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2015

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UNIVERSITY OF CALIFORNIA

Los Angeles

Teaching to Play or Playing to Teach:

An examination of play targets and generalization in two interventions for children with autism

A dissertation submitted in partial satisfaction
of the requirements for the degree Doctor of Philosophy
in Education

by

Hilary Margret Gould

2015

ABSTRACT OF THE DISSERTATION

Teaching to Play or Playing to Teach:

An examination of play targets and generalization in two interventions for children with autism

by

Hilary Margret Gould

Doctor of Philosophy in Education

University of California, Los Angeles, 2015

Professor Connie L. Kasari, Chair

Play is universally found and is an important aspect of childhood development. Difficulty with imaginative, or symbolic play, is a core deficit of children with an autism spectrum disorder (ASD) (DSM-5; APA, 2013). This study represents the first attempt to compare play targets between two interventions. Sixty-five pre-school aged, minimally verbal children with ASD and their parents participated in this study. Both Discrete Trial Training (DTT) and Joint Attention, Symbolic Play, Engagement & Regulation (JASPER) interventions directly target play skills as a primary area for improvement, but have varying methodological approaches. A randomized

controlled trial found that symbolic play types increased across both interventions when targeted, but children receiving the JASPER intervention demonstrated greater gains compared to children receiving DTT. Additionally, only children in the JASPER condition were able to maintain these gains six months later at follow-up. Improvements in symbolic play types were associated with higher scores on cognitive and languages outcomes for both treatments. JASPER interventionists were more likely to choose play targets that were matched with the child's developmental play level compared to DTT, but this did not result in different outcomes between groups. Improvements made with therapists in both treatments did not generalize to parent child interactions at home. These findings suggest further adaptations must be made to improve generalization from school to home, and across partners.

The dissertation of Hilary Margret Gould is approved.

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Acknowledgements

First and foremost, I would like to thank the families of the children with autism who participated in this project. This dissertation would not have been possible without the guidance and advisement from Professor Connie Kasari. Thank you to the National Institute of Health and Connie Kasari who allowed me to use the data. I am grateful to my colleagues who assisted with each phase of this project, and to Alison Holbrook and Wendy Shih for statistical consultation. My sincere gratitude goes to my parents, siblings, and friends for their continued support and inspiration.

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Panganiban, J.; Gould, H.; Chang, YC; Shire, S., Kasari, C. (2015, May). *The effects of teacher perceptions on fostering engagement during dyadic play interactions with students with ASD*. Poster presented at the International Meeting for Autism Research. Salt Lake City, Utah.

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INTRODUCTION

Play is universal. It is found in every society observed by anthropologists, but the purpose and perceived value, the typical actions of the play acts, as well as, whom the playmates are, is widely dependent upon the ecocultural context (Lancy, 2007; Edwards, 2000; Weisner, 2011). Nonetheless, across all cultures, play is creative, explorative, imaginative and collaborative (Edwards, 2000). Although play is innate and natural for most children, its developmental sequence can be interrupted or delayed in children with developmental disorders. Children with an autism spectrum disorder (ASD) are unique because they have difficulties in both object and social play in contrast to children with other developmental disorders or typically developing children. In fact, difficulty with imaginative, or symbolic play, is a core deficit of children with ASD (DSM-5; APA, 2013). The majority of interventions for children with ASD directly target play skills as a primary area for improvement. However, the methodological approaches for teaching play targets varies widely. The aim of the study is to determine if Discrete Trial Training (DTT) or Joint Attention, Symbolic Play, Engagement & Regulation (JASPER) interventions is more effective in choosing developmentally appropriate targets, and teaching, generalizing, and maintaining play skills in children with ASD.

Defining Play

Just as play has a certain amount of flexibility and freedom, so too does the definition of it. It seems unlikely that researchers, clinicians, and policy makers will come to a consensus on one meaning of play, as this has been persistently debated for decades (e.g., Baron-Cohen, 1987; Burghardt, 2011). The pioneers of child development also had varying opinions on play; Piaget defined play as a “happy display of actions”, and considered it a proxy of developmental

maturing (1962). Early on, Piaget promoted the idea of a developmental progression of play by observing that children first engage in sensorimotor or manipulative play, and then move towards more symbolic or pretend play (Piaget, 1962). Vygotsky argued against the pleasure principle of play, and instead focused on: cognitive and learning aspects of play, the importance of a zone of proximal development to learn from others, and that play provides a stepping in separating reality from abstract thought (1933). Both theorists remain influential in guiding theory and practice in the field of play today.

Despite disputes over the meaning and purpose of play, many definitions include a number of the same attributes. Current definitions acknowledge that all play should be: voluntary, flexible, intrinsically motivating, pleasurable, non-literal, and involve active engagement (Wolfberg, 1995; Krasnor & Pepler, 1980). These characteristics bring to light the contrast we see in children with ASD who often engage in inflexible, repetitive play and may not exhibit non-literality or pretense with toys. For the purposes of this paper, Lifter and Bloom's (1998) definition of play will be used, which posits that:

Play is the expression of intentional states—the representations in consciousness constructed from what children know about and are learning from ongoing events—and consists of spontaneous, naturally occurring activities with objects that engage attention and interest.

Play may or may not involve caregivers or peers, may or may not involve a display of affect, and may or may not involve pretense.

Developmental Sequence of Play

Play follows a developmental sequence. Infants first treat all objects indiscriminately (e.g., mouthing), then they begin to discriminate according to more diverse features, next they begin to

combine objects together, and eventually play becomes more decontextualized and symbolic (Belky & Most, 1981). In a broader sense, play is seen as serving either a functional or symbolic purpose, similar to Piaget's global classification of "manipulative play" versus "pretend play". Functional play is defined as using toys as they were intended to be used, and generally begins to emerge around 12 to 13 months of age (Ungerer & Sigman, 1981). Symbolic play is defined as the ability to use objects or actions to represent something else, and it has been well established that it emerges after functional play around 20 months of age (Libby, Powell, Messer, & Jordan, 1998). The terms "pretend", "symbolic", and "imaginative play" are often considered synonymous. Lifter and colleagues (1993) have listed a developmental sequence of sixteen play types throughout early childhood: indiscriminate acts, discriminative actions, takes apart combinations, presentation combinations, general combinations, pretend self, physical attributes combination, child as agent, conventional attributes combination, single scheme sequences, substitutions, substitutions without objects, doll as agent, multi-scheme sequences, sociodramatic play, thematic fantasy play (see Table 1).

Importance of Play

Play is often considered the most important activity for young children to engage in. The United Nations High Commission for Human Rights has recognized play as a right of every child, and has deemed it essential to child development (UNHCHR, 1989). In fact, in the United States play has been highly valued and promoted for a number of decades. The National Association for the Education of Young Children, which guides practitioners and educators, has "argued that self-paced, child-controlled play is the best way for children to make the most of their lives" (Rogers & Sawyer, 1988). The promotion for play coincides with numerous research

studies that have found play related to a number of important developmental domains, including: language (McCune, 1995; Lifter & Bloom, 1989; Barton & Wolery, 2010), cognitive skills (Whitebread, Coltman, Jameson, & Lander, 2009; Belsky & Most, 1981), and social and peer relations (Rubin, Fein, & Vandenberg, 1983; Garvey, 1974; Jordan, 2003). This high correlation is not only consistently found across varying cognitive skills, but also across diverse diagnostic populations, including children with autism (e.g., Thiemann-Borque, Brady, & Fleming, 2011; Sigman & Ruskin, 1999; Yoder, 2000). Thus, many studies have used play as a measure of developmental and cognitive progress.

Play and Language. Although many researchers do not specify or differentiate the types of play that they are researching, it appears that symbolic play is more related to positive traits than functional play. One reason for this is, is that in order to demonstrate symbolic play skills a child must be developing other representational or abstract skills, which require more cognitive prerequisites than functional play. The most important type of a symbolic or representational skill that humans have is the use and development of language (Lewis, Boucher, Lupton & Watson, 2000). It is important for children to acquire both strong receptive skills, or comprehension of language, and also to develop spoken or expressive language. For most children, play and language emerge at the same time, regardless of variability in chronological age of onset (McCune, 1995; Lifter & Bloom, 1988; Barton & Wolery, 2001). Enriched sociodramatic settings for young children have shown improvements in children's receptive language (Levy, Scahefer, & Phelps, 1986), and increases in the use of spoken language (Dickinson & Tabors, 2001).

Play and Cognition. Play is often considered a proxy for cognition. Cognitive skills such as, planning, problem solving, creativity and meta-cognition have also been thought to develop systemically with symbolic play (Whitebread et al., 2009). Additionally, functional play, such as object manipulation, allows for greater understanding of object permanence, spatial, and general visual reception skills. Play has also been associated with reasoning, conservation, creativity, and general intelligence; however, the majority of these studies are correlational and few have determined the causality or direction of this relationship (Lillard et al., 2012).

Play and Social Interactions. Play serves as a social bridge between children, and is one of the primary activities children have to engage in social interactions together. In fact, Mueller and Brenner found that toys are central to developing social relationships in toddlers (1977). As complexity of social interactions increase over time, from parallel aware play to coordinated joint engaged play, so do the progression of more sophisticated play behaviors. Therefore, play has been attributed to a number of social outcomes in typically developing children from self-regulation, negotiation, compromise, trust, and eventually leads to forming and maintaining friendships (Jordan, 2003; Fantuzzo, Sekino, & Cohen, 2004). Children that participated in a Head-Start preschool play intervention were shown to have more verbalizations directed to their peers (Craig-Unkefer & Kaiser, 2003). Naturally developing play and instructional play are both associated with higher frequency and quality of positive social behaviors in typically developing children.

Play in ASD

Current research suggests that children with ASD follow a similar play sequence as typically developing children (Lifter et al., 1993), although more research needs to be done on play

trajectories in this population, as many children with ASD never demonstrate any symbolic play skills (Ungerer & Sigman, 1981), or continue to have qualitatively idiosyncratic play, even after enrollment in play interventions (Stahmer, Schreibman, & Palardy, 1994).

Numerous studies have reported that symbolic play skills are demonstrated less frequently and diversely in children with ASD (see Jarrold, 2003 for review), and some researchers have proposed a specific play deficit (Sigman and Ruskin, 1999). Since the earliest descriptions of autism by Leo Kanner in 1943, abnormal object manipulation and a lower frequency of play was noted. Kanner described abnormal play or object behaviors in all 11 children in his case report. “Autism’s first child”, or case 1, described by Kanner was Donald T. At 2 years of age it was reported that he “developed a mania for spinning blocks and pans and other round objects” (Kanner, 1943), and by age 36 his mother reported that he was “a fair bridge player but never initiates a game” (Kanner, 1971). Other children were reported to have play restricted to specific interests (e.g., preferences for “anything with wheels”), lack of social play (e.g., “self-sufficient in their play”, “does not play with other children”), repetitive or obsessive tendencies (e.g., “takes things to bed with her”, played “monotonously”, “extremely upset about seeing anything broken or incomplete”), and lastly a poor understanding of “other children’s games” (Kanner, 1943). Lower frequency and reduced quality of social initiations, as well as deficits in functional, make-believe and joint-interactive play are all parts of the diagnostic criteria to meet on the gold-standard for diagnosing autism, the Autism Diagnostic Observation Schedule (ADOS-2; Lord, et al., 2012). The Diagnostic and Statistical Manual of Mental Disorders, 5th edition, also discusses play in relation to both social communication: “difficulties

in sharing imaginative play or in making friends”, and in restricted, repetitive patterns of behavior: “lining up toys or flipping objects” (APA, 2013).

Whereas symbolic play shows the greatest delays, delays are also found in functional play. Overall, both functional and symbolic play acts in children with ASD are less frequent and flexible compared to their typically developing peers (Williams, Reddy, & Costall, 2001; Lifter et al., 1993). Other researchers have noted that children with autism tend to be more focused on objects, rather than directing their attention to parents (Kasari et al., 2010) or peers (Kasari et al., 2011). Just as Kanner first observed, research has found that play in children with ASD often tends to be repetitive (Atlas, 1990; Williams, Reddy, & Costall, 2001), includes intense focus on detailed or sensory aspects of the objects (Freeman et al., 1984), and often lacks both pretense and play partners (Kasari, et al. 2010). These findings emphasize the importance of early intervention to engage children in higher quality and frequency of play acts.

Play and Language. Children with ASD often have deficits in both language and play skills. Despite this overlap, studies have shown that when typically developing controls are matched for level of receptive language, the group of children with ASD still demonstrate impairments in symbolic play, independent of language skills (Baron-Cohen, 1987; Jarrold et al., 1996). This deficit in symbolic play goes above and beyond what is observed in children with other developmental delays, such as Down syndrome (Libby et al., 1998). Receptive language skills have been able to differentiate children who had more functional and/or symbolic play, as well as distinguish which children were able to integrate play acts into meaningful sequences (Ungerer & Sigman, 1981). Other researchers have found that both receptive and expressive language skills were associated with symbolic play, while just receptive skills were associated

with functional play (Mundy, Sigman, Ungerer, & Sherman, 1987). These studies suggest that play skills and language are closely associated for children with ASD, and a level of mental thought and representation is needed to demonstrate certain levels of play.

Play and Cognition. Research has shown that children with ASD have a heterogeneous presentation of cognitive skills, ranging from comorbid intellectual disability to high intelligence, and savant syndrome. Children with intellectual disabilities (ID) are defined as having impairments in intellectual functioning (i.e., IQ below 70) and in adaptive functioning (DSM-5; APA, 2013). Savant syndrome is independent of IQ, and individuals are characterized by an “island of genius” often associated with impressive memory skills (Treffert, 2009). The majority of children with ASD do not have cognitive impairments or prodigious capabilities. However, since about 31% of children on the spectrum also have ID (Baio, 2014), it is important to note that children with lower IQ are often found in solitary play (Dunn & Herwig, 1992; Rubin 1982). Different levels of play also require a certain level of cognition. Researchers have shown that prompted toy play with dolls is predictive of rate of development of communication in children with ASD, and the authors hypothesize that this relationship is largely due to the cognitive skills associated with play including: attention to the activity, interest and curiosity with the task, memory, exploration of the environment, representational thought, and cognitive planning (Toth, Munson, Metzloff, & Dawson, 2006). Emphasizing the complex relationship between play, language, and cognition. Additionally, children that demonstrate more functional play acts at baseline have higher scores on cognitive assessments five years later at age eight (Kasari, Gulsrud, Freeman, Paparella, & Helleman, 2012). The current body of literature is inundated with correlational findings, rather than causal relationships

between play and cognition in children with and without ASD, making it difficult to disentangle these two domains apart from one another.

Play and Social Interactions. For young children, play has an important role in social communication between peers and forming friendships. Children with ASD have fewer friendships and they are of poorer quality than their typically developing peers (Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011). There are many characteristics of ASD that can affect these social relationships; play may be one of these components. Some researchers find that difficulty engaging and imitating peers in play can exacerbate the social difficulties faced by children with ASD (Baker et al., 1998). In addition to the social aspects of play, children's odd and repetitive actions with toys may lead to social exclusion. Play skills in children with ASD are an important and unique deficit. Early play skills during toddlerhood can predict later peer engagement for children with ASD, but not children of other developmental delays (Sigman and Ruskin, 1999). Due to these findings, many interventions target play skills when interacting with peers and other social partners.

Although the domains of play, cognition, language, and social behaviors are related, many children with autism show heterogeneity in these areas. For example, some children may have sophisticated language skills, while still presenting with severe challenges in social settings (Cantwell, Baker & Rutter, 1978). Other children can show social skills progress while still retaining severely low scores on cognitive and language tasks (Rutter, 1978).

Studies have reported that when play behaviors increase, self-stimulating stereotypies, such as visual inspection or lining up toys, decreases (Wolfberg & Schuler, 1993). In a treatment study that examined the profiles of children that were high and low responders to the intervention,

researchers found that children that demonstrated more play skills with toys at baseline had greater gains in language, play, and social skills than children that did not demonstrate these play behaviors (Scherer & Schreiman, 2005).

Future studies need to discriminate more between types of play (e.g., functional versus symbolic), as well as include more research beyond correlational studies, in order to determine if play has a casual relationship to other developmental domains, such as language, cognition, and social behavior. It is evident that play is related to important outcomes, but the directionality and strength of this finding is still unclear for both typically developing children and children with ASD. This relationship is particularly important in order to better inform and design clinical interventions.

Parent Child Dyads

In Western countries, play with parents, particularly mothers, is a common practice (Lancy, 2007). Attachment styles have been found to be associated with play behaviors for children with and without ASD, with more secure children demonstrating more frequent and advanced play behaviors (Naber et al., 2008; Main, 1983). By three months of age typically developing infants are often engaging in “protoconversations”, where parents help scaffold a back and forth exchange, introducing early social communicative turn-taking (Bateson, 1975; Bruner, 1978). From six to twelve months, play interactions move from being predominately physical (e.g., tickles, swings, etc), to turn taking with simple toys (Crawley & Sherrod, 1984). This is a shift from person-engaged play to joint engaged play with objects. In contrast, children with autism tend to be more object-focused without engaging a social partner or parent. In the first two years of life, researchers found children with ASD had a low frequency of initiating

conventional social games (e.g., peek-a-boo) and turn taking (Bernebei et al., 1998, DiLavore et al., 1995).

Due to these differences in object interest, family play partners, such as parents and siblings, may need to change their approach and strategies to engage the child. Research has shown that parents direct more play behaviors and instructions to their children with ASD, and this is positively correlated with level of child severity (El-Ghoroury & Romanczyk, 1999, Freeman & Kasari, 2013). Parents may be prompting too heavily during the interaction, which limits the child's opportunity to initiate independently. Although children with ASD directed more verbalizations to their siblings rather than parents, siblings did not interact much with each other in the study (El-Ghoroury & Romanczyk, 1999). The authors suggest that both parents and siblings would benefit from taking a "play organizer" role, where they specify an activity and role for the target child to help engage and maintain in the activity. This strategy has been shown to elicit more positive social responses from peers (Tremblay et al., 1981). Scaffolding play across settings and play partners is important, which is why current play interventions for children with ASD have been with therapists, teachers, playground aides, parents, siblings, and peers.

Play Interventions in ASD

Considering all the widespread associations with language, cognition, self and object discovery, and social interactions, there is a strong theoretical underpinning for teaching functional and symbolic play to children with autism. Functional play teaches children how to manipulate objects and create new combinations. Symbolic play helps teach children how to think abstractly and carry out familiar roles in everyday and fantasy worlds. It is not surprising

that teaching play to children with ASD has become a primary focus of many intervention programs. In fact, nearly every behavioral or developmental intervention for ASD incorporates play as a target or context for delivering treatment.

Researchers have differentiated developmental appropriateness and age appropriateness when choosing play targets and toys. Developmental appropriateness refers to targeting skills that are where the child's current level of functioning is, and following sequential steps in a developmental hierarchy. Age appropriateness refers to targeting skills that are similar to what peers without disabilities are doing for that chronological age. Lifter and colleagues found that choosing play targets that are age appropriate, rather than developmentally appropriate, resulted in reduced skill acquisition and generalization in children with developmental disabilities (1993). This study suggests that there may be prerequisites to learning certain play strategies, and taking a developmental approach seems relevant and important for researchers and practitioners trying to improve these skills in children with ASD. This is consistent with Vygotskyian approach, that learning should be matched to the child's developmental level (1962).

Currently there are a number of early treatment programs, particularly naturalistic developmental behavioral interventions, for children with ASD that have been shown to have some promising outcomes for play improvements. These include: Pivotal Response treatment (PRT; Stahmer, 1995); Early Start Denver Model (ESDM; Dawson et al., 2010); DTT (Smith, 2001); JASPER (Kasari, Freeman & Paparella, 2006); enhanced milieu teaching (EMT; Kaiser and Hester, 1994), reciprocal imitation training (RIT; Ingersoll & Schreibman, 2006), Social Communication/Emotional Regulation/Transactional Support (SCERTS; Prizant et al. 2003), and more. Video modeling has also been used (e.g., Hine & Wolery, 2006), and a recent review found

that the most common component across interventions is to model appropriate play behaviors (Lang et al., 2009). Many of these interventions have been able to teach and maintain play targets.

Single Subject or Case Study Designs. It is important to note that the majority of research on these interventions is single-subject designs, which has each participant acting as their own control. Although this offers good individualized data, this research design has some difficulty in generalizing to larger populations, particularly since there is wide heterogeneity in ASD and skills may not transfer to all subgroups of children with ASD, such as those that are minimally verbal or have other comorbidities. Additionally, single subject and case designs are not as strong in determining long term outcomes, as compared to group designs (Smith et al., 2007). Although single subject designs are useful in determining initial efficacy, larger randomized control trials are important in analyzing potential mediator and moderators in the treatment (Smith et al., 2007; Kasari & Smith, 2013). Therefore it is important to interpret their findings with this knowledge.

Many single subject designs have found success in teaching play skills to children with ASD, and this has improved associations on social and communication outcomes. Interventions have found that using a child's perseverative interest or behaviors improved social interactions with peers and siblings, compared to targeting a general play curriculum (Baker et al., 1998, Baker, 2000). Sociodramatic, or symbolic, play interventions have also been implemented in samples of children with ASD to improve social and communicative interactions with peers, however these skills are difficult to generalize and maintain (Thorp, Stahmer, & Schreibman, 1995; Goldstein & Cisar, 1992). Other studies have found that children with ASD learned to

imitate pretend play with adults, and this increased spontaneous pretend play acts as well (Ingersoll & Schreibman, 2002). Modeling in-vivo or in videos has been used with success in increasing appropriate play behaviors, duration of play, and play related language (Schwandt et al., 2004; Buggey et al., 1999; Charlop-Christy et al., 2000), but these interventions often create non-flexible, identical scripts and behaviors that could lead to difficulties in generalizing and generating novel, unrelated play.

Some of these interventions have faced problems related to flexibility and spontaneity in play. For instance, interventions that report children are increasing “scripted play acts”, which are defined as rote acts that are re-enacted, often fail to develop spontaneous or independent play acts (MacDonald, Clark, Garrigan, & Vangala, 2005). Additionally, since many interventions rely heavily on prompting, children never learn to develop unprompted play skills, and instead wait for a cue, or instruction, to “play” with toys in a particular manner. Teachers, parents, and therapists teaching play to children need to be reminded of some of the most critical aspects and defining features of play, such as: spontaneity, focused attention, and active interest and pleasure. Although explicit teaching of play skills may not always share these same features, the goal of play interventions in ASD should be to see an increase in these features and an increase in intrinsic motivation with toy use or person games.

Randomized Controlled Trials. Group designs, which involve larger number of participants and randomization, are starting to become more present in the field of ASD. To date, only a few studies have been methodologically sound and rigorous, using randomized controlled trials to demonstrate that their intervention produces improved play outcomes (Kasari et al., 2010, Kasari, Freeman, & Paparella, 2006). More interventions need to include large sample

randomized controlled trials to determine efficacy, feasibility, and replicability (Smith et al., 2007). An intervention targeting symbolic play directly found that children in this condition improved not only in play skills, but also in social communication skills such as increased time in joint engagement and more frequent demonstrations of joint attention gestures and language (Kasari, Freeman & Paparella, 2006). Due to randomization and control, researchers can be more confident that positive outcomes are in fact due to the intervention and not some outside factor.

Dismantling Comprehensive Interventions

There have been very few studies that compare different interventions with one another, despite varying instructional approaches. We currently do not know how dosage or type of treatments is related to child outcomes (Richler, 2013). In order to move the field of early intervention for developmental delays forward, it is imperative to compare treatments with one another to dismantle essential, or active, components of the treatment package. For example, it is difficult to distinguish if play is the driving force for improved social communication outcomes, or if it is due to a supportive environment and enriched responsiveness from adults and/or peers. This will be an important goal in order to produce more effective targeted programs, rather than packaging all interventions as a comprehensive treatment plan. In a recent publication by several of the founders of many of the ASD interventions mentioned above (e.g., PRT, JASPER, RIT), the experts argue for more evidence about critical components of these interventions:

In most cases, researchers do not yet have empirical evidence to support the frequency, quality or relative balance of strategies included in treatment packages. These types of dismantling studies also are needed in order to move to the next step of matching specific active ingredients to an individual or dyad (Stahmer, Schreibman, & Cunningham, 2011;

Stahmer, Akshoomoff, & Cunningham, 2011). And of course this may vary enormously across children, as the heterogeneity of the population is well known (Schreibman et al., 2015).

More high quality research needs to be done to determine the purpose and functionality of play. Interventions also need to disentangle which elements of an intervention (e.g., dosage, therapist traits, modules, etc.) are producing optimal outcomes. This goal of the proposed project is to offer some insight into instructional approaches of play by examining two evidence-based interventions, DTT and JASPER, which take a very different stance in their promotion of play for children with ASD.

Teaching to Play: Discrete Trial Training

DTT teaches play explicitly and discretely by breaking up play actions into small components. This approach is highly structured, adult-led, and the goal is to reduce environmental distractions to improve discrimination trials and provide clear and highly motivating reinforcement (Smith, 2001). Play skills are simplified to maximize successful (i.e., correct) responses. The theoretical approach behind play is operant conditioning (Skinner, 1953), and the intervention was the first one developed in the sixties that demonstrated that children with ASD can benefit from an intensive intervention program (Lovaas, 1987). Over 50 years later, the same approach is the most well-known and researched intervention, but clinicians have adapted the original protocol to include more natural reinforcement, less use of punishment, and variability in dosage and intensity (Smith, 2001, Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, 2002).

A discrete trial is composed of five parts: 1. Discriminative stimulus (SD): the interventionist provides clear or brief instruction or command, 2. Prompt: the prompt is delivered at the same time or immediately after the SD to help the child respond correctly, 3. Response: child responds either correctly or incorrectly, 4. Consequence: the interventionist either reinforces correct responses, or prompts the child, 5. Inter-trial Interval: the teacher pauses briefly for 1 to 5 seconds before presenting the next SD (Smith, 2001). Although DTT programs follow a curriculum map where one skill must be mastered before teaching another skill, they do so without following a standardized developmental trajectory. For instance, one DTT program goal such as “imitation with objects” may teach play skills ranging from discriminative actions on single objects, general combinations, and child as agent acts, all at the same time.

The goal of DTT is to teach explicit skills, and the child’s response is either marked as correct or incorrect. The adult gives a clear direction, the SD, for the child to play with the toys in a particular way. For instance, if the instructor delivers the SD of “give the doll a drink”, and the child, instead, takes a drink from the cup, this would be considered incorrect, and the instructor would then prompt for the correct response. This method of teaching play focuses on learning specific skills, or remembering rote ways to play with objects. If a child plays with the toys in a different, novel, or creative way after the SD has been delivered than this is considered wrong. This conflicts with current definitions of play that state it should be spontaneous, flexible, and of interest (Lifter & Bloom, 1998). DTT has been shown to be an effective way of teaching direct skills to children with ASD, although no rigorous studies have been conducted.

Playing to Teach: Joint Attention, Symbolic Play, Engagement, and Regulation

JASPER is an intervention that uses play as a context to teach children with ASD a variety of skills. The theoretical framework behind this naturalistic developmental behavioral intervention draws from a number of pioneers in child development, in particular, Vygotsky who emphasized the importance of developmentally appropriate learning experiences (1962) and choosing intervention programs that fall in the “zone of proximal development” to encourage faster and more successful learning (1978). JASPER focuses on early social communication skills by targeting joint attention gestures that are associated with expressive language outcomes (Kasari, Gulsrud, Wong, Kohn & Locke, 2011; Kasari, Paparella, Freeman, & Jahromi, 2008). This approach is consistent with how most young children in the United States are learning about their world, and developing the skills needed to navigate it. The important intervention components are, 1. the adult (parent or therapist) is responsive to child’s interests, language, and actions, 2. the context is relevant and meaningful for learning opportunities, and that 3. the adult models gestures and expands on the child’s play levels to maintain joint engagement (Kasari et al., 2014).

JASPER interventionists assess the child’s play level prior to beginning therapy, and then targets the child’s current play level and expands on it with slightly more advanced play. By targeting children’s play levels just slightly above what they are already doing allows the interventionists to scaffold and facilitate new and emerging skills. This is similar to other ABA approaches that combine maintenance tasks with new novel tasks to keep engagement and motivation high. In order for children with ASD to learn from these play sessions the therapist has adopted a variety of strategies such as matching the child’s language, building simple and

predictable routines, arranging the environment and their body position to maximize interactions, and modeling joint attention and language. This intervention has been effective in improving symbolic play skills (Kasari et al., 2006; 2014).

The aim of the current study is to determine if two treatment approaches that are known to be effective in improving outcomes for children with ASD have different results on teaching, generalizing, and maintaining play targets. This could inform future researchers and clinicians in deciding on the approach to take to improve play outcomes, since currently the method of instruction is still under debate (Freeman & Kasari, 2013; Mastrangelo, 2009).

CURRENT STUDY

This study proposes to examine the effectiveness and generalization of teaching play skills to children with ASD between two evidence-based interventions. By targeting a specific teaching goal, the outcomes of one critical component of intervention can be compared rather than the approach as a whole. This will help researchers begin to identify active ingredients of more comprehensive evidence based practices and understand if certain teaching approaches are more effective than others. Although existing research has shown through randomized controlled trials that JASPER is effective in teaching symbolic play skills (e.g., Kasari et al., 2006, 2014), only smaller case studies, and single-subject designs have found that DTT is effective at teaching play skills (e.g. Eason et al., 1982; Greer et al., 1985; Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, 2002; Santar-Carangelo et al., 1987). To date, there have been very few studies that compare two interventions against each other, or that examine theoretical and methodological practices for improving play in children with ASD. This will be the first study to compare

JASPER and DTT approaches together in their effectiveness on teaching, generalizing, and maintaining play skills.

First, the study will examine which intervention is better at choosing play targets that are matched with the child's developmental play level at entry. It is hypothesized that JASPER interventionists will choose more appropriate play level targets since the intervention follows a developmental trajectory of play, and the DTT curriculum is not as developmentally sensitive. Secondly, the study will examine if play targets at the end of intervention generalize to play with the parent and during a structured play assessment at exit. It is expected that play will generalize more during the end of the study when parent training occurs for both intervention groups. It is hypothesized that JASPER play strategies will generalize more to the parent-child interaction than DTT, since the teaching approach is more naturalistic and similar to how parents interact with the child. Lastly, the study will determine if play targets at the end of intervention will maintain at six months follow-up during assessments and interaction with the parent. Although it is hypothesized that play skills will be maintained for both groups since parents were taught the intervention, it is expected that the JASPER group will be able to better maintain and develop play skills since the intervention may be easier and more natural for parents to practice at home than DTT, which is more structured and academic in nature.

METHOD

Participants

Children with ASD. Participants are children that have a diagnosis of an autism spectrum disorder from an outside clinical or physician, and diagnosis was confirmed in the current study. Children were part of a five year long study and were recruited through school

administrators, teachers, and parents that had contacted the research group at the University of California, Los Angeles. At entry, children enrolled were between the ages of 33 and 54 months. They were receiving at least 12 and half hours per week of early intervention or preschool developmental services and were classified as nonverbal (less than 30 spontaneous, non-echoed, words heard during entry assessments including other languages). Children had a cognitive level of greater than 12 months as measured by the visual reception or receptive language scales on the Mullen Scales of Learning (Mullen, 1991).

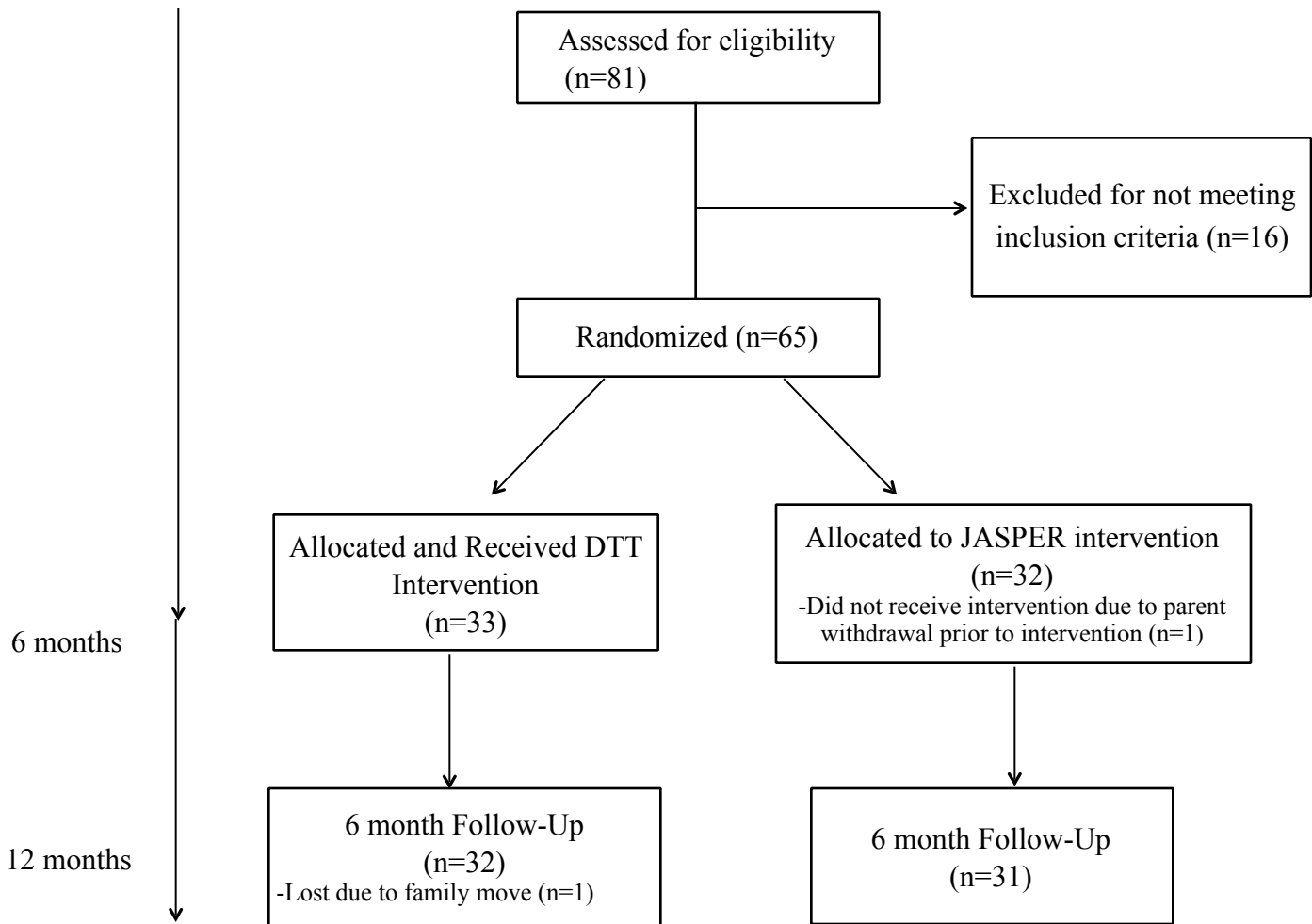
Parents. Parents participated in assessments during all time-points, and also took part in two months of parent training. The majority of parents in the sample had at minimum some college or special training. The highest level achieved of maternal education ranged from: 3.1% having a junior high education, 3.1% having some high school, 21.9% having graduated high school, 4.7% having some college, 21.9% having some special training, 35.9% having graduated college, and 9.4% having completed graduate school. For paternal education, the highest level of school achieved ranged from: 1.7% having less than a 7th grade education, 1.7% having a junior high education, 3.3% having some high school, 21.7% having graduated high school, 10% having some college, 20% having some special training, 25% having graduated college, and 16.7% having completed graduate school.

Design

Parents and children with ASD included in this study were part of a large multi-site randomized controlled trial. Upon meeting eligibility criteria, children were randomly assigned to receive either DTT or JASPER interventions, since both have shown to be effective intervention programs (see Figure 1). Both interventions were with a trained therapist who had

either a bachelor's or master's level related degree. Therapists were supervised by Ph.D. level professors or clinical supervisors, and each received individualized feedback on their children from a weekly clinical. Although as part of the inclusionary criteria parents had to be comfortable with English, many spoke multiple languages. When possible interventionists that spoke the same primary language as parents were matched up together. Therapists in both conditions met with the child for 6 months total: 4 months of sessions for 5 days a week, 1 month of sessions for 3 days a week, and the last month fading back to 2 days a week. Sessions lasted for 60 minutes each, and usually took place in the child's school. Parent training also occurred in both intervention groups during the last two months of the child's intervention program for a total of eight sessions.

Figure 1
Enrollment and Study Design



Assessments were done at three major time-points during the year long study: entry into the study, six months later at exit, and a year post-entry for follow-up. Assessments were done with a trained assessor either at the child’s school, home, or in the university clinic. Parents were offered what was most convenient for them, and therefore, the majority of assessments occurred within the school setting. At entry, children were assessed with the ADOS-2 (Lord, et al., 2012) to confirm diagnosis and with the MSEL (Mullen, 1997) to assess age equivalencies of receptive and expressive language abilities at baseline. At entry, exit, and follow-up and children were

administered the Structured Play Assessment (SPA, Ungerer & Sigman, 1981), and participated in a Parent-Child Interaction (PCX: Kasari, Gulsrud, Wong, Kwon & Locke, 2010). Assessments were completed by assessors blind to treatment conditions or phase of study. Attrition was low during the study, and did not differ between the two treatment conditions.

Measures

Autism Diagnostic Observation Scale (ADOS-2, Lord, et al., 2012). Diagnosis of ASD was confirmed for each child at baseline using the ADOS. The ADOS is a 30 to 45 minute semi-structured assessment of social interaction, communication, and play. All assessors were independent research-reliable testers. All children completed Module 1 at entry, because this module is designed for children who are minimally verbal.

Mullen Scales of Early Learning (MSEL, Mullen, 1997). The MSEL was used to assess mental age across four subscales of development: Visual Reception (VR), Fine Motor (FM), Receptive Language (RL) and Expressive Language (EL). These subscales produce age equivalency scores reported in months.

The Structured Play Assessment (SPA: adapted from Ungerer & Sigman, 1981). The SPA is a 10-20 minute semi-structured assessment of play skills. The child is presented with five sets of toys, including: 1. puzzle, shape sorter, nesting cups, 2. tea set and dolls, 3. hair brush, phone, mirror and dolls, 4. toy furniture and small figurines, and 5. truck, barn, blocks, farmer and animals. The child is able to freely play with each toy set and is not given instruction or prompts on how to play. The assessor can comment on the child's play but does not label or model novel play acts. Eight independent coders established inter-rater reliability through single measures

intra-class correlations (ICC) for the composite variables of simple (ICC = .863), combination (ICC = .901), presymbolic (ICC = .888), and symbolic play (ICC = .854).

Parent-Child Interaction (PCX: Kasari, et al., 2010). A ten-minute video-taped play interaction was collected for each parent-child dyad. A standardized set of toys was used that could be used to engage in simple (e.g., cause and effect toys), functional (e.g., cars and ramp), pre-symbolic (e.g., figurines on bus), and symbolic (e.g., dolls and animals) play acts. Parents were asked to engage in free play with their child as they normally would at home. The same coding scheme was applied to the PCX as the SPA. Eight independent coders established inter-rater reliability on all four composites: simple (ICC = .829), combination (ICC = .903), pre-symbolic (ICC = .916), and symbolic play (ICC = .824).

Coding and Outcome Data

Discrete play behaviors are coded from videotaped administrations of the SPA and PCX. Trained coders code each play type as spontaneous, verbally prompted, model prompted, or physically prompted. Only spontaneous play acts are credited to the child in determining type, frequency, and highest level of play achieved. Play categories are determined by the mutually exclusive, hierarchy of sixteen developmental play levels (see Table 1). Play is coded for number of different types and frequencies within each category. For instance, a child that feeds the same baby doll twice and then him/herself would get coded as having two play types (i.e., “feeding doll”- child as agent, and “feeding self”- pretend self), and three frequencies (i.e., two for the child as agent act and one for the pretend self). The SPA determines a play level that a child is comfortable playing at spontaneously, and can be informative in determining a developmentally appropriate play target.

In addition to coding play from the SPA and PCX, play targets from the daily sessions were recorded. During every DTT session, written data was taken that lists out all programs and targets on a per diem and weekly basis. In one session, multiple play targets may have been practiced. Every listed play target was coded to fit into one of the mutually exclusive play targets, and the primary targets for the week and month were analyzed (see Table 3 for a list of targets and their corresponding play levels). For each specific play target the program was considered mastered if the child responded correctly with at least 80% accuracy across two consecutive teaching days. Play tasks were dropped if the child did not make progress on the task for two weeks, even after adjusting teaching prompts.

Although JASPER does not have written data, many of the sessions are video-recorded. At minimum, there are videos once per month for JASPER sessions. From these taped recordings, a primary play target was coded using the same coding scheme that is applied to the DTT sessions, play assessment, and parent-child interactions. Monthly fidelity session videos were observed for longest time spent targeting a specific play level. One third of each child's month one and six sessions were coded by two observers, the author and an independent graduate level coder, blind to the purpose of the study. Inter-rater reliability for primary play target was measured through intra-class correlations and equaled .824.

Play targets were recorded during month one and month six of the intervention. At month one, play targets are absent for two children in the JASPER condition due to missing videos. At month six, play targets were present for all children (N = 64) except one who was missing video. In the DTT group, most children's play targets were taken from written data (N = 31), except for two children who were missing data so videos were watched for targeted play trials. All play

levels from SPA, PCX, and sessions were then transformed to the major play categories of simple, combination, pre-symbolic, and symbolic play. Missing data for the assessments include one SPA at follow-up, and twelve missing PCX's (entry: 1, exit: 4, follow-up: 7).

Fidelity of Implementation

All therapists were trained in DTT or JASPER by graduate level clinicians. Weekly clinical calls with doctorate level clinicians were done to check-in with each therapist to discuss each case and solve issues related to challenging behaviors or programming. Therapists were required to demonstrate 80% correct implementation of the intervention on three videos with different children before providing treatment. Fidelity of implementation was rated as high in both treatment conditions (DTT: M = 91.15, range 70.8 - 97.5; JASPER: M = 87.97, range = 66.51 - 98.35).

RESULTS

Participant Characteristics

There were no significant differences between treatment groups on gender, ethnicities, chronological age, parent education, or receptive and expressive language skills (see Table 2). On the outcome variables of play during the SPA and PCX there were no statistically significant differences at entry between the two treatment groups (see Table 4), with the majority of children demonstrating play mastery at the pre-symbolic category (N = 42). All children were included in the analysis except for one child in the JASPER condition who dropped form the study before receiving treatment. Since different cultures have shown to have differences in play types and partners (e.g., Lancy, 2007), play types were also examined across ethnic minorities compared to

Caucasians at baseline using a Fisher’s exact test, $\chi^2 (1, N = 64) = .62, p = .62$, and no differences were found in symbolic play between the two groups.

Table 2
Characteristics of Participants by Treatment Condition at Baseline

	JASPER <i>n</i> =32		DTT <i>n</i> =33		Group Differences
	Mean (<i>SD</i>)	Range	Mean (<i>SD</i>)	Range	F (<i>p</i>)
Chronological Age	45.68 (5.31)	37-54	45.81 (5.59)	37-55	.01 (.92)
Receptive Language (Age Equivalency)	20.39 (8.43)	8-36	17.91 (7.73)	1-34	1.51 (.22)
Expressive Language (Age Equivalency)	17.45 (6.67)	6-29	15.85 (7.19)	4-23	.853 (.36)
*All ages reported in months					
	Frequency (%)		Frequency (%)		χ^2 (<i>p</i>)
Gender					0.00 (.99)
Male	27 (84.4%)		28 (84.8%)		
Female	5 (16.6%)		5 (15.2%)		
Race/Ethnicity					5.59 (.47)
Hispanic	10 (31.3%)		11 (33.3%)		
Asian	9 (28.1%)		11 (33.3%)		
Multi-racial	5 (15.6%)		4 (12.1%)		
White- Non-Hispanic	5 (15.6%)		4 (12.1%)		
Black/ African-American	2 (6.3%)		0 (0%)		
Hawaiian/ Pacific Islander	0 (0%)		2 (6.1%)		
Non-disclosed or missing	1 (3.1%)		0 (0%)		

Intervention targets at entry for DTT were predominantly in the combination (*n* = 10) or symbolic category (*n* = 11), while JASPER play targets were primarily in the combination (*n* =

14) and pre-symbolic group (n =11). DTT targets were spread more evenly across the four play categories compared to JASPER.

Table 4
Play Types and Frequencies on Entry SPA

		JASPER <i>n=31</i>		DTT <i>n=33</i>		Group Differences
		Mean (<i>SD</i>)	Range	Mean (<i>SD</i>)	Range	F (<i>p</i>)
Simple Play	Type	7.23 (2.54)	2 - 14	7.06 (4.12)	1 - 19	0.04 (.85)
	Frequency	40.26 (24.56)	3 - 98	42.03 (28.3)	3 - 118	0.07 (.79)
Combination	Type	9.23 (4.26)	1 - 19	9.00 (4.5)	0 - 17	0.04 (.84)
	Frequency	34.44 (17.78)	5 - 77	33.97 (18.8)	0 - 76	0.02 (.90)
Pre-Symbolic	Type	7.19 (5.68)	0 - 27	7.18 (4.37)	0 - 17	0.00 (.99)
	Frequency	15.55 (14.45)	0 - 54	15.06 (10.41)	0 - 42	0.02 (.88)
Symbolic	Type	1.19 (1.74)	0 - 6	1.00 (1.52)	0 - 6	0.23 (.64)
	Frequency	2.52 (4.5)	0 - 19	1.61 (2.4)	0 - 8	1.04 (.31)

Developmentally Appropriate Play Targets

In order to determine which intervention is better at choosing play targets that are matched with the child’s developmental play level at entry, an odds ratio using a 2x2 structure of JASPER or DTT, and matched or unmatched play targets was conducted. Play targets were determined from the first month of sessions and appropriate developmental play level were determined from the SPA at entry. Play targets were classified as fitting into the simple, combination, pre-symbolic, or symbolic categories. The odds of having a developmentally matched play target is 7.93 times greater for children in the JASPER intervention compared to children in the DTT intervention.

Table 5*Odds Ratio of Treatment Condition and Play Targets*

		Play Targets	
		Matched	Non-matched
Treatment Condition	DTT	5	28
	JASPER	17	12
OR= 7.93, 95% CI [2.38-26.45], $p < .00$			

Play targets were measured at the beginning of intervention (month one) and at the end (month six). The majority of children receiving JASPER had no changes in play targets (N = 18), except for one child who decreased in complexity of play target (i.e., from pre-symbolic to combination) and the rest of the participants increased in play complexity by one (N = 7) or two play levels (N = 2). Similarly, the majority of children receiving DTT had the same play targets at entry and exit (N = 19), but there were many more children who had play targets that decreased in complexity by one (N = 2) or two levels (N = 3). The rest of the participants in DTT increased by one (N = 3), two (N = 3), or three (N = 1) levels.

Acquiring Play Skills

By month six of intervention, the majority of children were learning combination (DTT: N = 12, JASPER: N = 11) or symbolic play skills (DTT: N = 12, JASPER: N = 11). The majority of children in both conditions (DTT: N = 19, JASPER: N = 18) had the same play targets from entry to exit. Only children in the DTT group targeted simple play (N = 5), and very few children in both treatments targeted pre-symbolic play (DTT: N = 3, JASPER: N = 7), for these reasons simple and pre-symbolic play were excluded from further analyses. Additional analyses

support analyzing combination and symbolic players separately since children in the combination group had on average almost 10 months lower score on receptive language (combination: $M = 15.57$, symbolic: $M = 24.87$) and 6 months lower on expressive language (combination: $M = 14.3$, symbolic: $M = 20.22$) than children targeting symbolic play.

Data for combination and symbolic play was normally distributed and did not have a statistically significant skew. Covarying for developmentally matched play targets was in the original ANCOVA model, but did not significantly predict combination ($p = .18$) or symbolic play skills ($p = .16$). Overall, children in both intervention groups improved in symbolic play skills when targeted, DTT: $F(1, 21) = 4.90, p = .049$; JASPER: $F(1, 21) = 12.742, p = .004$, but neither group improved in combination play when targeted, DTT: $F(1, 21) = 1.29, p = .279$, JASPER(1, 21): $F = 0.02, p = .90$.

Both treatment groups demonstrated significant improvements in symbolic play skills from entry to exit (DTT: $M = 2.00$, JASPER: $M = 5.91$). Children in the JASPER condition had an average of 5.91 more types of symbolic play acts from entry to exit, and this improvement was greater than the improvement in the DTT group, $F(1, 21) = 4.85, p = .039$, (see Table 5). Approximately nineteen percent of the variability in symbolic play can be accounted for by treatment condition.

Table 5*Change Scores on Play Types Targeted on Exit SPA*

	JASPER <i>Combination: n=11</i> <i>Symbolic: n = 11</i>	DTT <i>Combination: n=12</i> <i>Symbolic: n = 12</i>	Group Differences
	Mean (SD)	Mean (SD)	F (<i>p</i>)
Combination	+0.18 (4.53)	+1.00 (3.04)	1.13 (.614)
Symbolic	+5.91 (5.01)*	+2.00 (3.23)*	2.59 (.039)*

*significant at $p < .05$ **Generalization**

Play during the parent-child interaction revealed that children demonstrated more advanced play during the SPA compared to the PCX, and less play types overall across all play categories, simple: $t(62) = 7.87, p < .00$, combination: $t(62) = 11.64, p < .00$, pre-symbolic: $t(62) = 10.54, p < .00$, and for symbolic: $t(62) = 3.75, p < .00$, (see Table 6). Although the PCX is slightly shorter in length than the typical SPA, this difference is greater than what would be expected for the difference in time. All children were included in the analysis except for one child in the JASPER condition who dropped from the study before receiving treatment, and one child in DTT who was missing videotape during the entry PCX.

There were no effects for treatment condition on targeted play types at any of the time-points (Entry: combination $t(21) = -0.49, p = .63$, symbolic $t(21) = -0.78, p = .11$; Exit: combination $F(1,20) = 1.25, p = .28$, symbolic $F(1,20) = .608, p = .45$; Follow-up: combination $F(1,17) = .37, p = .55$, symbolic $F(1,18) = 0.01, p = .98$). Additionally improvements in symbolic play observed on the SPA were not demonstrated in the play interaction with parents at exit, for combination play (DTT: $F(1, 11) = 0.17, p = .67$; JASPER: $F(1, 9) = 0.97, p = .35$) or symbolic

play (DTT: $F(1, 11) = 0.42, p = .53$; JASPER: $F(1, 9) = 3.77, p = .08$) for either intervention group.

Table 6
Play Types and Frequencies on Entry PCX

		JASPER <i>n=31</i>		DTT <i>n=32</i>		Group Differences
		Mean (SD)	Range	Mean (SD)	Range	F (<i>p</i>)
Simple Play	Type	3.61 (1.84)	1 - 8	3.69 (2.1)	1 - 11	0.15 (.88)
	Frequency	34.00 (31.94)	1 - 139	40.53 (33.86)	2 - 154	0.62 (.43)
Combination	Type	2.65 (2.26)	0 - 10	2.63 (1.62)	0 - 6	0.00 (.97)
	Frequency	10.16 (10.55)	0 - 46	12.31 (10.37)	0 - 37	0.67 (.42)
Pre-Symbolic	Type	0.90 (1.40)	0 - 5	0.81 (1.00)	0 - 4	0.09 (.77)
	Frequency	1.87 (3.97)	0 - 16	2.03 (3.64)	0 - 18	0.03 (.87)
Symbolic	Type	0.19 (0.54)	0 - 2	0.47 (0.98)	0 - 4	1.88 (.18)
	Frequency	0.26 (0.68)	0 - 2	0.66 (1.29)	0 - 4	2.34 (.13)

Maintenance

Only children receiving the JASPER treatment maintained improvements at exit into follow-up on the SPA. Gains made at follow-up in symbolic play were statistically significant compared to entry for the children receiving JASPER, $F(1,10) = 5.14, p = .045$, and this was not statistically different compared to exit scores, $F(1,10) = 0.49, p = .50$. Although children in the DTT group had significant improvement in symbolic skills at exit, this was not maintained six months later at follow-up, DTT: $F(1,11) = 1.92, p = .19$. Differences between the two treatment groups were not statistically significant for either combination or symbolic play at follow-up (combination: $F(1,20) = 0.02, p = .88$, symbolic $F(1,21) = 1.92, p = .18$). The general pattern at

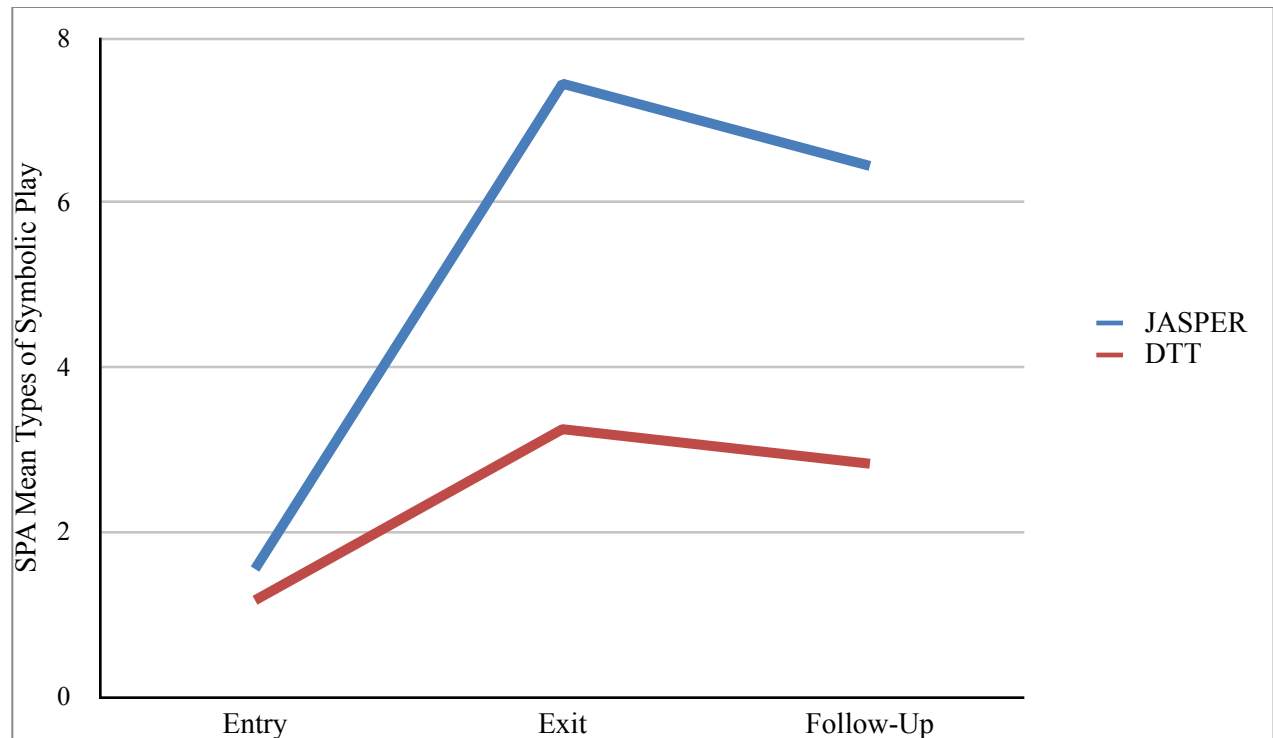
follow-up was similar to gains made at exit for combination play (DTT: $M = 1.91$, JASPER: $M = .82$) and symbolic play (DTT: $M = 1.67$, JASPER: $M = 4.91$, see Table 7).

Table 7
Change Scores on Play Types on Follow-Up SPA

	JASPER <i>Combination: n=11</i> <i>Symbolic: n=11</i>	DTT <i>Combination: n=11</i> <i>Symbolic: n=12</i>	Group Differences
	Mean (SD)	Mean (SD)	F (<i>p</i>)
Combination	+0.82 (2.93)	+1.91 (3.73)	.365 (.552)
Symbolic	+4.91 (6.85)*	+1.67 (4.16)	1.921 (.18)

*significant at $p < .05$

Figure 2
Mean Number of Types of Symbolic Play on SPA by Treatment



Relationship to Cognitive and Language Outcomes

Improvements in symbolic play predicted changes in cognitive scores assessed through the MSEL. Changes in symbolic play types from entry to exit across all children in the study predicted non-verbal measures of cognition including the Visual Reception ($b = .57$, $t(61) = 3.0$, $p = .004$) and Fine Motor areas ($b = .37$, $t(61) = 2.09$, $p = .041$) across both treatment conditions.

At follow-up, changes in types of symbolic play from entry to follow-up predicted improvements in Visual Reception ($b = .78$, $t(59) = 3.01$, $p = .004$), Expressive Language ($b = .51$, $t(60) = 3.00$, $p = .004$), and in Receptive Language ($b = .89$, $t(60) = 2.50$, $p = .015$) across both treatment groups. At both entry and follow-up differences between the two treatment groups did not predict changes in cognitive and language assessments above and beyond changes in symbolic play types.

DISCUSSION

One of the greatest challenges in current play intervention research is to determine which play treatment approach should be used for each specific child (Mastrangelo, 2009). This study represents the first attempt to compare play targets between two interventions for children with ASD. Critically comparing interventions against one another can inform future individualized treatments by determining if certain treatments are better at teaching targeted skills. Overall, findings indicate that children receiving the JASPER intervention demonstrate greater gains in symbolic play types when targeted, compared to children receiving DTT. While improvements in symbolic play types increased for both interventions, only children receiving JASPER were able to maintain these skills. Additionally, JASPER interventionists are more likely to choose play targets that were matched with the child's developmental play level compared to DTT, but

matching play level did not result in many differences between groups and did not generalize to play with parents. Combination play did not improve in either treatment groups, and gains made in both combination and symbolic play did not generalize to play interactions with parents. Across both treatment groups, improvement in symbolic play was associated with changes in both verbal and nonverbal cognitive functioning.

Acquiring Play and Developmental Readiness

This study found promising results in improving play skills across both DTT and JASPER interventions. Therapists were highly trained and received weekly feedback about their specific cases by experts in the field. Therefore, gains made within these two interventions may not generalize to all community settings that are practicing these same types of intervention with less training and support. Additionally, many play interventions require that children have a expressive language skills around two years of age for symbolic play, and four years for sociodramatic play (e.g., Stahmer, 1999). This study showed that children that are minimally verbal are also able to develop symbolic skills. Even so, the sample has significantly higher receptive and expressive language skills compared to children targeting combination play, highlighting the need for some developmental readiness. Neither intervention improved play diversity in combination play. Entry SPA data reveal that children started the intervention with a large number of combination play types, and it thus may be more revealing to examine low versus high complexity skills in combination play (e.g., presentation versus conventional combination). This finding is consistent with the research literature that shows functional play, which encompasses combination play, is less impaired in children with ASD compared to symbolic play (e.g., Sigman and Ruskin, 1999). Presentation combination play (e.g., puzzles) are

a common target for DTT interventions; thus examining combination play in more fine grained categories may yield some differences between treatment approaches. Additionally, using child-therapist sessions may be a better indicator of changes in abilities compared to the SPA, which requires the children to demonstrate generalization with an unfamiliar assessor and novel toys.

Although improvements in symbolic play were demonstrated in both groups, children in the JASPER treatment condition demonstrated significantly more symbolic play types than children receiving DTT on the SPA. This suggests that the JASPER intervention has aspects that make it easier and more effective for children to learn and maintain. Some of these strategies that particularly support more symbolic play include: child-driven intentions, naturalistic play settings, and freedom to play with the toys in any particular manner. It is important to encompass these qualities of play that are central to the meaning and definition of play, and are also found to be more effective in improving symbolic play skills.

It is important to remember that change in play types was measured from a child's specific targeted play goal in session. At entry, only 24% of the minimally verbal preschool children were learning symbolic play, and by the end of intervention only 36% of the sample was targeting symbolic play skills. A one-size-fit model was not used for either intervention, and instead intervention goals were specific to the child's needs. Thus, the sample on a whole with different play goals may not reflect these gains over time, or by treatment. This reflects the importance of developmental readiness to target specific skills and may require children to have certain cognitive or language capabilities to improve on play targets, particularly symbolic play. Many other research studies that have showed a significant and unique relationship with both expressive language and nonverbal cognitive ability (Stanley & Konstantareas, 2007), and thus

have only taught symbolic play skills to a more narrow group of children with expressive language abilities equivalent to 30 months (Stahmer, 1995).

Many studies have found that children learn better when their developmental level is taken into consideration, but this study did not find significant differences between those that had matched targets and those that did not. The matched variable created does not reflect therapists playing at a level below the child's play level at entry or targeting play levels above the child's level which would fall within their zone of proximal development. Both children in JASPER and DTT were likely to have the same play target over the course of the six-month intervention, but children receiving DTT were more likely to decrease in complexity of the play target compared to JASPER, suggesting that the DTT intervention failed to follow a developmental sequence. Additionally, because JASPER interventionists were already about eight times more likely to incorporate developmental appropriateness into their targets it may be difficult to disentangle the treatment and matched variable from one another.

Maintaining and Generalizing Play Skills

Six months after the study was complete, children were able to maintain gains made in play during the JASPER intervention, but not the DTT intervention. The JASPER intervention occurs in a more natural context, so the children in this group may have had an easier time practicing these skills outside of the research context. Although involving parents was meant to help with maintenance of these strategies the parent child sessions did not show evidence of change. Thus, it is likely that the child-therapist session made lasting benefits for these children. Further, although children in the JASPER condition had higher averages in symbolic play than

DTT, this was not statistically significant at follow-up. This finding may be due to a small sample size or reflect more similarities in skills six months post treatment.

Generalization to new play partners has been a consistent difficulty in early intervention research for children with ASD (Yang, Wolfberg, Wu, & Hwu, 2003, Hine & Wolery, 2006; Thorp, Stahmer, & Schreibman, 1995). Even though this study incorporated eight weeks of parent training, gains made in play were not reflected in the parent-child interaction. Parents may have spent more time learning about language targets, which were the main outcome of the original multi-site study. Additionally, unlike the SPA, parents may choose not to present all objects in the assessment. Many of the parents and children spent a large majority of time engaging in cause-and-effect toys rather than selecting developmentally appropriate toys. Future interventions with parents should emphasize the importance of toy selection and play levels with their specific child in mind. The overall goal of intervention is to ensure that children generalize goals they learn to a variety of play contexts and people.

Relationship to Cognitive and Language Outcomes

Improvements in symbolic play during the two interventions was related to lasting effects in language and cognitive skills. At exit, increases in non-verbal cognitive scores were demonstrated on the visual reception and fine motor areas for children who demonstrated more symbolic play skills across the six months. At follow-up, the language domains on the MSEL were also related to improvements in symbolic play. Visual reception, spoken language and receptive language all were associated with improvements in symbolic play, reflecting a relationship with developmental quotient and play skills. These results suggest that interventions targeting symbolic play also create collateral benefits in language and cognitive domains.

Limitations

There are several limitations of the present study. The primary weakness of the study is small sample sizes and power once children were grouped by targeted play category. This was important to do since children were taught different play acts throughout the course of intervention. Teaching functional play types is easier to do than teaching symbolic skills, in part because of the cognitive prerequisites needed (Yang et al., 2009). Even with a small n , symbolic play skills were higher at the cessation of intervention for the JASPER group compared to the children receiving DTT. Another weakness of the study is that both JASPER and DTT target more than play skills through their intervention, and it is unclear if improvements in other areas (e.g., cognitive skills, joint engagement, language) may be producing collateral effects on play skills. Therefore, it may not be the teaching approach towards play that is driving the findings. Although both interventions rely on toy and object use, children in the JASPER condition are expected to play for longer periods of time than children in DTT.

Future Directions

This study made several important contributions to the literature. First, the study recruited pre-school aged children who were minimally verbal, a population that is often overlooked in ASD research and symbolic play interventions. The majority of the sample (86%) included children from ethnic minority populations. By examining multiple hierarchical levels of play, we get a richer understanding of the development of play over time, and can measure changes to types of play specific to intervention research. As mentioned earlier, no studies have compared two interventions targeting play against one another. Using a randomized controlled trial this study showed that both treatments showed gains in symbolic play over time, highlighting the

effectiveness of both treatments. Additionally, the two treatments produced benefits in language and cognitive skills if symbolic play skills improved. Children in the JASPER group demonstrated greater gains that were maintained at follow-up. This is the first time that a study has shown that the JASPER intervention is more effective in changing symbolic play outcomes compared to DTT. Future research studies should be done with larger sample sizes, and include children of younger and older ages to see if the same findings occur. The lack of generalization in the study is important to note, and future therapists and research interventions need to find new ways to help children generalize to important play partners (e.g., parents or peers). Lastly, considering that DTT is the primary applied behavior analysis intervention offered in schools and in homes, this study has important policy implications. More therapists and teachers should be learning play strategies from the JASPER intervention in order to produce larger and sustained improvements in symbolic play, which is a core deficit for children with an autism spectrum disorder.

Appendix

Table 1

Developmental Trajectory of Play (Lifter et al., 1993, Kasari, Freeman & Paparella, 2006, Lifter, 2000)

	Play Category	Definition	Example	Associated Play Major
1	Indiscriminate Acts	Treats all objects alike, does not discriminate between objects.	Mouths all toys.	Simple Play
2	Discriminative Actions	Differentiates objects, preserving physical or conventional characteristics.	Roll car, open/ close barn doors.	
3	Take Apart Combinations	Separates toy combinations.	Takes puzzle pieces out.	
4	Presentation Combinations	Recreates combination based on a specific and set configuration.	Puts shapes in shape-sorter.	Combination
5	General combinations	Combines objects in a non-specific configuration.	Stacks furniture or dishes.	
6	Physical Combinations	Preserves physical combinations of toys.	Makes tower structures out of blocks.	
7	Conventional Combinations	Preserves the unique conventional characteristics in the combination.	Pours kettle into teacup.	
8	Pretend Self	Extends familiar actions to themselves.	Places phone to ear.	Pre-symbolic
9	Child as Agent	Extends familiar actions to dolls.	Gives bottle to doll.	
10	Single-Scheme Sequences	Extends familiar action to 2 or more dolls sequentially.	Puts two dolls in their beds.	
11	Doll as Agent	Treats dolls as if they are capable of life.	Doll walks to the house.	Symbolic
12	Substitution	Uses another object as something else.	Uses cup as hat.	
13	Substitution without Object	Pretends to use something that is not physically present.	Pretends there is coffee in the cup.	
14	Multi-scheme Sequences	Extends different actions to the same figure.	Doll takes a bath and then goes to sleep.	
15	Sociodramatic Play	Adopts familiar roles and assigns roles to others.	Plays house, assigns roles of mom and baby.	
16	Thematic Fantasy Play	Adopts fantasy roles and assigns roles to others.	Takes on role of superhero and assigns role of criminal.	

Table 3

Discrete Trial Training Categorization of Developmental Trajectory of Play (Created from Smith, 2001; Lifter et al., 1993, Kasari, Freeman & Paparella, 2006, Lifter, 2000)

Play Level	DTT Target Skill Examples	Instructional Method
<i>Discriminate Actions</i>	<ul style="list-style-type: none"> • Play xylophone • Hit drum • Roll car • Shake maraca 	Imitation
<i>Presentation Combination</i>	<ul style="list-style-type: none"> • Shape Sorter • Puzzles • Nesting Cups 	Verbal
<i>General Combination</i>	<ul style="list-style-type: none"> • Block in bucket • Load dump truck 	Imitation Verbal
<i>Conventional Combination</i>	<ul style="list-style-type: none"> • Pretend to cook • Pour tea • Cut food • Put gasoline in car 	Verbal
<i>Pretend Self</i>	<ul style="list-style-type: none"> • Pretend to eat • Answer phone • Put on hat 	Verbal
<i>Child as Agent</i>	<ul style="list-style-type: none"> • Feed baby • Put baby on bed • Listen to baby's heart 	Verbal
<i>Substitution</i>	<ul style="list-style-type: none"> • Pretend banana is phone • Pretend book is piano 	Verbal
<i>Substitution without Object</i>	<ul style="list-style-type: none"> • Push horn on car "beep beep" • Ring doorbell on house "ding dong" 	Verbal
<i>Doll as Agent</i>	<ul style="list-style-type: none"> • Make baby drive • Fly bird "chirp chirp" 	Verbal
<i>Sociodramatic Play</i>	<ul style="list-style-type: none"> • Pretend to be a dog • Pretend to be a baby 	Verbal

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