A SIBLING-MEDIATED BEHAVIORAL INTERVENTION FOR PROMOTING PLAY SKILLS IN CHILDREN WITH AUTISM

by

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A thesis submitted to the

Graduate School-New Brunswick

Rutgers, The State University of New Jersey

in partial fulfillment of the requirements

for the degree of

Master of Science

Graduate Program in Psychology

written under the direction of

Sandra L. Harris, Ph.D.

and approved by

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New Brunswick, New Jersey

January, 2011

ABSTRACT OF THE THESIS

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Siblings of children with autism often experience isolation and frustration within the sibling relationship. Studies have suggested that the quantity and quality of interaction between the pair is significantly poorer relative to sibling dyads affected by other developmental disabilities. However, research has shown that siblings can act as effective interventionists for their sibling with an Autism Spectrum Disorder. The present study assessed the efficacy of a home-based treatment program to teach siblings to use three sets of behavioral skills while playing with their brother or sister with autism. In a multiple baseline design across skills, three sibling dyads were trained to a) elicit play and play related speech, b) to deliver reinforcement and c) to prompt the child with autism following an incorrect or non-response. Siblings were also given a target word for each session which they attempted to teach. As evidenced in the completer dyad, siblings successfully acquired these behavioral skills, they maintained over time, and generalized to untrained contexts. Siblings with autism showed increases in responding to and initiating play-based interactions, and one of the children spontaneously verbalized target words. Siblings found the treatment to be acceptable, and parents indicated satisfaction

with the procedures. These findings support the hypothesis that siblings can utilize behavioral skills to act as effective interventionists in a play setting with their brother or sister with autism.

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Introduction

Typically developing children spend much of their free time engaged in play (Sutton-Smith, 1976). Without direct instruction, children perform play behaviors which are closely associated with important developmental gains in social skills, language, gross motor, creativity, emotional control, and problem solving (Bredekamp & Copple, 1997). Young children depend on first their parents and then later their siblings and peers to interact with toys and engage as imaginative partners. For children on the autism spectrum, appropriate play behavior does not advance as naturally nor as quickly. In a disorder characterized by impaired social interaction, communication, and restricted or stereotyped interests (DSM-IV-TR, 2000), play is often very limited or nonexistent. In the last three decades, research has consistently shown that play skills are impoverished in children with autism, so much so that diagnostic materials have included aspects of functional and symbolic play as criteria in assessments (ADOS: WPS Version; Lord, Rutter, DiLavore, & Risi, 1999, and the ADI-R; Lord, Rutter & LeCouteur, 1994).

For family members of children with autism, and especially for siblings, this deficit may be frustrating. As noted by Celiberti and Harris (1993), these children are more likely to not respond or to respond inappropriately to a sibling's attempt to engage them, and the siblings often lack the skill and understanding it requires to successfully interact with their brother or sister on the spectrum. After a number of failed attempts to play, it is likely that the sibling will become frustrated and give up, resulting in a pattern of low rates of interaction and lost opportunities for the acquisition of valuable play gains (James & Egel, 1986). For both the child with autism and the typically developing

sibling, joint play represents critical learning opportunities and a chance to bond with one another.

The Development of Play Behavior

There are five basic elements that define play: 1) Play is inherently motivating; 2) Play activities are the child's choice; 3) Play involves some level of imagination; 4) Play is enjoyable; and 5) Play keeps the child engaged (Boutot, Guenther, & Crozier, 2005; Wolfberg, 2003). Play behaviors are typically first observable around one year of age and the complexity and flexibility of play is influenced by increasing cognitive awareness and maturation as children progress through the differing stages of play (Piaget, 1962). Initially, children begin to learn about their world through exploring objects by physical manipulation such as mouthing or touching (Gibson, 1988; Williams, 2003). Around 14 months of age (Bretherton, 1984), children develop the capacity for functional play, or the use of an object in its intended manner, such as pushing a car across the floor or feeding a doll from a fork. Symbolic play involves pretence and is considered the highest level of play, often first observable around 24 months (Naber et al., 2008). Play is considered symbolic if a child is able to use an object as if it were a different object (e.g., a wooden block becomes a hairbrush), the object gains attributes it does not currently have (e.g., a doll is hungry), or the child is able to imagine the object when it is not present (e.g., "Come in my igloo!") (Baron-Cohen, 1987; Stahmer, 1995; Ungerer & Sigman, 1981). Symbolic play is considered more complex than functional play as it involves moving away from the concrete qualities of an object and instead creating figurative imaginative qualities that require higher level cognitive processes. According to Piaget (1962), as children progress to more sophisticated plays acts, these activities

begin to function as rehearsals for potential real world occurrences and play an important role in the experience of emotion regulation, whether real or contrived (Rutherford, Young, Hepburn, & Rogers, 2007).

Play Behavior in Autism

It is widely accepted that children with autism perform less complex play activities and have less symbolic play than typically developing children or children with other disabilities (e.g., Baron-Cohen, 1987; Lewis & Boucher, 1988; Stahmer,1995; Wing, Gould, Yeats, & Brierly, 1977). While some would argue that the level of demonstrated play complexity is directly proportionate to the child's mental age, the evidence in the literature remains mixed. A 1986 study by Gould found that ratings of play were positively correlated with scores on the Bayley Scales of Infant Development (Bayley, 1969), implying a relationship between cognitive ability and level of play. Baron-Cohen (1987) also found that even among children diagnosed with autism, those who utilized pretend play had significantly greater nonverbal mental age estimates than those who did not use pretend play. However, other studies have shown that when children with autism are compared to children with other disabilities at an equivalent mental age, they have consistently lower scores in pretend play (Power & Radcliffe, 1989; Riguet, Taylor, Benaroya, & Klein, 1981). While mental age may play a role in creating this deficit, it seems likely that unique factors in autism also contribute.

As symbolic representations have been tied to many other coinciding developmental gains, they have understandably been the target of many play based interventions. One such intervention used Pivotal Response Training (Koegel et al.,

1989) to model appropriate symbolic training (Stahmer, 1995). Following the intervention, all of the participants were performing symbolic play acts at levels equivalent to those of language matched typically developing children. Perhaps most significantly, many of the participants were able to generalize symbolic play to new toys and with new partners, even after a three month follow up period. The ability to generalize an acquired skill across novel contexts has historically been a problem for children with autism (Plaisted, 2001). While others have argued that modeling symbolic play merely teaches deferred imitative action sequences (Williams, Reddy, & Costall, 2001) the generalization to new toys makes it less likely that the child was reproducing scripts with a novel stimulus in a novel environment.

Another collateral gain noted in the Stahmer (1995) study was in an area where children with autism struggle most palpably: social skills. Children who began to engage in the highest level of symbolic play following the training also had the highest increases in responding to and initiating play requests with adults. Across the board, positive responses were increased, while initiations for play among children with lower levels of symbolic play remained closer to baseline levels. Interestingly, participants did a poorer job responding to play requests from peers. This may be because of the difficulties associated in generalizing the training from adults to peers, or the fact that children are less forgiving of poor play skills in their peers (Oke & Schreibman, 1990; Stahmer, 1995). Additionally, Stanley and Konstantareas (2007) found a positive correlation between social development and symbolic play ability in children whose nonverbal IQ scores were above the sample median. However, in children whose scores fell below the median, no such relationship was noted.

Echoing research on play and caregiver attachment in neurotypical children, recent research extended Ainsworth's classic work on attachment theory (1978) to symbolic play in children with autism. In a study comparing children on the spectrum to neurotypical children and children with other disorders, it was found that attachment quality predicted play behavior regardless of the clinical diagnosis of the child (Naber et al., 2008). In children with autism, those who were securely attached to their caregiver spent significantly greater amounts of time exploring their environment and playing symbolically than did children with autism who had a disorganized attachment to their caregiver.

Theoretical Underpinnings of Play and Autism

Several theories have attempted to explain the nature of the discrepancy in representational play and autism. In an influential paper, Leslie (1987) posits that children with autism do not have the cognitive flexibility to "decouple" learned representations of objects in the world and to alter them to more fluid "metarepresentations" by applying symbolic meaning in an imaginary fashion (Hobson, Lee, & Hobson, 2009). The ability to metarepresent involves the ability to be aware of the object's primary use, while holding another simultaneous imaginative representation in mind. Leslie likens this inability to form metarepresentations to the same cognitive processes implicated in theory of mind tasks. Indeed, in the 1987 Baron-Cohen study, children with autism produced similar levels of functional play, yet much less symbolic play than their peers. If similar parts of the brain govern theory of mind and symbolic play, then it follows that individuals with autism will show impairments in both.

Another theory points to a lack of creative generativity as a result of impaired executive functioning (National Research Council, 2001). This view holds that individuals on the spectrum have difficulty with the typical executive function tasks of planning, organizing and attending. As such, it becomes difficult to switch from concrete to make believe play sets and to disengage from rigid "real world" thinking (Harris, 1993; Hobson et al., 2009). In addition, research points to the fact that children with autism have difficulty generating new make believe ideas on their own. With proper adult scaffolding and modeling put into place, they are able to successfully engage in pretend play, but are far less likely to create the initial imaginary scenario unprompted. This is in exact opposition to Leslie's theory of metarepresentation, as the children are able to carry out the symbolic acts once the scene has been set for them. This line of reasoning purports that the failure to think symbolically is the effect of an impairment in the area of the brain that allows one to generate creatively and sequentially organize and attend to new ideas.

Play and Language

Toddlerhood is an exciting time of rapid developmental gains for a child, and research has shown that the relationship between play and language is likely reciprocal in nature. While there are a number of ways in which the two are correlated, they both depend on the concept of symbolic representation (Lewis, 2003). As children develop and language and play evolve, ideas move from single word objects and phrases (e.g., "baby") to more complicated actions and phrases (e.g., "The baby is petting the dog"). A 2000 study by Lewis, Boucher, Lupton, and Watson showed that symbolic play was correlated with expressive and receptive language in children between 1 and 6 years, but

functional play was only correlated with expressive language. This might be a reflection of the emergence of lower level functional play developing alongside expressive language abilities. Another study correlated expressive language levels to both functional and symbolic play in 20 month olds, while simultaneously finding that the relationship between play and receptive language was not significant (Charman et al., 2000).

Given the close developmental proximity of language and play, one might likely assume that they co-occur at similar time points. However, developmental literature continually points to play as the likely predecessor. In a longitudinal study following children on a monthly basis from 8 to 24 months, McCune (1995) found that symbolic play acted as a precursor to first words. Sequentially, symbolic play predated language by a couple of months, and each level of more complicated symbolic play was followed shortly by increasingly complex utterances. Other research supports this timeline, suggesting that measures of play taken at 13 months were significantly correlated with aspects of language at 22 months, with fewer correlations reported between language at 13 months and measures of play at 22 months (Ungerer & Sigman, 1984).

Play and Language in Autism

In addition to social skills deficits, qualitative impairments in communication are a hallmark feature in an autism diagnosis and it is often this delay in language that causes parents to suspect a developmental disability. In most cases, spoken language is either delayed or nonexistent at normative developmental milestones in children with autism. Studies estimate that between 25-50% of these individuals do not develop functional spoken communication by the age of 10-13 years (Lord & Schopler, 1989; Sigman &

Ruskin, 1999). It is well established that an early diagnosis and intervention lead to optimal outcomes, and interventions focused on language are no exception to this rule.

While many recognize that language and play reflect deficits in children with autism, there is a general paucity of research on the interrelatedness of the two. Early research showed a positive correlation between language comprehension and the spontaneous use of object-directed and self-directed functional play (Ungerer & Sigman, 1981). Although few children with autism engage in symbolic play behavior, this study also noted that when the children had higher levels of language comprehension, they were more able to play symbolically following a modeled prompt. From an educational standpoint, this correlation appears to be a logical one: the better the child is able to follow an instruction or a model, the more likely it is that he or she will succeed at subsequent imitation. A study by Mundy et al. (1987) lends support to this argument. Significant positive correlations were found between the number of symbolic play acts and both expressive and receptive language skills, while no there was no relationship between functional play and language.

While earlier literature appeared to support a strong relationship between play and language in children with autism, more recent research has been more careful to partial out age as a potential confounding variable. For example, when Lewis and Boucher reexamined data from their 1988 study, they found that their significant relationship between both expressive and receptive language and play suddenly became nonsignificant when accounting for the effects of age. However, longitudinal data from Sigman and Ruskin (1999) do show that advances in expressive language could be predicted by the number of functional play acts. Interestingly, these data were not

significant across a one year time span, but rather across an eight or nine year time span. The general lack of longitudinal research investigating play and language may lead us to overlook the important qualitative data in this relationship. As a result, it is possible that the one and two year windows where language gains were made are more easily attributable to maturation effects, and can only be fully understood over a larger interval of time.

A common problem among young children on the autism spectrum is that they are often hesitant to use language unless prompted to do so. Interventionists search for ways to increase spontaneous language through the labeling or "tacting" of objects in the environment, particularly salient in more naturalistic play-based settings. Past research has shown that when learners on the autism spectrum become overly dependent on verbal prompts, they have difficulty generating tacts for objects in the environment in the absence of a verbal prompt, and as a result have poor generalization outside of the original setting in which it was learned (Williams & Greer, 1993). Williams, Carnerero, and Perez-Gonzalez (2006) noted that when verbal children with autism were initially presented with an action (e.g., a teacher pretending to "sleep") they failed to spontaneously tact the action, and would only do so in response to the cue "What is she doing?". However, once the students began tacting actions without the antecedent, they were successfully able to generalize spontaneous tacting to other actions that had previously required a verbal prompt.

Generalizing vocalizations across environments and stimuli is a consistent challenge in the education of a learner with autism. As Skinner noted in 1957, when a verbalization is learned in one manner (e.g., a mand) it cannot be assumed that the same

verbalization will retain its meaning across verbal operants (e.g., an intraverbal). Lending support to the functional independence of verbal operants is recent research showing that topographically similar responses as simple as ‘yes’ and ‘no’ required additional training in order to function across contexts (Shillingburg et al., 2009). To maximize learning of language and to increase the possibility of generalization, students need to learn to use words flexibly across operants and a variety of stimuli. Research has shown that merely teaching a child to tact an item leads to less sufficient rate of acquisition than utilizing a combination of mand-tact training (Arntzen & Almas, 2002). For example, participants were able to establish words across two operants (tact and mand) with the same pace as it took to establish words across one operant (mand only) when asked “What is it?” versus alternating between a mand and a tact.

A play-based learning structure provides the opportunity to utilize a variety of verbal operants in a context that the child finds reinforcing. Coordinating play behaviors, particularly with family members in a home setting, may stimulate enduring language gains. Early research has shown that neurotypical children of mothers whose vocalizations were aligned with the interest of their children in play had superior early communication skills seven months later (Carpenter, Nagell, & Tomasello, 1998). A longitudinal study by Siller and Sigman (2002) found that parents who were more responsive and synchronized to the verbalizations of their child with autism had children with significantly greater language gains than parents who were not as socially reactive. Interestingly, this association could not be explained by IQ, pre-existing language skill, or the child’s own level of responsiveness to bids for joint attention, and it was significantly greater at 1, 10, and 16 years after the initial assessment. The results from

this study are particularly encouraging for family members of children on the autism spectrum, and as yet have not been replicated with the coordinated play behaviors of the neurotypical siblings in these families.

The correlation between successfully responding to and initiating joint attention and language outcomes has been established as a positive one. Several studies have pointed out that children who undergo joint attention interventions make greater gains in language outcome measures (Charman et al., 2003; Dawson et al., 2004; Loveland & Landry, 1986). Research has also shown that in a randomized controlled trial, children with autism enrolled in a symbolic play intervention made similar advances in language as the joint attention intervention group in comparison to a control group (Kasari, Paparella, Freeman, & Jahromi, 2008). Interestingly, for children with lower baseline language skills, the joint attention intervention proved to be more effective. It is possible that a nonspecific treatment effect resulting from the symbolic play intervention was the establishment and maintenance of joint attention. Although not specifically targeted, when engaging with a child in a 1–to-1 play setting, parents and teachers often unknowingly practice joint attending skills.

Siblings of Children with Autism

Play behaviors have understandably become the target for an increasing number of interventions, and research has shown that siblings make the ideal playmate. Abramovitch, Corter, and Lando (1979) noted that interactions with siblings are likely the major source of interactions in the early developmental years. Neurotypical siblings are familiar with the behaviors of their brothers and sisters and are less likely to be put off by

behaviors that might cause typically developing peers to abstain from playing with the child with autism. Interventions aimed at increasing play behaviors are beneficial to both children, and both are given the opportunity to build a social connection with a lifelong partner.

Due to the genetic etiology for at least some autism spectrum disorders, concerns have been raised about the appropriateness and capabilities of siblings as trainers. Using children as teachers creates a power differential in the sibling pair, such that the neurotypical sibling is now expected to shape their younger sibling's behavior. In addition, practitioners may be concerned about the adaptive functioning of siblings of children with autism in the family. However, research has shown there is no difference on measures of verbal IQ, (Chuthapisith, Ruangdaraganon, Sombuntham, & Roongpraiwan, 2007) executive functioning, and social behavior (Wong, 2008) when siblings of children with autism are compared to a control group of children without autism in the family.

Research investigating the emotional functioning of siblings remains mixed. Some argue that siblings are at greater risk for developing social and behavioral problems (Orsmond & Seltzer, 2007). Bebko, Konstantareas, and Springer (1987) report that stress levels are generally higher in families with a child with autism, and the very nature of the social and communicative impairments may expose family members to psychological difficulties induced by stress (Glasberg, 2000). In a study comparing siblings of children with autism to siblings of children with Down syndrome, siblings of children with autism spent less time playing with their brother or sister and had fewer successful responses to their bids to play (Knott, Lewis, & Williams, 1995). When compared to children with typically developing siblings, the, siblings of children with autism often feel that they do

not receive as much parental attention (Howlin, 1988) and are asked to take on more responsibilities around the home, such as caring for the child with autism (Randall & Parker, 1999). In adulthood, siblings of an individual with autism were less likely to be in contact with their brother or sister, reported less positive affect throughout the relationship, and were more likely to claim that their relationship with their parents had been altered as compared to siblings of individuals with Down syndrome (Orsmond & Seltzer, 2007).

Conversely, studies have also shown that having a sibling with autism fosters psychosocial and emotional development within a stable family unit (Macks & Reeve, 2007), and a positive view of the self (Ferrari, 1984; Mates, 1990). Interestingly, Macks and Reeve found that siblings of children with autism reported more positive scores on self-concept measures and had lower depression scores than children of typically developing children. However, if the sibling of the child with autism is concurrently facing multiple demographic risk factors (e.g., an unstable family situation such as a divorce) they have a lower threshold for successfully coping with psychological and emotional problems when they arise. In a 2007 study comparing siblings of autistic, Down syndrome, and children with various forms of intellectual disability, Hastings found that children with an autistic sibling were not at an increased risk for developing adjustment problems, nor was adjustment adversely effected by behavioral changes in their sibling over the course of two years. A potential protective factor for siblings may be the temperamental dimension of persistence, which is believed to be directly related to the quality of the sibling relationship (Rivers & Stoneman, 2008). As children with autism often don't respond to their siblings' request to play or respond in a way that is

negatively reinforcing to the sibling (e.g., aggression or screaming) the majority of children might give up on interactions. It makes sense that those who persist and continually try to engage their brothers and sisters have stronger relationships.

When children with autism do make initiations to play with family members, they are more likely to make these bids towards siblings rather than parents (El-Ghoroury & Romanczyk, 1999). Although parents made more initial bids to play than the typically developing children, children with autism were more likely to attempt to engage a brother or sister. In sibling pairs with a Down syndrome child, the disabled child interacted with the sibling by imitating his or her actions, and this pattern was found to be reversed in sibling relationships where the child had an autism spectrum disorder (Knott, Lewis, & Williams, 2007). Taken together, the desire to interact with siblings is intact, but the mechanisms inherent to the disorder hinder the initiations and maintenance of joint play interactions. However, research on intervention strategies utilizing siblings as behavioral models has largely been met with success.

Sibling Mediated Interventions

Cash and Evans (1975) were the first to demonstrate that children could be taught to modify the behavior of siblings with disabilities. Shortly after, Colletti and Harris (1977) successfully trained a sibling to use contingent reinforcement to shape her sister's behavior. There are a number of other studies using the principles of Applied Behavior Analysis (ABA) to teach behavioral training to siblings (e.g., Miller & Cantwell, 1976; Schreibman, O'Neill, & Koegel, 1983; Lobato & Tlaker, 1985; James & Egel, 1986; Swenson-Pierce, Kohl, & Egel, 1987). In one of the early studies applying sibling

training to a child with autism (Schreibman, O'Neill, & Koegel, 1983), siblings quickly learned to use behavioral training and to generalize their new skills to a less structured novel setting. As siblings improved their teaching skills, there were collateral gains in the level of correct responding in the sibling with autism. Perhaps most importantly, typically developing siblings made fewer negative comments and more positive remarks about their brother or sister with autism following the training.

Early studies focused on teaching socialization skills to children through siblings noted that siblings were easily able to acquire training procedures, increased their own number of initiations, and that their sibling's response to initiations, and reciprocal social interaction were maintained by the child with autism across an untrained, novel child without autism (James & Egel, 1986). Importantly, the increased rate of initiations of the typical sibling was retained at a 6-month follow-up. Celiberti and Harris (1993) were the first to promote social play behavior with siblings for children with autism. The researchers found that typical siblings were able to acquire skill sets aimed at acquiring and maintaining cooperative play behavior and language in their sibling with autism, and siblings were able to generalize their new skills to a novel toy and maintained their skills at a 16 week follow-up period. Social validity ratings also reflected positive changes in the playtime behavior of the child with autism.

Siblings have also been able to effectively utilize Pivotal Response Training techniques to train social behaviors in children with autism (Sulllivan, 1999). Again, it was found that siblings were capable of leaning and implementing training strategies, resulting in an increase in behaviors that maintain interactions and a decrease in non-engagement in the child with autism. More recent studies noted collateral gains in joint

attention following a sibling-mediated social intervention (Tsao & Odom, 2006). Although not specifically targeted, joint attention is embedded in social interaction by its very nature, and an increase in play interactions led to a requisite increase in joint attending behaviors. In the study by Tsao and Odom, increased social interaction failed to generalize from a home setting to a novel setting, highlighting the difficulties associated with generalizing any new skill taught to a child with autism.

The present study was largely based on the work of Celiberti and Harris (1993) and involved a systematic replication of that earlier study. While maintaining the original three skill sets acquired by the sibling trainers, the intervention also focused on the impact of training on the sibling with autism. While the earlier study found that typical children may learn to act as behavior modifiers, the present work extended this research by aiming to understand the impact of such training on initiating, responding, and the maintenance of social interaction in children with autism. In addition, potential collateral language gains associated with enhanced play skills were also tracked in the sibling with autism. While recognizing the important role of sibling play relationships and attempting to make these interactions more enjoyable for both children, the present author investigated the social validity of the measures from the perspective of the parent and the typically developing child.

Method

Participants

Participants were three sibling-target pairs recruited from a waitlist of families seeking home based services at the Douglass Developmental Disabilities Center at Rutgers University. An introductory letter (see Appendix A) describing the aim of the study was sent to all families with a child with autism between three and five years of age. In order to protect the privacy of families, the envelopes sent to parents were addressed by a staff member who knew the families and had no involvement in the research. Eligibility for participation required that the child have some verbalizations, and that their neurotypical sibling could have no developmental or behavioral disorders and had to be between the ages of five and ten years old in order to stimulate appropriate cooperative play with the child on the autism spectrum. 18 families responded to recruitment letters, and several had to be excluded because of distance or the ages of the sibling pair. Two were excluded because of aggressive behavior in the child with autism toward their sibling.

This study included three sibling dyads. The first dyad was composed of Dante, a 4 year, 2 month old boy with autism, and his 10 year, 2 month old sister Dakota. The second dyad consisted of Andrew, a 4 year and 3 month old child with autism, and Annie, his 6 year 11 month old sister. The final dyad consisted of Cory, a 3 year 9 month old boy with autism, and his sister Sara, aged 6 years and 3 months.

Assessment

To assess the presence and severity of an autism spectrum diagnosis, the target children were seen at the Douglass Developmental Disabilities Center for the administration of the *Autism Diagnostic Observation Schedule* (*ADOS*: WPS Version; Lord, Rutter, DiLavore, & Risi, 1999) prior to the first home teaching session. Due to travel constraints, Cory was evaluated in his home prior to beginning the intervention. Dante and Andrew were given a module 1 ADOS, appropriate for children who are pre-verbal or use single words. Cory was administered a module 2 ADOS, appropriate for children with phrase speech. All three children exceeded Autism score cut-offs on this measure, confirming existing diagnoses.

In the same session, the *Mullen Scales of Early Learning* was administered to obtain a mental age across motor, perceptual, and language domains (Mullen, 1997). The Mullen is a standardized developmental test for use with children between 3 and 60 months which demonstrates good concurrent reliability with other established tests measuring motor, language, and cognitive development. Participants were all given a standard administration of this test, with reinforcement and praise as needed to maintain motivation and cooperation. Dante's mental age averaged across all five domains was 15.2 months, while Andrew and Cory had an average mental age of 12.6 and 39.8 months, respectively. Refer to Table 1 for demographic information and scores across domains on this measure.

Table 1

Demographic Characteristics for Sibling with Autism at Entry to Study

		(Months)	*Mullen Age Equivalents*				
Child	Gender	CA	Gross motor	Fine motor	Visual Reception	Receptive Language	Expressive Language
Dante	M	50	21	18	19	10	8
Andrew	M	51	23	15	11	2	12
Cory	M	45	>33	42	46	41	37

During the administration of the Mullen, the primary caretaker completed the *Vineland Adaptive Behavior Scales-Parent /Caregiver Rating Form Second Edition* (Sparrow, Balla, & Cicchetti, 1984) to evaluate adaptive behavior skills in their child with autism across four domains: social, communication, daily living, and motor skills. Reliability coefficients reported for the Vineland for internal consistency, interrater reliability, and test re-test concordance are very strong, ranging from .8-.9. In addition, the validity of the questionnaire has been well established (Sparrow et al., 1984). Domain standard scores for Andrew and Cory are reported in Table 2. Repeated attempts to obtain questionnaires from Dante's parents were unsuccessful. Pre- and post-intervention, the *Expressive One-Word Picture Vocabulary Test* (*EOWPVT*; Gardner, 1980) were used to assess baseline expressive language skills that could potentially mediate successful play interactions in the child with autism. The EOWPVT is a standardized and validated measure that is commonly used to measure expressive language skills in individuals aged 2 to 95. Both Dante and Andrew obtained a standard score of <55 and a percentile rank of <1. Cory had significantly more language, with a baseline standard score of 97 and a percentile rank of 42.

Table 2

Vineland Adaptive Behavior Scale Domain Scores

	VABS II Domains-Standard Scores				
Child	Communication	Daily Living Skills	Socialization	Motor Skills	Adapt. Behav Comp.
Dante	--	--	--	--	--
Andrew	44	46	59	56	49
Cory	97	87	88	91	88

In addition, the *Child Behavior Checklist* (*CBCL*: Achenbach, 1991) was mailed to the family to assess emotional and behavioral functioning of the typically developing child and was returned on the day of the assessment. The CBCL is composed of 112 items which differentiate clinically referred from non-referred children on internalizing and externalizing behaviors based on a 3-point Likert scale. The CBCL is widely used and considered to psychometrically sound, demonstrating both strong reliability and validity when compared to other measures purported to measure similar constructs. Both Sara and Annie scores in the non-clinical range for internalizing and externalizing disorders, in accordance with parent report of no previous or current psychiatric diagnoses. Data for Dakota are not available as the form was not returned, but parents reported that she had no current diagnosis.

To evaluate social validity, siblings were interviewed by the examiner before and after the treatment in their homes to assess perceptions of their brother or sister with autism and the training (see Appendix C). Parents were also given a questionnaire (see Appendix D) following treatment to evaluate the perceived efficacy of the training for the

sibling pair, and to evaluate any changes observed in their children over the course of the intervention.

Written consent (see appendix B) was obtained from a parent of all the enrolled children, and verbal assent (see appendix C) was granted by the typical sibling. The present author, a graduate student in clinical psychology with six years of extensive experience in autism treatment and diagnosis, conducted all training and follow up sessions across all dyads.

Setting

All baseline, training, follow-up, and generalization sessions were conducted in a specified room of the family's home. Parents were invited to observe, but their attendance at sessions was not mandatory. The television and all other electronic entertainment equipment were turned off during all sessions to minimize potential distracters. The initial assessment of the child on the spectrum was conducted in an assessment room at the Douglass Developmental Disabilities Center.

Procedure

Each typical sibling received in-home training in which they sequentially acquired three behavioral skill sets aimed at encouraging and maintaining play interactions with the child with autism. These skill sets described by Celiberti and Harris (1993) correspond with treatment conditions, and included (A) effectively establishing and delivering play-related commands; (B) delivering praise contingent on appropriate behavior; and (C) responding to incorrect or nonresponding. Social initiations,

responsiveness, and frequency of expressive language of the child with autism were assessed across all baseline, training, and follow up sessions.

Materials

Toys used for baseline, performance probes, and follow up were the Playskool *Mr. Potato Head,* Fisher-Price *Little People Animal Sounds Farm*, Fisher-Price *Little People Tow 'N Pull Tractor,* Friction *Farm Tractor,* and Melissa and Doug *Pasture Pals 12 Horses.* The Little Tike *Fold Up and Go Train* set was used as the novel toy during the generalization check with the siblings. The toys for used for training prior to each session included the Fisher-Price Medical Kit, Play-Doh *Case of Colors,* Melissa and Doug *Deluxe Wooden Construction Vehicles Chunky Wood Puzzle- 6 Piece,* Melissa and Doug *Magnetic Puzzle Game – Tow Truck,* Imaginarium *75-Piece Wooden Blocks Set,* Blip *Hair Ball*, and the Fisher-Price *2- in-1 Crocodile Keys Xylophone.* The video recording equipment to be used to video all sessions was a Sony DCRSX40 Flash Memory Handycam Camcorder.

Design

A single-subject, multiple baseline design with multiple probes was used to assess the sibling's ability to acquire three sets of behavioral skills with replications across three sets of siblings. These skill sets included (A) effectively establishing and delivering play-related commands; (B) delivering praise contingently; and (C) responding to incorrect or nonresponding. Children were given training sequentially, meeting with the examiner for three days a week with two sessions at each meeting.

After the initial baseline period, each typical sibling was trained on skill set A, while skill sets B and C remained in baseline. Once skill set A was considered mastered, the pair moved on to skill set B, while set C continued in baseline. Skill set C was the last set trained. Upon mastery of a skill set, training for that particular skill was discontinued and intermittently reinforced with verbal praise once per session by the examiner for the duration of the study.

For each skill set, mastery was considered to be achieved when the typically developing sibling correctly demonstrated at least 80% of the target skills for two consecutive sessions. For skill set A, eliciting responses, an elicitation was scored as correct if the child with autism established eye contact with the sibling or was attending to the stimulus, the sibling's requests were varied and not merely repetitions, and the child with autism was allowed at least five seconds to respond. Data on the frequency of elicitations were taken, but the emphasis remained on the quality of these interactions, and as a result all of the above components had to be present concurrently to yield a score of "correct". Mastery of sets B and C were determined when the typical sibling respectively praised or prompted the target's responses at least 80% of the time across two consecutive sessions.

Three generalization probes were conducted in the same setting with a novel toy set. These probes were conducted in the baseline session, upon completion of training, and at the twelve week follow-up session. Follow-up data were collected at six weeks and twelve weeks after each dyad successfully completed training.

Intervention

As noted above, the behavioral skills taught to siblings in this study were a systematic replication of the intervention used by Celiberti and Harris to teach play skills (1993). For the purposes of the present study, the addition of a language based prompt was added to skill set A to investigate if target words incorporated naturalistically in a play-based context would be spontaneously acquired and utilized by the target child. Every two sessions the examiner introduced a "word of the day" to be the target word for those two sessions. All words were related to play materials, and were determined on the basis of baseline data and parent interview not to have already been demonstrated in the target child's vocabulary. Once a minute, the sibling was prompted to incorporate the target word into play (e.g., with the target word 'cow' siblings may state "Give me the cow" or "What does a cow say?"). A timer set to vibrate on 1 minute intervals was placed in the child's pocket to discretely remind them to use the target word. Due to the age of the siblings and the complexity of demands, the target word could be used across all verbal operants, and did not require that the typical sibling necessarily ask a question in which the target word must be labeled by name (e.g. "Please put the cow in the barn", or "Can you give me the cow?"). Target words were considered mastered when they were spontaneously spoken by the target child twice in an appropriate context in a single session. If the child mastered the target word in a single session, the following session a new target word was introduced. If the target word had not been used twice appropriately across two sessions, another word was chosen for the following session.

The purpose of the target word was to attempt to increase expressive vocabulary in a naturalistic, play based setting. As the play sessions were meant to be enjoyable for

both siblings, efforts were taken to weave an emphasis on target words into play interactions, without becoming a laborious task for either participant.

Training of Skill Sets

Skill Set A) This set focused on effectively delivering play-based commands to the target child. Commands took the form of directives that required the target child to manipulate a toy, or elicit play-based speech. Specifically, siblings were taught to:

1. Obtain eye contact and appropriate attending behavior before the delivery of a command or a model. Techniques for establishing attending behavior were demonstrated by the examiner.
2. Deliver instructions in a clear, simple, and audible manner, while maintaining enthusiasm.
3. Allow sufficient response time. The child was given 5 seconds to respond before that particular command is scored as a nonresponse. Siblings were taught to count to 5 mentally, or to softly count aloud after delivering an SD.
4. Use a wide range of directives and requests dispersed throughout the session.

Skill Set B) This set focused on reinforcing appropriate responding. The sibling learned how to deliver praise contingent upon play-related speech or play behavior. Set B involves the following skills:

1. Praise **every** instance of appropriate play or play-related speech that was in response to a request. The highest levels of praise and enthusiasm were reserved for any instance when the child speaks the target word.
2. Deliver social praise immediately, contingent on the response. For training, praise is required to follow within 3 seconds of the child's response.
3. Maintain a wide variety of praise statements.
4. Incorporate praise statements that were specific to the nature of the child's response (e.g. "Great job saying cow!" instead of "Nice work").
5. Vary the length and intonation of praise statements according to the appropriateness and novelty of the child's response.
6. Use physical contact whenever appropriate (e.g. tickles, hugs, squeezes) and to as great an extent as possible.
7. Deliver praise in a clear, direct, and enthusiastic manner.

Skill Set C) Set C focused on providing prompting or corrective feedback for non-responding or incorrect responding, and included the following skills:

1. Withhold prompts until a 5 sec interval has passed, the child responds incorrectly, or responds with incompatible behavior.
2. Provide feedback each time the child fails to demonstrate the desired response, (e.g., "Not quite, but let's try it again").
3. Provide a variety of prompts so that the child understands the request to the best of his/her ability, (e.g., "Copy me. See, do what I do. Like this").

4. Maximize attending behaviors during a prompt using techniques taught in skill set A.
5. Provide appropriate contingent reinforcement for any partial attempt (e.g., "Really nice job trying").

Sibling Training

At the start of each baseline condition in the participants' home, siblings were instructed to "play with your brother/sister like you normally do" using the barn set. An emphasis was placed on creating a typical interaction, without prompts or feedback from the examiner. The examiner only intervened in the event of risk of injury or emotional distress to either child, or if the child with autism left the play area and the sibling was unable to redirect the child back into the room within 10 seconds.

Training for the skill sets began with the examiner briefly reviewing the objectives for that set with the child. The examiner spent five minutes modeling each specific portion of the set with the child with autism, offering techniques and emphasizing goals. In the next 10 minutes, the typical child first role-played with the examiner and then practiced these skills with their sibling. The examiner offered consistent feedback during the training. If the child was having difficulty with any of the concepts, a role-play with the examiner was used again to help explain finer points. To keep motivation high, the examiner offered enthusiastic praise statements along with the corrective feedback to the teaching sibling. Initially, feedback specific to behaviors were on a continuous reinforcement schedule, and were gradually thinned to an intermittent schedule with increasing skill acquisition. The first 15 minutes of every training session continued in this format, with modeling and role-play sessions adapted as needed. In order to keep the

siblings motivated in a potentially frustrating situation, they were able to choose a prize from a “treasure chest” and a certificate of achievement at the completion of each skill set. The siblings chose from two separate treasure chests that were filled with items that were developmentally appropriate to the interests of each. At the end of all 3 components the typical sibling received a certificate testifying to his/her excellent teaching skills.

All sibling dyads were videotaped by the examiner during the final 10 minutes of a 25 minute session. These data were later analyzed and coded to assess the progress of the sibling pair.

Dependent Measures

Sibling with autism.

Data were collected during baseline, intervention, and follow-up on the number of social initiations and the number of social responses within the videotaped 10 minute period. Initiations were defined as any attempt to interact with the sibling through a variety of modalities (e.g., directed eye contact, speech, touch, or cooperative toy manipulation) not in response to an interaction made by a sibling. Social responses follow identical criteria to the initiation response, but contingent upon another’s social overture. Data were also taken on the frequency of any spontaneous use of the target word for that session, as well as the use of past target words across later sessions.

Teaching sibling.

Data for the sibling were scored as the frequency of the sibling’s attempt to initiate an interaction. The collected data reflected the frequency of skill sets: (A) ability to initiate an interaction, (B) when appropriate responding is reinforced and (C) when both incorrect and non-response were prompted. For set A, the data were divided into

both a qualitative and quantitative measure. "Elicitation attempts" reflect the frequency of such attempts, derived by dividing the total number of elicitation attempts (both correct and incorrect) by the total possible number of intervals in that session. Qualitatively, the "correct elicitation attempts" must reflect all the components discussed in training, and is computed by dividing the number of attempts scored as correct over the total number of elicitation attempts. Skill set B measured "praising", and is reflected by the number of occurrences when the sibling praised the child with autism appropriately, divided by the total number of opportunities to do so (equivalent to the number of correct responses by the child with autism). Scores for "prompting" from skill set C were obtained by the number of occurrences when the sibling correctly prompted the child with autism divided by the number of occurrences when the child with autism failed to respond or responded incorrectly.

Frequency data was also taken on the number of times in which the typical child utilized the target word. These data were recorded as response per minute, derived by dividing the total number of "target elicitations" by 10 (to reflect the videotaped 10 minute interval). Although the child was prompted to use the target word at least once per minute through the timer, some variation was expected and was recorded to note any potential differences in acquisition rates by the child with autism.

Interobserver Agreement

Prior to coding data, an undergraduate research assistant with prior experience working with children on the autism spectrum met with the investigator. This individual was responsible for memorizing observational codes, and was tested on her ability to define and correctly apply these codes (see appendix E). Initially, the observer practiced

coding on a taped segment from a previous sibling intervention which gave ample opportunity to code all target behaviors from the present study. When the interventionist and the observer were able to maintain a mean of 80% agreement across two consecutive training probes, coding for the present intervention began. The observer worked alone, and was unaware of the condition she was currently coding as well as the reliability scores while the study was ongoing. Throughout coding, the investigator tracked reliability and offered feedback as necessary to minimize observer drift.

For reliability, the sessions were divided on a 10 second interval basis, for a total of 60 intervals per taped session. The formula for exact agreement interobserver agreement (IOA) was used, and was obtained by dividing the number of intervals in which both observers agreed that the behavior occurred by the number of agreements and disagreements, multiplied by 100. In the event of a disagreement, data from the present author were designated as primary and were used. Reliability checks were distributed across conditions for each participant, such that each participant had at least one reliability check in each condition (baseline, each training set, and follow-up), resulting in interrater reliability for 20% of all sessions.

Reliability for each of the dependent variables shown in Table 3 was acceptable, with the mean for every category for every dyad falling above 80%. There were no instances for Dakota and Dante where reliability was ever less than 80%. Annie and Andrew had 3 sessions where one or more category fell below 80%. Likewise, Sara and Cory had 2 sessions where one or more category fell below 80%. In instances where reliability was less than 80%, the children were often very quiet on the tape and difficult to hear, particularly in the early training sessions.

Table 3

Reliability

	Dakota & Dante	*Annie & Andrew*	*Sara & Cory*
Eliticing Play-Qualitative			
Mean %	93.66	88.89	83.66
Range %	88 - 98	78 - 98	73 – 87
# of sessions < 80%	0	1	1
Eliticing Play-Quanitative			
Mean %	89.79	86.11	82.66
Range %	83 - 93	70 - 90	70 – 87
# of sessions < 80%	0	1	1
Praising			
Mean %	94.66	94.99	93.66
Range %	90 – 100	88 – 100	88 – 98
# of sessions < 80%	0	0	0
Prompting			
Mean %	92.66	88.87	89.33
Range %	85 – 97	82 - 100	82 – 100
# of sessions < 80%	0	0	0
Eliciting Target Word			
Mean %	98.33	93.33	96.66
Range %	--	--	95 – 98
# of sessions < 80%	0	0	0
Child with autism-Responding			
Mean %	92.33	82.22	91.73
Range %	87 – 95	60 – 98	85 – 87
# of sessions < 80%	0	1	0
Child with autism-Initiating			
Mean %	98.33	100	94.73
Range %	95 – 100	--	92 - 97
# of sessions < 80%	0	0	0

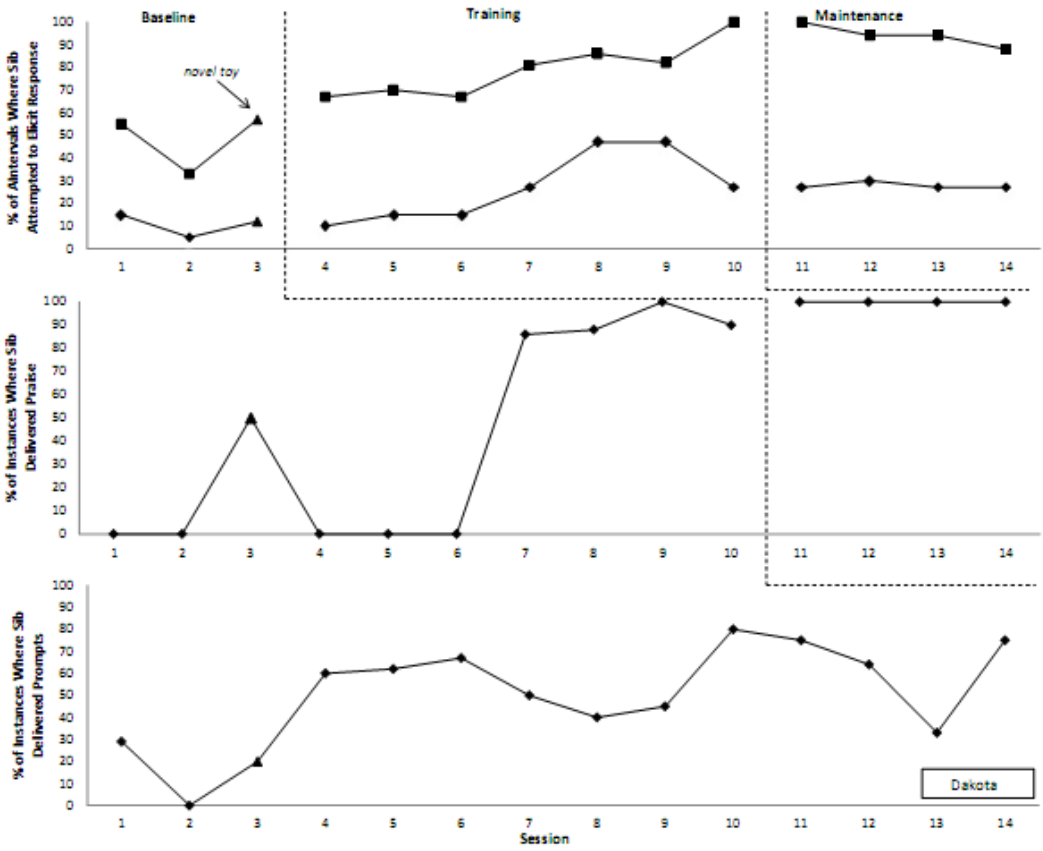
Results

Dakota & Dante

Figure 1 displays Dakota's performance data. Dakota participated in 3 baseline sessions, followed by 7 training sessions in skill set A and 4 training sessions in skill set B.

Figure 1.

Percentage of target behaviors across baseline, training, and maintenance for Dakota and percent of elicitations scored as adequate (square). Also reflects generalization probes across skills (triangle).

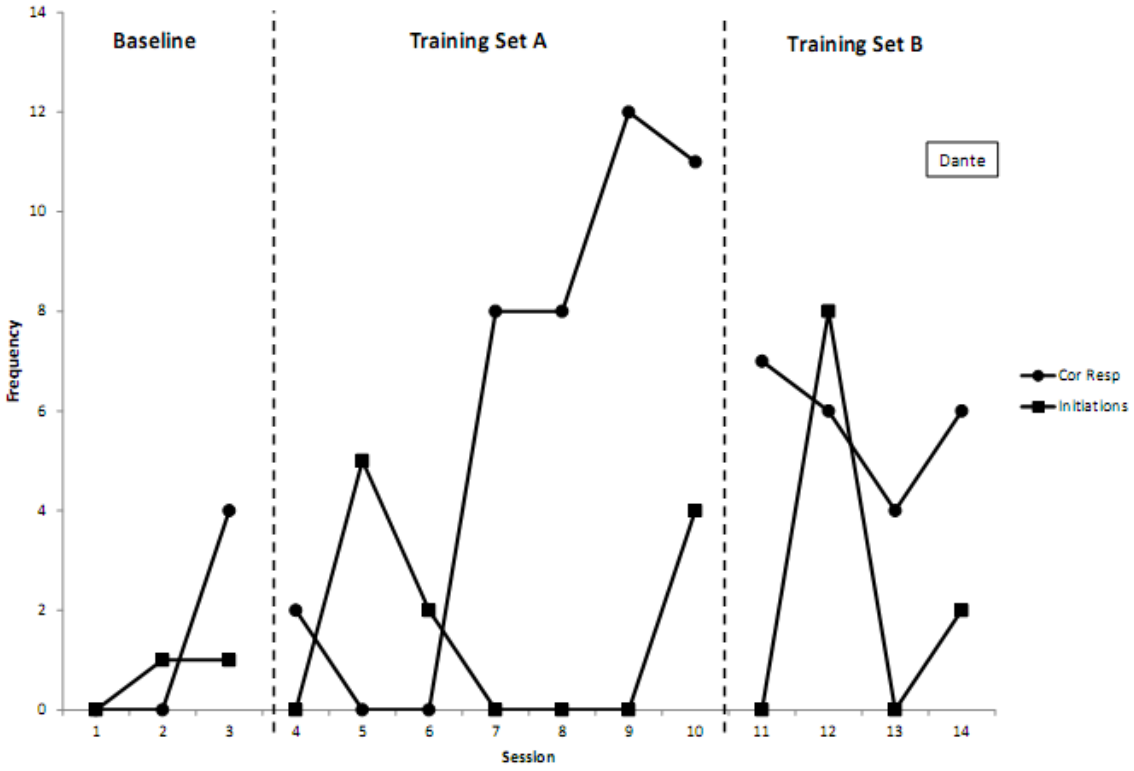


Dakota and Dante were able to withdraw at any point in the study without consequence, and their parents chose to terminate the intervention after session 14 due to scheduling conflicts. During baseline sessions, Dakota attempted to elicit play with her brother for an average of 11% of 10-second intervals. According to the coding criteria established in Appendix E, an average of 48% of these attempts were scored as adequate. Training for skill set A, eliciting responses, was started in session 4. Dakota advanced through training sessions very quickly, and the overall quality of her elicitations to her brother improved. The number of play bids that Dakota made to Dante also gradually increased through training for skill set A. Her frequency of delivering play bids averaged 27% of intervals in the first training set, compared to 11% of intervals during baseline. This trend continued once the praising skill set was initiated (M = 28%). She was similarly able to maintain high rates of adequate elicitations in the four sessions following direct training. In session 7 of the baseline for delivering praise, there was an unexpected jump where Dakota began to praise prior to direct teaching on appropriate delivery of reinforcement. Following training on the praising skill set, Dakota praised 100% of possible instances for the next four sessions, compared to 41% in baseline. Prompting data remained in baseline and never entered the intervention phase due to participant drop-out. The baseline data for prompting was highly variable throughout, ranging from 0 to 80%.

Figure 2 shows the number of correct responses and initiations made by Dante over the course of the intervention. The data show a variable but gradual trend toward increasing initiations across sessions.

Figure 2

Number of correct responses (circles) and initiations (squares) per session for Dante.



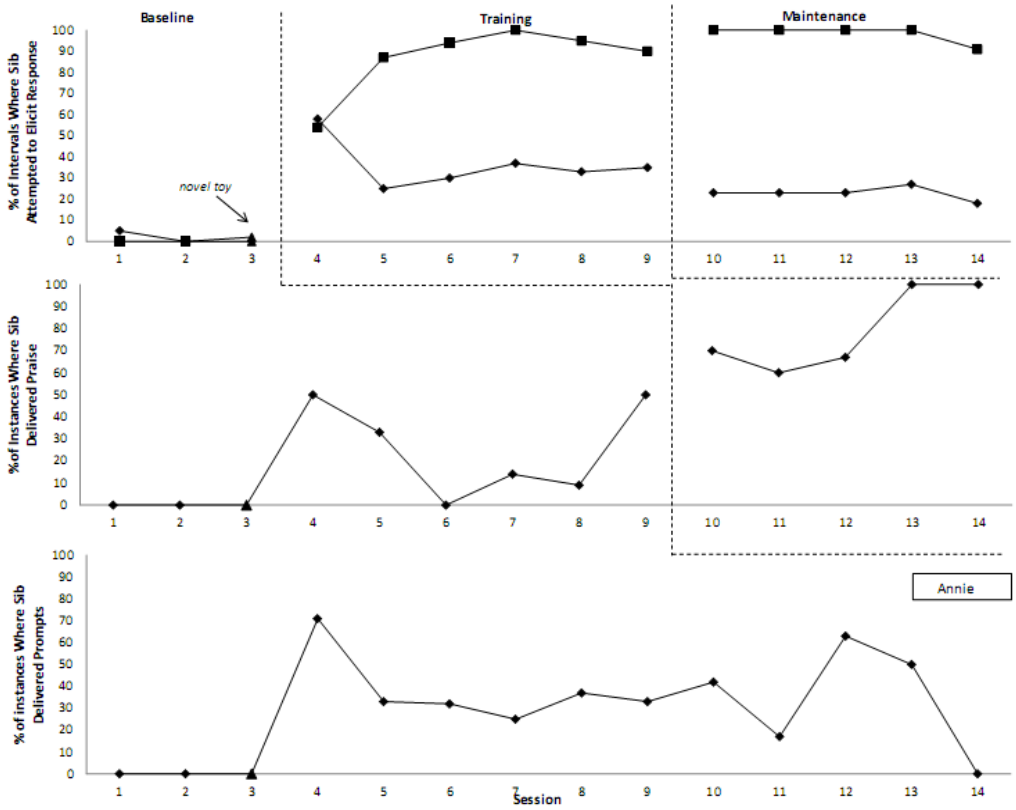
In baseline, Dante initiated interactions with his sister an average of .67 times a session, compared to an average of 1.9 times a session in the training phases. Correct responding increased dramatically in the training for skill set A, and continued to remain above baseline levels in the training portion of set B. During the course of the intervention, Dante spontaneously uttered an approximation of the target word “horse” and responded to an echoic prompt for the target word “barn” with another verbal approximation.

Annie & Andrew

The data for Annie's performance in the training are depicted in Figure 3. Due to an unforeseen circumstance that necessitated halting the intervention, Annie and Andrew also completed 14 total sessions.

Figure 3.

Percentage of target behaviors across baseline, training, and maintenance for Annie and percent of elicitations scored as adequate (square). Also reflects generalization probes across skills (triangle).



During the 3-session baseline, Annie attempted to elicit play with her brother an average of 2.3% of intervals, 0% of which were scored as adequate. There were no instances of prompting or reinforcement in the baseline sessions, and no differences when a novel toy was introduced in session 3. After the training was introduced for skill set A,

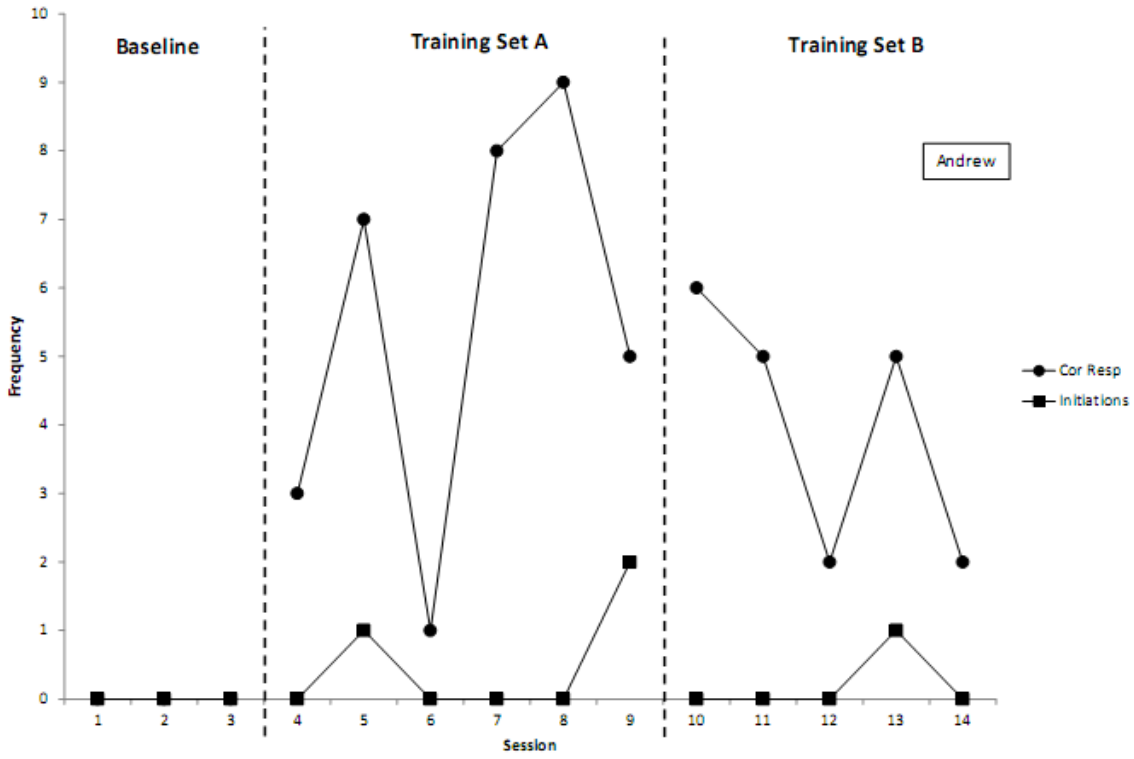
Annie rapidly increased the quality of her play elicitations from baseline rates (*M* = 0%) to a stable mean of 87% throughout the training for the first skill. There was also a dramatic increase in the instances in which she elicited play in the three baseline sessions (*M* = 2.3% of intervals) compared to an average of 36.33% when directly targeted throughout training for skill set A. When praise was introduced in skill set B, Annie's elicitations continued to increase in quality (*M* = 98%) and decrease slightly in frequency (*M* = 23%). Annie met criteria for acquisition for skill set A in session 6, but the intervention was continued to encourage a more stable rate of elicitations. Prior to initiating the intervention skill set B, the baseline for praise delivery was variable and relatively low, with Annie praising Andrew less than 50% for correct responding. Following training, Annie rapidly increased her praise delivery and met acquisition after 5 training trials. During training, praise delivery increased to an average of 80%, compared to a mean of 17% at baseline. Annie met criteria for acquisition at session 14, and the next session would have initiated the third skill set. As shown in Figure 3, Annie never entered the final phase of the intervention. The prompting baseline was low and variable with a mean of 28%.

Figure 4 shows the data for the number of Andrew's correct responses and initiations per session. After training began in skill set A, Andrew rose to an average of 5.5 correct responses per session, compared to 0 in baseline. As the sessions continued, Andrew's correct responding decreased in skill set B (*M* = 4). Andrew made no initiations to Annie in the baseline condition, and had three sessions in later training where he approached her first for play, and during one of these sessions approached her

twice. Andrew had no spontaneous or echoic approximations of the target word during training sessions.

Figure 4

Number of correct responses (circles) and initiations (squares) per session for Andrew.

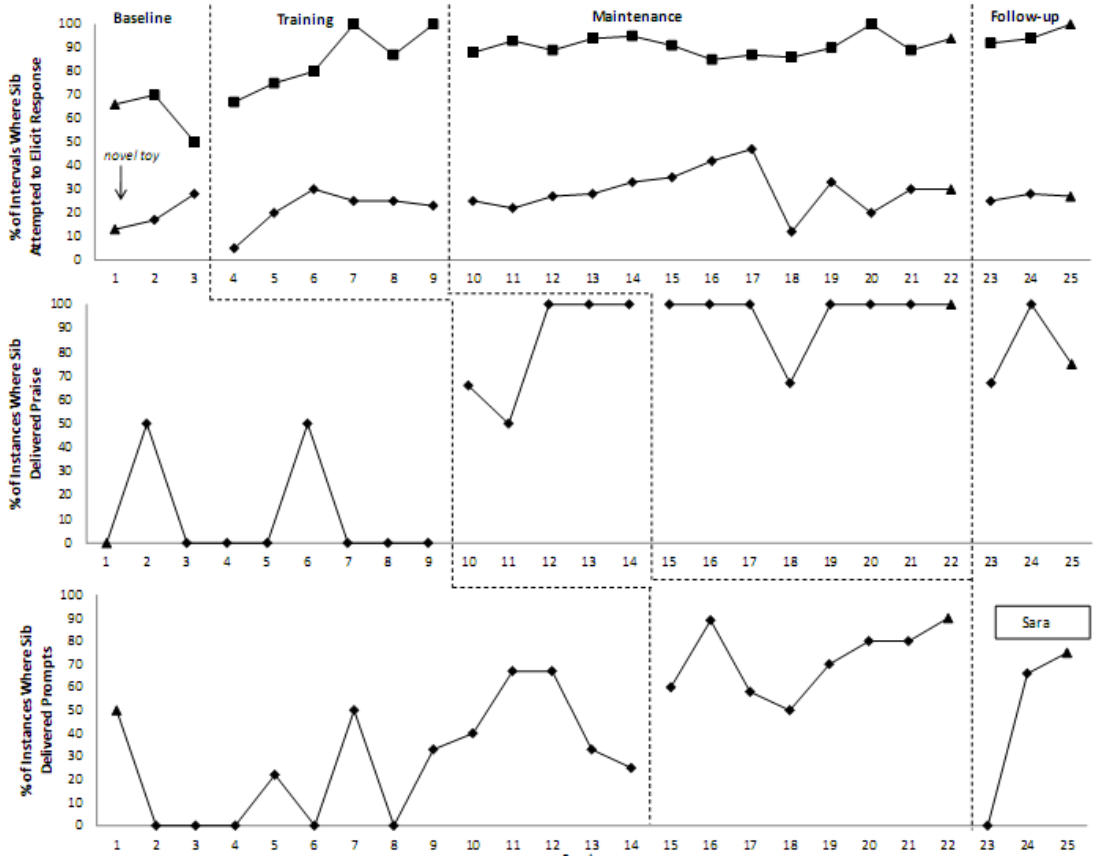


Sara & Cory

Figure 5 shows the training data for Sara across all three phases. Sara and Cory participated in 18 training and three follow-up sessions through the course of the intervention. Sara's rate of elicitations was an average of 19% of intervals for the three baseline sessions, and an average of 62% of these elicitations were scored as adequate. After training commenced on skill set A, eliciting responses, Sara's attempts to elicit

Figure 5

Percentage of target behaviors across baseline, training, maintenance, and follow-up for Sara and percent of elicitations scored as adequate (square). Also reflects generalization probes across skills (triangle).



play from her brother decreased briefly, and then increased again to average levels similar to baseline (M = 21%). Sara rapidly increased the quality of these elicitations, and was able to meet criteria for acquisition in the 7th session, though two more sessions were continued in the first skill set to ensure stable rates of elicitation. Sara was able to maintain consistent and high levels of adequate elicitations (M = 91%) when this skill moved into the maintenance phase. She continued to increase the percentage of intervals in which she performed a play elicitation, increasing from an average of 19.% in baseline, to 21% in training, and 30% in maintenance.

There was a notable increase in praise delivery following direct training on skill set B. Sara reinforced Cory's correct responding 5% of the time in baseline, and quickly increased to an average of 83.2% across five sessions in which she acquired the skill. Sara did very well with the delivery of praise in the maintenance phase, praising Cory for each correct response in 7 out of 8 maintenance sessions. Sara's third skill, prompting, had a variable baseline which was on a decreasing trend prior to initiating training (*M* = 27%). After training was introduced, Sara quickly improved on the percent of instances in which she prompted her brother. In 7 training sessions, she was able to acquire this skill and improved her mean for skill set C to 69%.

Figure 6

Number of correct responses (circles) and initiations (squares) per session for Cory.

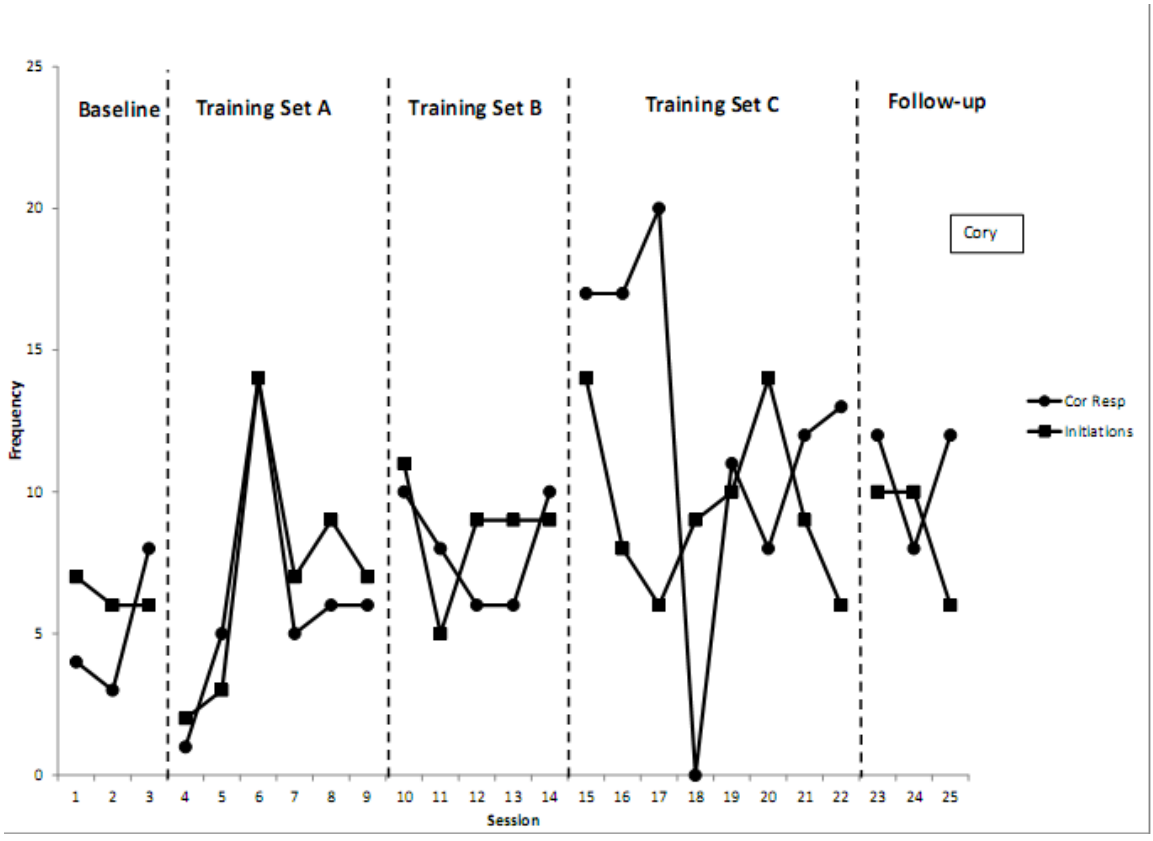


Figure 6 depicts the number of Cory's correct responses and play-based initiations made towards his sister. During the three session baseline, Cory's frequency of correct responding (*M* = 5) and initiations (*M* = 6) were both low. Over the course of 18 training sessions, means for number of correct responding increased to 8 per session, and initiations increased to an average of 9 per session. It should be noted that in session 18, Sara had very few instances of elicitations (12% of intervals), and Cory was never able to appropriately respond to any of them. The percent of questions which Cory responded to accurately also rose dramatically. During baseline, Cory was responding to an average of 44% of Sara's questions accurately. During the final three training sessions, this number rose to 79%. In sum, while Cory had a greater number of correct responses per session during training, he also increased on the percentage of questions that he as able to answer, despite the fact that Sara was asking more questions in later training sessions.

Follow-up data.

Because only Sara and Cory completed the full intervention, follow-up data are only available for this pair. Performance probes taken 6 and 12 weeks post intervention demonstrated that Sara was able to maintain most of her newly acquired skills at levels similar to training. In skill set A, Sara continued to deliver play elicitations at a consistent rate. During training, she elicited play from her brother an average of 21% of intervals and elicited play in 30% of intervals during maintenance. At 6 and 12 week follow-up, she elicited play an average of 27% of intervals, an increase from training, and a slight decrease from maintenance. From these two probes, an average of 93% of elicitations were scored as adequate in follow-up, an increase from the qualitative score obtained during training (*M* = 85%) and maintenance (*M* = 91%). These results indicate

that Sara was able to remember the rules for eliciting a play directive to her brother, and she actually improved on these criteria at the 6 and 12 week follow-up probe.

Follow-up data for skill set B, praise delivery, are also encouraging. In the week 6 probe, Sara reinforced her brother's correct responding 67% of the time, a decrease from both the maintenance (*M* = 95%) and training (*M* = 83%) phases, but a significant improvement from her baseline (*M* = 5%). Data from the 12 week follow-up session showed a more positive trend, with Sara reinforcing all instances of Cory's correct responding, or 100% of instances. Follow-up data from skill set C, prompting, showed a similar trend. In the six week follow-up session, Cory answered every play bid correctly, and there was no opportunity for Sara to provide prompting. At the 12 week follow-up there was an opportunity to Sara to prompt and she scored adequate on 67% of total instances, prompting 2 out of 3 incorrect or nonresponses from Cory. This number is fairly consistent with the average from the training phase of this skill (*M* = 69%) and marks a large increase from baseline levels of prompting (*M* = 27%).

Figure 6 shows that at 6 and 12 week follow-up, Cory continued to increase his levels of correct responding and initiating. At follow-up sessions, he averaged 10 correct responses per session, an increase from both baseline (M = 5) and training data (M = 8). Cory's initiations followed a similar pattern: He averaged 10 per session at follow-up, which again marked an increase from baseline (M = 6) and training (M = 9) levels of initiation.

Generalization data.

Sara and Cory were successfully able to transfer their skills to a novel toy set (see Figure 5). At the end of training and 12 week follow-up, Sara elicited play in 30% and

27% of intervals, respectively, using the train set, compared to 13% of intervals using the same novel toy in the baseline condition. 94% of these elicitations were scored as adequate at the end of training and 100% were adequate at 12 week follow-up, compared to 66% in the novel toy baseline condition. The data for skill sets A and B show a similar trend. Sara never delivered praise with the novel toy in the baseline condition, and at end of training praised 100% of correct responding and 75% at the final follow-up session. In baseline, Sara prompted her brother 50% of the time when the novel train set was used, compared to 90% at the end of training and 75% at the final follow-up session.

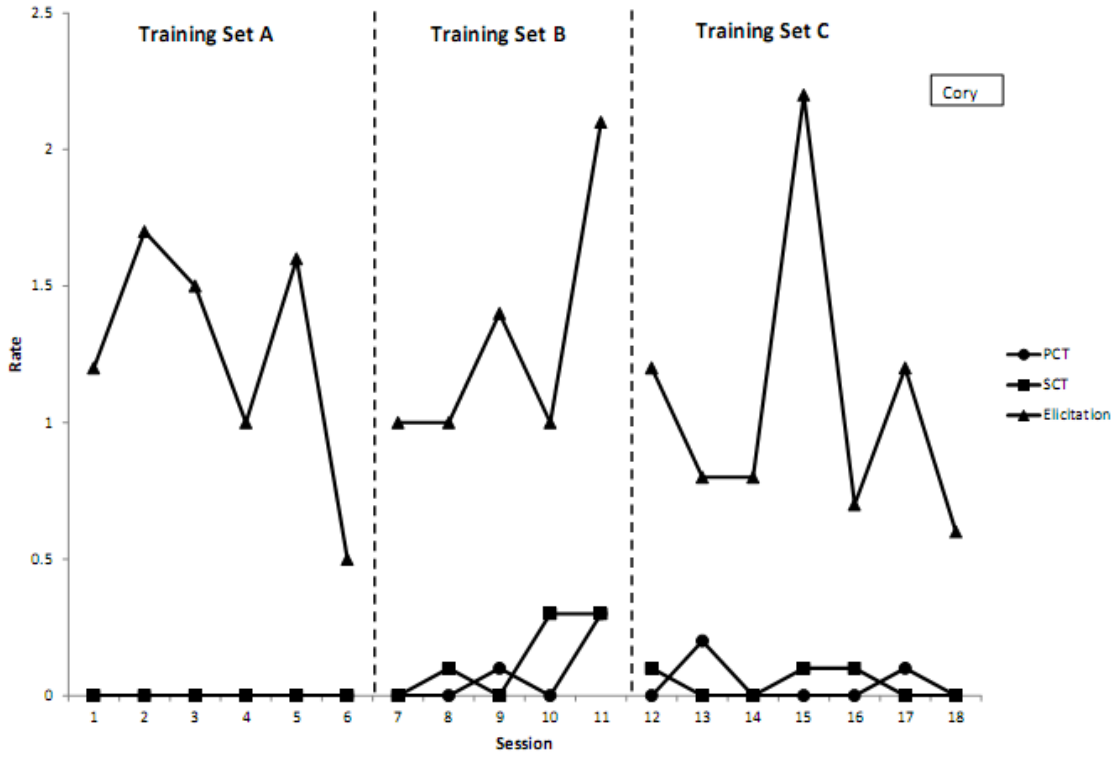
Target word elicitation data.

Figure 7 depicts data on the frequency of Sara's elicitation of the target word for each session, as well as Cory's spontaneous or prompted vocalizations of the target word. It should be noted that baseline, generalization, and follow-up sessions are not included, as there was no target word during these sessions. Beginning in session 8, Cory had his first spontaneous elicitation of the target word, followed by a prompted target word in session 9. In sessions 10 and 11 he rapidly increased in naming the target words without a prompt on three separate occasions. In sessions 12-17, he continues to have both prompted and spontaneous elicitations. Sara's rates of naming the target word averages to 1.25 times a minute across 18 training sessions.

Cory's score on the EOWPVT at conducted post-intervention also reflects an increase in expressive language skill. Cory obtained a standard score of 115 and a percentile rank of 84 compared to his pre-intervention score of 97, (percentile rank 42) taken approximately 6 months earlier.

Figure 7

Prompted target words (circles) and spontaneous target words (squares) elicited by Cory as rate per minute. Also reflects target word elicitations rate per minute (triangle) for each session by Sara.



Social Validity

All of the siblings were interviewed prior to beginning the assessment to examine their current attitudes towards playing with their brother with autism. A sample of responses is included below:

Q: Is it easy or hard to play with your brother/sister?
Dakota: Sometimes it's easy, sometimes it's a little hard. Sometimes when I want to do something, like read books, he just wants to go and do something else.
Annie: Easy with Legos®. It's hard without Legos®. He only likes Legos®.
Sara: Hard. Because he doesn't make any sense. He copies things from TV.

Q: What would you change to make your play time more fun for you both?
Annie: By working together more. He would learn how to not scream
Dakota: Well, for him to mostly focus on one thing for both of us to do together. Remember when you were videotaping? First he wanted to go to the farm, then he wanted to go the swing, you know? He likes a lot of different stuff.
Sara: That we will do something that we both want to do. Sometimes I play with his trains, but not very often.

Another interview was conducted post-intervention. As Sara was the only sibling participant who completed treatment, a sample from her answers are included below:

Q: What did you think about being a teacher to your brother?
Sara: Fun. It was fun playing with him and teaching him a lot of things.

Q: What was hard about being a teacher?
Sara: Knowing what to say.

Q: What is the most important thing you learned about playing with your brother?
Sara: That Cory had fun.

Q: Do you think your brother liked it when you played with him?
Sara: Yes. Because he was smiling. He was really wanting to play with me. He was playing with me when you weren't here. I taught my mom and dad like the first and second paper of rules. They needed them.

Q: Do you think you will still help your brother/sister by being a teacher when you play?
Sara: Yes!

Sara and Cory's parents indicated high levels of satisfaction with the treatment package as it related to both their children. On a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), parents rated the extent to which they agreed with positive statements about the treatment and it's impact on their children. Items 6 and 7 were reverse coded. The mean score for this rating scale was a 4.7, indicating a high degree of satisfaction with the treatment package. They also reported observing improvements on various dimensions of their child's interactions, including, cooperative play, shared

enjoyment, less frustration, more language, time spent together, and the creation of a sibling relationship. Sara and Cory's parents provide additional feedback about the intervention, a sample of which is provided below:

> We saw an immediate impact of the strategies Amy taught our (teacher) child and before long it was rewarding for the kids to play together. This strengthened their sibling relationship and gave them the ability to interact positively. Previously, interactions were limited and those that occurred were frustrating for both children. This experience is one of the highlights in our child's treatment plan this year.

Discussion

A sibling-mediated behavioral intervention to promote play behavior was administered to three sets of sibling dyads. Based on the available acquisition data, the neurotypical siblings were able to effectively learn and independently implement a behavioral treatment package for the sibling with autism. This is consistent with a large body of work which suggests young siblings are able to competently function as interventionists (e.g. Bass & Mulick, 2007; Celiberti & Harris, 1993; Colletti & Harris, 1977; Schreibman, O'Neill, & Koegel, 1983; Tsao & Odom, 2006).

The baseline data from these sessions were confirmed by parents to have accurately captured a typical play session in the home. Across all three dyads, baseline interactions were strikingly different. For Annie & Andrew, baseline sessions consisted almost exclusively of parallel play, with one instance of interaction. Annie sat engaged with the toys on the floor, while Andrew walked around the room, often gazing into corners. Though Dante and Andrew had similar functioning levels, Dakota made a greater number of attempts to engage with Dante in baseline. The oldest of five children, it was clear that Dakota felt very comfortable interacting with her brother in a "mothering" role. Sara and Cory's play was more advanced and imaginative, but in baseline consisted of mostly parallel play. While the purpose of parallel play has been debated among developmental psychologists, between the ages of 2 and 3 children typically advance from parallel play to group play (Bakeman & Brownlee, 1980). However, research has shown that children with autism often continue to engage in parallel play instead of graduating to increasingly sophisticated levels of interaction (Thorp, Stahmer, & Schreibmen, 1995). The first step in skill set A was to increase

interaction within the dyad by decreasing parallel play and initiating cooperative play. For Annie in particular, this was a marked shift from their usual play, and was the first time she persisted at attempting to play with her brother. She initially required more encouragement than the other two teaching siblings, but was able to initiate play with Andrew frequently and independently throughout the intervention.

Skill set A was composed of two different components that were assessed simultaneously. One was a quantitative index, which assessed how frequently siblings initiated play with their brother. The other was a qualitative index which evaluated the quality of these attempts as judged by whether the child was autism was paying attention, whether the elicitation was clear and appropriate, and whether it was unnecessarily repeated. Even though it was not required as part of the training, all three teaching siblings did an excellent job memorizing the "rules" of skill set A, and would proudly recite them for the examiner. For these participants, attempting to alter the quality of their interaction was more effective than attempting to increase the frequency of play bids. By having to continually change their play requests, creativity became an important factor. The author spent one training session with Annie and Dakota brainstorming a list of different play commands which was appropriate for use with the study toys to increase the variability of play-related commands. This way, the teacher sibling was able to avoid repeating the same play command.

Acquisition rates across sibling dyads were all relatively similar. As eliciting play bids formed the basis of the intervention, it was essential that siblings performed a substantial number of play bids in order to facilitate later praise delivery, prompting, and responsive behavior by the child with autism. It took Dakota five sessions, Annie three

sessions, and Sara four sessions to reach criterion for acquisition for skill set A. For each sibling pair, extra sessions were run after acquisition was reached on the qualitative index in order to encourage a greater number of elicitations. In training sessions, this was the most challenging of the skills for the children to practice. For both Annie and Dakota, establishing attending behavior in their siblings was especially difficult, and it often required a physical prompt and several attempts. Andrew and Dante rarely, if ever, responded to a verbal prompt alone. Available data for all three participants suggest that this skill set took more sessions to acquire (M = 6.3) compared to praise (M = 4.6).

The responsiveness of the child with autism also played a role in the quantity of play directives delivered. For example, Annie and Dakota spent more time encouraging attending behavior from their siblings and as a result had less time to elicit play. In addition, when the child with autism was being compliant and cooperative, siblings were able to make more social overtures. Across all three participants, the number of elicitations was affected by different forms of non-compliance across all sessions. As the number of sessions increased, responding and initiating increased across all children with autism. There are a couple plausible explanations for this finding. It may be that the child with autism began to realize that these sessions were meant as “play-time” with the older sibling. By consistently pairing siblings with enjoyable activities and reinforcement, a positive association may have been created which influenced initiating and responding behavior in the child with autism. It might have also been that the teaching sibling felt more comfortable with her role the more she practiced. As her teaching improved, she might have been approaching her brother in a more skillful and confident way to elicit responding.

As mentioned previously, the teaching siblings had the quickest acquisition for skill set B, delivering praise. As before, all three participants memorized the rules that were associated with reinforcement (e.g., be happy, speak in a loud voice, use tickles and hugs) although they were not directly instructed to do so. Delivering praise was a much easier step for siblings to acquire after they had previously learned how to correctly deliver a play related command. Perhaps most importantly, the siblings enjoyed using praise and were excited to use it with their siblings. For Dakota, delivering praise was very natural, and she began to do so before the skill was directly targeted. As is evidenced in Figure 1, it is apparent that Dakota met acquisition for praising in the eighth session prior to the initiation of training on this skill. In examining Figure 2, Dante began to respond correctly in the seventh session, and Dakota's elicitations increased on both the quantitative and qualitative index during this session. Dakota's rapid increase in skill set B appears to be a result of increased opportunities to reinforce her brother's correct responding. As Dante continued to have a high number of correct responses through session 10, Dakota reinforced the large majority of these attempts before the skill was directly targeted.

Interestingly, for both Andrew and Dante, correct responding appears to decrease after reinforcement strategies are taught to their siblings. This might be due to two different explanations. Andrew became increasingly ill throughout the last couple weeks of the intervention, which ultimately culminated in a long-term hospitalization. Beginning around the ninth session, Andrew began to lose mobility, and his parents noted that he was "not himself." As Andrew was put on several waitlists to see specialists, the intervention continued at the request of his parents. During the last few sessions, Andrew

was increasingly ill and eventually entirely immobile. Sessions had to be modified so that Annie could bring play materials to him. At this point he was hospitalized, and the intervention was discontinued. It is plausible and likely that the progression of the illness, and not the addition of praising, caused him to have poorer responding. For Dakota and Dante, it became increasingly difficult to schedule a convenient time for sessions in the home after session 10. The intervention was normally run two to three times a week in their home, and the last four sessions spanned across one month before the family decided to withdraw from the study. As evidenced by Figure 2, Dante began to respond to the study around session 7, and it may be that the thinner intervention schedule was less potent in promoting his responding behavior. It is important to note that this trend does not exist for Cory's responding and initiation data.

As Sara and Cory were the only dyad to complete the study, conclusions about skill set C, generalization, and maintenance are drawn from their data set. Following direct training on skill set C, Sara gradually increased her prompting of Cory's incorrect or nonresponding. Sara struggled most with Cory's nonresponding, often forgetting to persist until an answer was achieved. Cory's number of correct responses increased from a mean of 7 correct responses during training for skill sets A and B to a mean of 12.25 correct responses per session following Sara's training for set C.

Generalization probes were conducted during baseline, after training, and at the 12 week-follow-up session. A toy train set was used to assess whether the skills would transfer to a novel item for the sibling pair. Generalization probes revealed that Sara's use of the target skills paralleled her acquisition of these skills with a novel item. Sara was successfully able to transfer all three skills to a level that was very close to or

exceeded training levels. Cory also had similar occurrences of correct responding with the novel toy set, but his initiations were decreased slightly at the end of training and follow-up. As previously mentioned, the novel toy was a train set, and this happened to be one of Cory's restricted interests. Although he still had six initiations in these sessions with his sister, it marked a decrease from his earlier number of initiations as he was preoccupied with this toy.

Follow-up data collected 6 and 12 weeks post-intervention indicate that the siblings maintained their skills at levels approximating the final sessions of training. Given the intensity of the training and the emphasis placed on consistency, it is encouraging that the targeted skills maintained over time without intermittent intervention or direct involvement from parents. In fact, when the author returned to Sara's home 12 weeks following the intervention, Sara still successfully recalled all 16 training points that encompassed the rules for each skill set.

Target Word Elicitations

This intervention also focused on adding a "word of the day" or target word in an attempt to enhance language acquisition in the context of play. Figure 7 shows Sara's rate per minute usage of the target word and Cory's prompted and spontaneous elicitations of the target word. It should be noticed that six months prior to the beginning of the intervention, Cory was completely nonverbal. Through intensive applied behavior analysis and speech therapy, Cory had a "language burst" and suddenly began to speak. By the time the dyad was enrolled in the study, Cory was capable of reliably speaking five word sentences, and continued to learn words quickly. The words chosen as target words for Cory were reported by his parents as words he did not know, and this was

confirmed briefly before each session. In session 8, Cory began to sporadically say the target words, both in response to a prompt and spontaneously. This did not appear to be in response in Sara's increased use of target words, as she averaged around 1.25 target word elicitations per minute. Spontaneous elicitation of past target words was also tracked. Cory was never observed to use a past target word in a later session, even those these toys were readily available for continued tacting. All elicitations reflect the "word of the day" for that particular session.

As stated previously, Andrew had no spontaneous or echoic approximations of the target word during training sessions. During the course of the intervention, Dante spontaneously uttered an approximation of the target word "horse" and responded to an echoic prompt for the target word "barn" with another verbal approximation. Unlike Cory's target word elicitations which were very clear, these approximations could not be reliably distinguished from verbal babbling. Previous research has shown that children's expressive language growth has been related to such factors as responsiveness to other's bids for joint attention, parental responsiveness to their child's attention and activity during play (Siller & Sigman, 2008), and imitative ability (Charman et al., 2003). Interestingly, these same studies found the non-verbal intelligence, IQ, mental age, and language abilities did not explain variation in expressive language. Cory's score on the Mullen was significantly higher than either Dante or Andrew's score, and yet research suggests that this may not have played a large role in his ability to acquire target words. However, Cory did respond to bids for joint attention more consistently than Dante and Andrew, and this may have played a role in his acquisition. Importantly, Cory also had an 18 point increase in his standard score on the EOWPVT from the pre to post

assessment. It is possible that Cory was still in the midst of a language burst, and this explains his elicitation of the target word. The directionality of the correlation could also be hypothesized such that Cory's increased interaction with his sister caused an increase in his overall language score. Further research is warranted before any definitive conclusion may be drawn.

Limitations

One clear limitation to this study is the presence of only one completer dyad. A potential downfall of single case design was realized in this study, and unfortunate circumstances beyond the author's control resulted in an incomplete data set. Although the data obtained for Annie and Dakota suggest a similar trend to Sara's data, there is limited ability to draw strong conclusions about the strength of this study. The replication of several subjects, though not possible over the course of this study, would lend reliability to the current results. The presence of one completer dyad does not appear to reflect poor subject recruitment or study design. These circumstances appeared to be idiosyncratic to this study, and represent one of the risks in utilizing single case research methodology.

A multiple-baseline design across skills becomes less methodologically rigorous if the skills are somewhat related. Particularly if the participants have been exposed to the skills prematurely there is a risk that the skills may become at least partially incorporated into their repertoire. However, performance data suggest that although these children may observe the skills in advance of direct training, they were only able to perform them reliably once training commenced on that skill. Training for each set was intensive and individualized, and consistent improvement in these skills was not

prominent until training. Given that the three sets of skills were interwoven and that the experimenter demonstrated some facet of all three skills when teaching the children to elicit play, it is not surprising that there was some spontaneous acquisition of skills in the extended baseline condition. In addition, it is also possible that Dakota, Annie, and Sara began to mimic the author's methods of training used to teach them play skills. Reinforcement and prompting were relied upon to teach the neurotypical siblings as well, and it may have unintentionally functioned as an imitative model.

Another potential limitation is that the number of hours that the dyads spent in play together when the author was not present was not accounted for in either baseline or training. Teaching siblings who spent a large majority of time with their siblings may have been practicing these skills outside of session, whereas others may not have had an opportunity to do so. Future studies should attempt to track the hours that sibling pairs spend in play before, during, and following the intervention.

Finally, it is important to address the representative nature of the sample. Given that autism is a disorder which encompasses a wide range of functioning and skills, it is impossible to generalize from the data that this intervention would be appropriate for all sibling pairs affected by ASD. While results are encouraging, it cannot be stated that this intervention would be successful for children of all levels of functioning across the disorder, or for every sibling dyad.

Future Directions

Future studies should attempt to facilitate a broader understanding of the mechanisms which mediate the acquisition of language within play. In particular, research points to joint attention, imitation, and symbolic play as important predictors in

the development of expressive language. Future studies should incorporate these aspects into initial and ongoing assessment to observe any potential correlation between these variables and language acquisition.

Attempts should be made to continually study children in the entire range of the autism spectrum. While this intervention assessed children from a broad range of functioning, future research should attempt to include a greater number of participants across all levels of the spectrum. This way, conclusions may be drawn about the efficacy of interventions for specific functioning levels. Because the autism spectrum encompasses individuals with a wide range of intellectual and adaptive ability, research should continue to be conducted on a diverse sample to reflect this variability.

Longitudinal studies that assess long-term impact of sibling based interventions are warranted. Particularly in the context of teaching play behavior, this intervention may have a lasting impact for a sibling relationship. Studies should attempt to evaluate sibling relationships in the years following the initial intervention to assess for any long-term benefit to either the sibling or the child. The difficulties associated with longitudinal data collection are apparent, but findings could potentially speak to the importance of using siblings in these interventions as opposed to peers. Potential benefits to the sibling dyad are numerous, and tracking the sibling relationship over time may allow practitioners to speak to the greater importance of incorporating siblings into treatment packages for their brother or sister with autism.

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Appendix A

Informed Consent for Research Participation

Purpose of the Study

This form requests your consent for your children's participation in a research study on enhancing play behavior between children with autism and their brother or sister. The project is being conducted by Amy Hansford; I am a doctoral student in clinical psychology at Rutgers University and a behavioral consultant at the Douglass Developmental Disabilities Center. I am doing this project for my Master's thesis under the supervision of Dr. Sandra Harris.

Study Procedures

Your participation in this study is always completely voluntary. If you give your consent your children will be one of four sets of participating children. Your child without autism will learn a series of behavioral skill sets aimed at acquiring, maintaining, and encouraging appropriate play behavior from their sibling. He/she will practice these techniques with the experimenter (Ms. Hansford) and will then use them in play sessions with your child with autism. These sessions will last approximately one hour, and will be run two to three times per week across several consecutive weeks in your home. Initial standardized assessments on your child with autism's social and intellectual functioning will be conducted before treatment at the Douglass Developmental Disabilities Center at Rutgers University. During this time, you will be asked to complete a developmental survey on your child with autism. This initial assessment will last for approximately two hours. You will also be asked to return that day a brief questionnaire about your typically developing child. We will mail this to you ahead of time. This questionnaire should take no more than 15 minutes to complete. At the conclusion of the teaching sessions your child with autism will be given a brief (about 5 minutes) standardized assessment of language in your home setting. You will also be asked to fill out a brief questionnaire to evaluate any changes you might have seen in the play interaction between your children. This questionnaire should take approximately 10 minutes to complete.

Risks/Benefits

Dr. Harris and I believe that potential risks associated with the study are minimal; they may include mild frustration with the teaching procedures and with the play interactions. To minimize any frustration, your children will be given breaks as often as necessary to assure that the training is always a pleasant experience. While I am required to inform you that Rutgers University will not be responsible for compensation or treatment in the unlikely event of research-related adverse experiences, this research study poses no significant foreseeable risks to your children.

Your child with autism will be receiving a behavioral based intervention supervised by experienced staff. The benefits of taking part in this study may be increased quality of

_____initial

play and social interactions between your children and their enjoyment in these interactions. Your child without autism may also feel more confident in initiating social interactions with his/her brother or sister. The results collected from this study will also give us important information on the effectiveness of involving family members, such as siblings, in behavioral training for children with autism.

Cost

There is no cost to participate in this study.

Voluntary Participation

Your children's participation in this study is completely voluntary. If you prefer not to grant consent or if you choose to withdraw your children at any time, you are free to do so with no adverse consequences. Participation or nonparticipation in this study will have NO effect on your child's ongoing or future services at the Douglass Developmental Disabilities Center. Furthermore, if your child chooses to withdraw his or her assent, s/he may do so at any time.

Use of Videotape Data

In addition to the use of assessment and observation data collected during the course of the study, videotaped segments will be recorded of your children during various sessions so that detailed research information, such a progress through and response to treatment can be obtained. The data obtained from these videotapes will be used solely for research purposes. These videotapes will be viewed only by Amy Hansford, Dr. Harris, and research assistants whom they hired; they will not be shown for any reason other than data collection purposes. Research assistants will rate tapes that have been coded with numbers, not names, for privacy and do not have identifying information attached to them. Videotapes will be stored in a locked cabinet in a locked office to which only Ms. Hansford and Dr. Harris will have access. All videotapes will be destroyed after 7 years.

_____ _____

Parent/Guardian signature Name (printed)

_____

Date signed

Confidentiality

The data collected during this study will be used only in the research study, evaluating the efficacy of sibling-directed play skills training and will be viewed only by me (Amy Hansford), my advisor, Sandra Harris, and research assistants whom I have hired. It is

_____initial

possible that one of these research assistants may help me collect the data in the home setting and you will meet that person, however, she/he will also be bound by the rules of confidentiality about your participation. If your child is enrolled at the Douglass School, you may request that I discuss my findings from the study with your child's teacher so the procedures can be implemented there as well if they prove to be effective. I will not however share any of this information unless you request that I do so.

To preserve the confidentiality of data, any identifying information about you or your children (i.e., consent forms and contact information) will be kept separate from assessment and treatment data. To maintain security and confidentiality, I will store and maintain all information in a locked cabinet to which only I have access. When the material loses its scientific value, it will be destroyed (e.g., shredded, erased) to ensure no one else gains access to it.

By signing this document you assert that all your questions have been answered and that you are granting consent for both of your children to participate in this study. If you have any questions or concerns you can contact Amy Hansford at 151 Ryders Lane, New Brunswick, NJ 08902, via phone (732-932-3017 x183) or at a.hansford@gmail.com. Dr. Sandra Harris may be contacted at 732-932-3017 x155 or at sharris@rci.rutgers.edu.

Thank you for your time and consideration.

Sincerely,

_____
(Principal Investigator) Amy Hansford
Behavioral Consultant, Douglass Developmental Disabilities Center

---

_____ I/we understand the terms of this consent and agree for my/our children to participate in this study.

_____ I/we decline to participate in this study.

_____
Child's name (sibling)

_____
Child's name (son/daughter with autism)

_____initial

_____ _____

Parent/Guardian signature Name (printed)

_____

Date signed

_____ _____

Investigator's signature Date signed

After the consent form has been retuned to the DDDC, a copy will be sent to you.

Appendix B

Sibling Verbal Assent Script

My name is Amy Hansford. Sometimes when you try to play with your brother/sister with autism, I bet it can be very hard. I am going to give you some special ways that can make playing with your brother/sister more fun for both of you. You will learn three steps to making playtime more fun, and each time you pass a step, you and your brother/sister will each get to choose a prize from your own treasure box. When we start working together, I will be asking you some questions about how you feel about playing with your brother/sister, and I will ask you some questions at the very end. Also, I would like to videotape you playing with your brother/sister so that I can learn more about how kids play together. Your parents have already said that it is O.K. to work with me. You can stop at any time that you want, and no one will be angry with you. Do you have any questions for me?

Do you understand this study and are you willing to participate in it?

Child's/Subject's response**:** ☐Yes ☐No

_____ _____

Investigator's signature Date signed

Appendix C

Sibling Interview Questionnaire

1.) Is it easy or hard to play with your brother/sister?

2.) How often do you try to play with your brother/sister? How often does your brother/sister try to play with you?

3.) Do you ever get upset when you're playing with your brother/sister?

4.) Do you have a lot of fun when you're playing with your brother/sister?

5.) What would you change to make your play time more fun for you both?

Post-intervention questions only:

1.) What did you think about being a teacher to your brother/sister?

2.) What was hard about being a teacher?

3.) What was easy about being a teacher?

4.) What is the most important thing you learned about playing with your brother/sister?

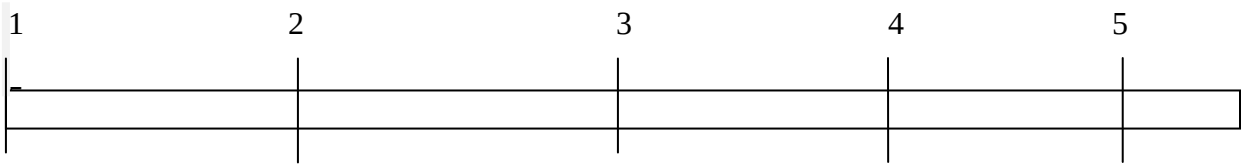
5.) Do you think your brother/sister liked it when you played with him/her?

6.) Do you think you will still help your brother/sister by being a teacher when you play?

Appendix D

Parent Questionnaire

Please use the scale below to rate the statements regarding the treatment package provided for your typical child (teacher) and your child with autism (learner).



1	2	3	4	5
Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree

1) My child (teacher) looked forward to the treatment sessions.

   _____

2) I felt that the treatment was explained appropriately to my child (teacher)

   _____

3) My child (teacher) gained new skills from the treatment

   _____

4) My child (learner) gained new skills from the treatment

   _____

5) My child (teacher) was frustrated by the treatment.

   _____

6) My child (learner) was frustrated by the treatment.

_____

7) I have observed a difference in their play interactions as a result of the treatment.

_____

8) The skills the treatment targeted were important to me.

_____

9) My family will utilize things we learned in the treatment in future play times.

_____

10) The treatment was effective for my child (teacher).

_____

11) The treatment was effective for my child (learner)

_____

12) As a whole, the treatment package was beneficial to my children.

_____

Have you noticed any of the following changes in your children's behavior following the treatment? Please check all that apply.

___More cooperative play

___More initiations for play

___More shared enjoyment

___Less frustration in play

___Other changes (please explain)

___More positive interactions

___More language in play ___More time spent together

Have your children ever participated in any treatment like this before?

Please briefly describe any other treatments or services your child with autism was receiving during the course of the treatment package (Specify estimated hours per week)

Do you have any other comments about the treatment?

Appendix E

Observational Codes

Modified from Celiberti and Harris, 1994

TEACHER CATEGORIES

SKILL SET A: ELICITS APPROPRIATE RESPONDING

ELICITS PHYSICAL PLAY (EP)- Sibling delivers a play-related directive to the child. These cues serve as a stimulus for the child to initiate the desired response. Instances of this behavior need not be restricted to models accompanied by a verbal descriptor. For example, this behavior can be predominately gestural in nature (e.g., sibling demonstrates desired response while saying to the child "Do this").

Examples: 1. Sibling marches a pig into the barn while saying, "Watch me put the pig in the barn. Now you do it"

2. Sibling asks child to place a puzzle piece in a puzzle (e.g., Put the piece in here.")

3. Sibling hands block to the child and says, "Put the block on top of the tower."

4. Sibling models "walking" pig into the barn and says "Do what I do."

5. Sibling hands rooster to child, opens up the door to the chicken coop, and points inside.

Please note that new (EP) is often present after a physical, gestural, or verbal prompt. The following serves as an example:

-The child does not respond to “roll the car” within 5 seconds of the initial EP. Sibling then does a hand-over-hand prompt and says, “Now you do it.” Score this statement as another (EP). Be sure to record it in the proper interval.

ELICITS PLAY RELATED LANGUAGE (EL) – Sibling models appropriate verbal response and asks child to repeat or mands for the appropriate response in the form of a question or command. These provide the child with an occasion to verbalize.

Examples: 1. “The pig says ‘oink’. Say ‘oink’”.

2. “Say b…”

3. “What does a cow say?”

Please note that a new (EL) is often present after a verbal prompt. The following serves as an example:

-Child does not respond within 5 seconds to the initial EL (“What color is the farmer’s hat?”) Sibling then says, “The farmer’s hat is brown. What color is it?” Score this second statement as another (EL). Be sure to record it in the proper interval.

ELICITS TARGET WORD (ET): Sibling uses target word for that particular session. Usage of the target word is not exclusively limited to a response in which the child must mand or tact the target word. Rather, it should be an elicitation of the word on the behalf of either the trainer or learner, at least once per minute.

Examples: (assuming target word of cow)

1. “What does a cow say?”

2. “Can you put the car in the barn?”

3. “Say ‘cow’ .“

4. “Which animal makes milk?”

5. “Touch the one with black and white spots.”

EXCLUSIONARY CRITERIA FOR EP OR EL:

Any of the following situations will be scored as an inadequate instance of EP, EL, or ET:

1. If the (EP) or (EL) is repeated with less than five seconds elapsing since the previous one unless that child gives an incorrect response, or an inappropriate behavior intervenes (e.g., child leaves area).

2. If the child is not attending at the time to the sibling or the relevant stimulus materials when the (EP) or (EL) is delivered (unless the child says “what”, “o.k.” or gives some indication suggesting the presence of attention).

3. If the (EP) or (EL) is not clearly presented or discrete in time. This will be difficult to ascertain and also be reliable, so use this exclusionary criteria if the (EP) or (EL) was horribly presented (e.g., the child is oriented toward the sib, but the sib is facing the other direction and talking into his/her hands). Also use this criteria if the instructions were not clear, simple, and audible.

4. If the sibling repeats 2 play based demands in a row, not as an attempt at an error correction, only the first command will be scored as adequate. This is to encourage a

wide range of directives from the sibling, and ensure that the same (EP) and (EL) prompts are not used repeatedly.

SKILL SET B: REINFORCING APPROPRIATE RESPONDING

REINFORCES PHYSICAL PLAY (RP) - Sibling delivers social praise within 3 seconds of every completion of the child's attempt.

Examples: 1. "Good putting that piece in the puzzle."

2. "That's nice driving the car."

3. "Good job! I like the way you put the pig in the barn."

4. "That's great."

5. "Thank you for the cow."

6. "Hmmm, yeah, alright…" or any verbalization which conveys praise.

7. "OK" said with praise intonation

REINFORCES PLAY RELATED LANGUAGE (RL) – Sibling delivers social praise within 3 seconds of every completion of the child's correct verbal response of attempt. Highest levels of praise (e.g., highly preferred physical contact with vocalizations) should be reserved for instances where the child produces the target word for that day.

Also use this category if the sib merely repeats the child's verbal responses in an affirmative fashion. If this was the case, please indicate that (RL) was a repeat of the (+L). Please be aware that the repetition can take on two forms, and neither of these would serve as an

(RL): the sib repeats the (+L) under their breath or for the benefit of the camera person and it does not appear that there was a praise component to the repetition or the sib repeated the child's verbal response in a corrective fashion because the sib was not satisfied with the verbal response (e.g., the sib provides the child with a more enunciated version of the desired response)

Examples: 1. "Wow! You sound just like the cow."

2. "Yes, ball, good saying ball."

3. "Nice talking."

4. "Thank you (for telling me the sounds of the animals)."

Please note:

1. If both the verbal praise statement is not directed specifically towards the child (e.g., sibling is looking away from the child while delivering social praise) and no physical contact is involved (e.g., tickles, pats, etc.), the (RP) or (RL) will not be circled.

2. Otherwise stated, an (RP) or (RL) should be circled if the sibling reinforces with physical contact while not looking at the child or the sibling verbally and/or gesturally (e.g., clapping hands) reinforces the child while looking at the child, though physical contact is absent.

3. Circle the appropriate (RP) or (RL) even if the sibling reinforces the child before he/she completes the desired response. In these instances the child would receive a (+P) or (+L) for his/her partial attempt.

SKILL SET C: PROMPTING/CORRECTING FOR NO/INCORRECT RESPONSE

PROMPTS A PHYSICAL OR GESTURAL RESPONSE (PP) – Sibling intervenes physically or provides verbal prompt to get child to respond correctly or to illustrate the correct response. Instances where the sibling does not facilitate the correct response but indicates to the child that his or her response is incorrect, insufficient, or inappropriate will also be included in this category. Do not score a (PP) if the sib merely obtains eye contact or better attending behaviors and then repeats the original (EP). The (PP) is scored if the content or delivery of the (EP) is changed to improve the likelihood of the desired response..

These prompts are used if the child does not respond to the initial (EP) within five seconds, gives an incorrect response, or presents an inappropriate response.

Examples: 1. While saying, "This is nice driving the car into the garage," sibling grasps appropriate play object in a hand over hand fashion with the child and the desired activity is executed. This occurs after an initial (EP) was not responded to.

2. Sibling gestures to child where to place puzzle piece.

3. Sibling repeats EP in such a way that gives the child more information to increase the likelihood of a correct response (or just changes intonation of original EP in a manner that would make it easier for the child to respond).

4. "No, Billy, this is how you roll the tractor."

5. A simple "no" would also be considered as a PL (or PP).

PROMPTS PLAY RELATED LANGUAGE (PL) – Sibling intervenes with a verbal prompt to get the child to verbalize. Do not score a (PL) if the sib merely obtains eye contact or

better attending behavior and then repeats the original (EL). The (PL) is scored if the context or delivery of the (EL) is changed to improve the likelihood of the desired response.

These prompts are used if the child does not respond to the initial (EL) within five seconds or sooner if an inappropriate response intervenes.

Examples: 1. The sibling repeats the particular (EL) in such a way that gives the child more information to increase the likelihood of a correct response. (or just changes intonation of the original (EL) is a manner that would make it easier for the child to respond).

2. "The cow says 'mm…" (Here the sib is giving the child a hint)

3. "It is the letter 'e', say 'e'."

4. "Say wagon."

5. "No, Billy, the pig does not go 'moo'. "

6. A simple "No" would also be considered as a PL (or PP).

EXCLUSIONARY CRITERIA FOR PP OR PL:

1. If the sibling fails to allow the child enough time (5 seconds) to initiate the desired response.

2. If the sibling prompts appropriate response with a corrective measure while the child is completely inattentive.

LEARNER CATEGORIES

SOCIAL RESPONDING

ENGAGING IN PROMPTED PLAY/PROVIDES APPROPRIATE PHYSICAL PLAY RESPONSE (+P) – The child responds appropriately by engaging in turn-taking or appropriate toy manipulation within 5 seconds of EP. Partial attempts to respond will also be coded with this category, particularly if the sibling reinforces. The child's response need not be completed within 5 seconds, but rather initiated within 5 seconds.

Examples: 1. In response to "Help me build a tower", child begins to stack blocks.

2. In response to "Put the wagon away", child performs the desired activity.

3. In response to a sibling's model, child marches pig into barn.

OFF TASK (-P) – Use this category when the child fails to comply with the EP within 5 seconds. This may be due to:

- Giving an incorrect response
- Giving no response
- Saying "no" or giving some other equivalent negative verbal statement
- Being inattentive
- Engaging in maladaptive behavior (e.g., getting out of the area, or engaging in self-stimulation with or without play objects).

PROVIDES APPROPRIATE PLAY RELATED LANGUAGE RESPONSE (+L) – The child verbalizes appropriately within 5 seconds of sibling's request. The child's verbal response need not be completed within 5 seconds, but rather initiated within 5 seconds.

Examples: 1. "baba"

2. "The pig says oink".

3. "ca ca car"

4. "I got the cow."

PROVIDES APPROPRIATE TARGET WORD RESPONSE (+CT) – The child verbalizes the target word appropriately within 5 seconds of the sibling's request (ET). The child's verbal response need not be completed within 5 seconds, but rather initiated within 5 seconds of the initial (ET). If the target word is the chosen target for that particular session, it is coded as a CURRENT TARGET (CT).

VERBAL OFF TASK (-L) – Use this category when the child fails to comply with the (EL) within 5 seconds. This may be due to:

- Giving an incorrect response
- Giving no response
- Saying "no" or giving some other equivalent negative verbal statement
- Being inattentive

- Engaging in maladaptive behavior (e.g., getting out of the area, or engaging in self-stimulation with or without play objects).

Please note:

1. The categories of (-P) and (-L) can be circled as soon as the child gives an incorrect response, engages in a maladaptive behaviors, or communicates any statement which indicates that he/she will not give the desired response. In these incidents, you do not need to wait 5 seconds.

2. Circle (-P) or (-L) even instances where the sibling fails to give the child enough time to respond by either prompting or moving on to another directive.

3. A decision about whether a child's response is (+P)/(+L) or (-P)/(-L) needs to be made as soon as it is scorable, but no longer than 5 seconds after the (EP) or (EL). You may need to view a few segments ahead to determine a particular response.

4. If the child's response is questionable, let the sibling determine the relative "correctness" of "incorrectness" of the behavior. For example, if the sibling reinforces a questionable child response, circle the (+). If the sibling corrects the child, then score a (-).

5. In cases where the child's response is questionable and it is not consequated by the sibling, then use your judgment (however, if the response "sits on the fence" then give the child the benefit).

SOCIAL INITIATION

SPONTANEOUS PHYSICAL INITIATION TO SIBLING (+I) – The child appropriately initiates a play interaction in a spontaneous fashion without sibling elicitation or intervention, and not in a response to a directive. Attempts at initiation may be either verbal or nonverbal, and the two must not necessarily be coordinated. Verbalizations must be related to the actual play or some aspect of it, such as the child asking the sib for assistance. This is a frequency measure focused on the quantity, and less on the quality, of such initiations.

Examples: 1. While sib is engaged in another activity, such as setting up toys, the child attempts to hand sibling the cow to play with.

2. The child clearly holds up a toy for the sibling to see, not in response to a command.

3. While sib is setting up toys, the child verbalizes independently to begin play (e.g., “toys!”).

4. The child gives sibling a toy and then states “you!”

Please note:

If the child attempts to use the siblings “hand as a tool” it should not be coded here, as its intent is not to communicate a joint play interaction. Similarly, parallel play in which the siblings play in close proximity, but the child does not attempt to interact with the sibling, is also excluded from this category.

PROVIDES SPONTANEOUS FORMER TARGET WORD (+FT) – The child spontaneously utters a word that was formerly a target word in an earlier session. This does not necessarily need to be directed to the sibling in a meaningful way, and could include tacting for

one's own benefit. Focus on the (+FT) is on spontaneous usage of the word, and must not occur in response to a sibling's directive (e.g. "What is this?" "Cat".)

PROVIDES SPONTANEOUS CURRENT TARGET WORD (+SCT) – The child spontaneously utters the current target word. This does not necessarily need to be directed to the sibling in a meaningful way, and could include tacting for one's own benefit. Focus on the (+SCT) is on spontaneous usage of the word, and must not occur in response to a sibling's directive (e.g. "What is this?" "Cow".)