preparing food with a McDonald's play set. She found that if the video model included ordering French fries, and chicken nuggets were also available in the fryolater, the children substituted chicken nuggets in their play. When using the substitutable loop strategy, it is important to find materials that could be substituted into the scripted play. Ordering different foods, or, as in the boat script, having different animals walk and talk, are some examples of materials that lend themselves to this sort of strategy.

Ostrowsky and Fouts (2008) used substitutable loop strategy to teach two children with autism reciprocal pretend play. Using a tool bench script that involved making several structures such as a birdhouse and a shed, they

taught children to use a variety of tools in their play. In this example, two children with autism were taking turns, and playing cooperatively using the same thematic structure but varying their play within the context of the theme.

Matrix Training to Vary Play: The matrix model is a strategy for organizing the teaching sequence to promote generalization. This procedure has been used most often to teach language. MacManus and MacDonald (2010) applied this model to teach play to children with autism by sequencing the video modeling script such that play actions, characters, objects, and locations varied in a manner that promoted recombinations of play scenarios. Using superheroes (Batman, Spiderman, Robin), vehicles (batmobile, batcycle, batcopter), valuable objects (diamond, ring, money) and settings (castle, mansion, bank), scripts for three play scenarios were developed. These scripts were arranged in a three-dimensional matrix, as shown in Figure 16. After video modeling training using this matrix model, all of the children were able to recombine actions and vocalizations for the characters across combinations of play materials not shown in the video model. In addition, these children began using the play materials for novel play. While this strategy is more complex to set up initially, it has promise as an efficient way to teach children to generate novel play.

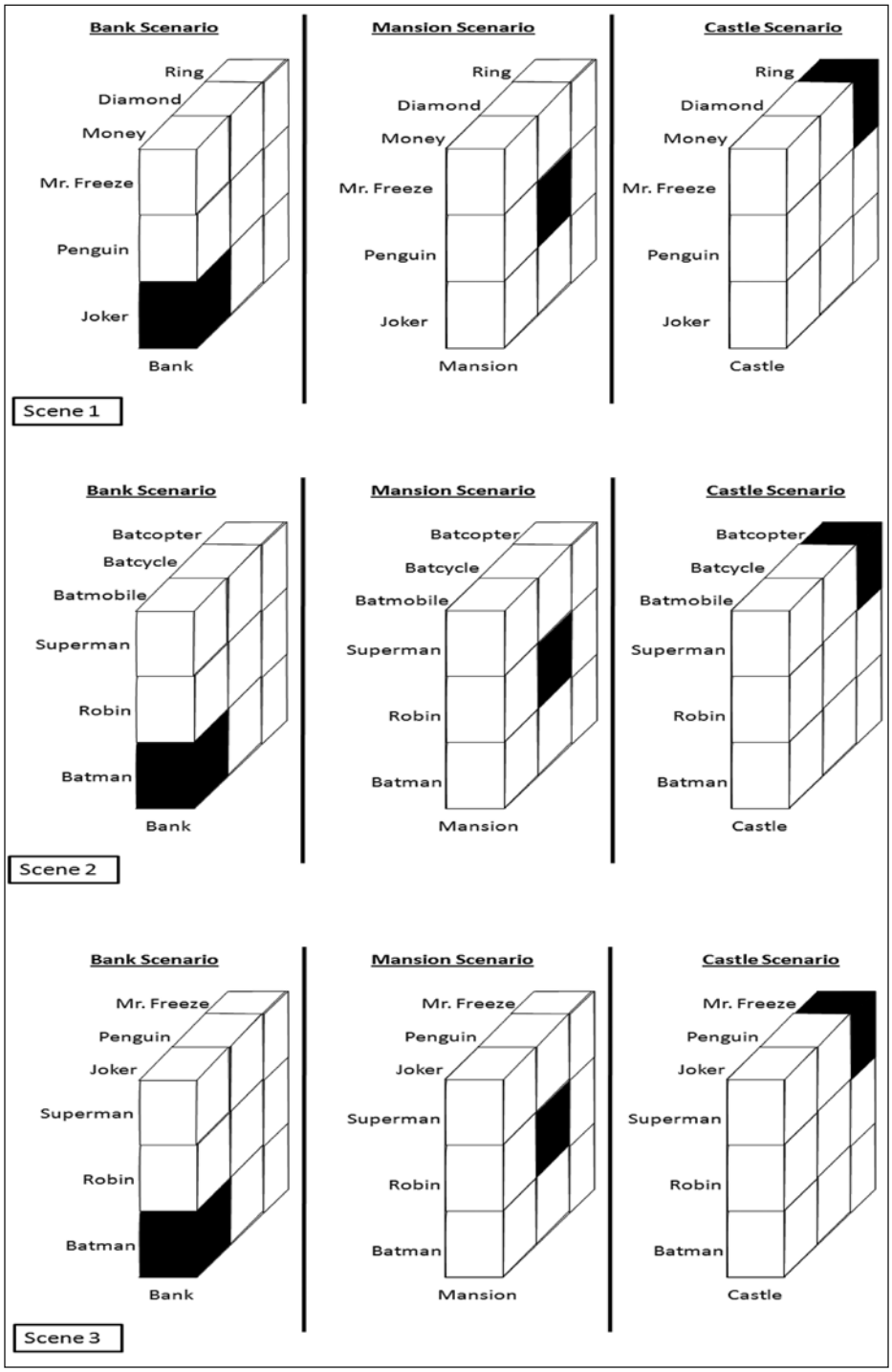
Summary

Video modeling is an efficient and effective teaching procedure to establish play in children with autism. Children who have the prerequisite skills of delayed imitation are ideal candidates to learn through video modeling. The procedures have been empirically validated with a variety of children, across a variety of different materials, to teach increasingly complex forms of play. Using video modeling to teach the play curriculum sequence outlined in this chapter, children can develop a rich repertoire of play skills.

Video modeling teaching procedures are easy to train and easy to implement. The most time consuming aspect of the procedure is creating the video models. However, once created, they can be used across many children. They can also be used by teachers and parents alike.

The emergence of novel unscripted play is slightly more challenging, but a variety of procedures can promote this type of play. The simplest strategies, involving multiple scripts and extra materials, can result in increases in the variety of play repertoires. Perhaps one of the most exciting areas in which video modeling has been shown to be effective is in teaching reciprocal pretend play with peers. Children show qualitative changes in cooperative play and social reciprocity in the context of play.

Figure 16. Matrix Model for Superhero Scripts



References

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice-Hall.

Charlop-Christy, M. H., Le, L., & Freeman, K. A. (2000). A comparison of video modeling with in vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders, 30,* 537-552.

Corbett, B. A., & Abdullah, M. (2005). Video modeling: Why does it work for children with autism? *Journal of Early and Intensive Behavior Intervention, 2*, 2-8.

Goldstein, H., & Cisar, C. L. (1992). Promoting interaction during sociodramatic play: Teaching scripts to typical preschoolers and classmates with disabilities. *Journal of Applied Behavior Analysis, 25,* 265-280.

Jahr, E., Eldevi, S., & Eikeseth, S. (2000). Teaching children with autism to initiate and sustain cooperative play. *Research in Developmental Disabilities, 21,* 151-169.

Jarrold, C. (2003). A review of research into pretend play in autism. *Autism, 7*, 379-390.

Kasari, C. (2002). Assessing change in early intervention programs for children with autism. *Journal of Autism and Developmental Disorders, 32*, 447-461.

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry, 47,* 611-620.

LeBlanc, L., Coates, M., Daneshvar, S., Charlop-Christy, M., Morris, C., & Lancaster, B. (2003). Using video modeling and reinforcement to teach perspective-taking skills to children with autism. *Journal of Applied Behavior Analysis, 36*, 253-257.

Lifter, K., (2000). Linking assessment to intervention for children with developmental disabilities or at-risk for developmental delay: The Development Play Assessment (DPA) Instrument. In K. Gitlin-Weiner, A. Sandgrund, & C. Schaefer, (Eds.), *Play diagnosis and assessment* (2nd ed.), pp. 228-261. New York, NY: Wiley.

Lifter, K., Ellis, J., Cannon, B., & Anderson, S. (2005). Developmental specificity in targeting and teaching play activities to children with pervasive developmental disorders. *Journal of Early Intervention, 27,* 247-267.

MacDonald, R., Clark, M., Garrigan, E., & Vangala, M. (2005). Using video modeling to teach pretend play to children with autism. *Behavioral Interventions, 20*, 225-238.

MacDonald, R., Robinson, M. E., Dickson, C. A., & Ahearn, W. H. (2010). Prerequisite skills for learning through video modeling: Role of delayed imitation and delayed matching. Unpublished manuscript.

MacDonald, R., Sacramone, S., Mansfield, R., Wiltz, K., & Ahearn, W. H. (2009). Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis, 42,* 43-55.

MacManus, C., & MacDonald, R. (May 2010). Video modeling and matrix training to teach pretend play in children with autism. Paper presented at the annual conference of the Association for Behavior Analysis, Austin, TX.

McCoy, K., & Hermansen, E. (2007). Video modeling for individuals with autism: A review of model types and effects. *Education and Treatment of Children, 30,* 183-213.

Murzynski, N. T., & Bourret, J. C. (2007). Combining video modeling and least-to-most prompting for establishing response chains. *Behavioral Interventions, 22*, 147-152.

Ostrowsky, D., Fouts, N., & MacDonald, R. P. F. (2008). Using video modeling to increase social interactions during play for children with autism. Poster presented at the annual convention of the Association for Behavior Analysis, Chicago, IL.

Palechka, G.D., & MacDonald, R. P. F. (2010). A comparison of play skill acquisition using teacher-created video models and commercially available video formats. *Education and Treatment of Children, 33,* 457-474.

Roberts, S. N., MacDonald, R. P. F., & Ahearn W. H. (2007, May). A method to teach varied play to children with ASD using video modeling. *Association for Behavior Analysis Special Interest Group Newsletter, 23,* 1-2.

Robinson, M. (2009). Training prerequisite skills for learning through video modeling. (Unpublished master's thesis).

Ryan, S., Mahoney, P., Braga-Kenyon, P. R., & Kara, L. (2009, May). Tooth brushing: Overcoming lack of motivation related to a task. Paper presented at the 35th ABAI Annual Conference, Phoenix, AZ.

Scattone, D. (2008). Enhancing the conversation skills of a boy with Asperger's disorder through social stories and video modeling. *Journal of Autism and Developmental Disabilities, 38,* 395-400.

Sigafoos, J., O'Reilly, M., Cannella, H., Upadhyaya, M., Edrisinha, C., Lancioni, G., et al. (2005). Computer-presented video prompting for teaching microwave oven use to three adults with developmental disabilities. *Journal of Behavioral Education, 14*, 189-201.

Tereshko, L., MacDonald, R. P. F., & Ahearn, W. H. (2010). Strategies for teaching children with autism to imitate response chains using video modeling. *Research in Autism Spectrum Disorders*.

Weiss, M. J., & Harris, S. J. (2001). *Reaching out, joining in: Teaching social skills to young children with autism.* Bethesda, MD: Woodbine House.

Young, J. (2007). Using video modeling to teach novel play skills to children with autism. (Unpublished master's thesis).