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**The Dissertation Committee for Russell Bennett Lang certifies that this is the
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**Enhancing the Effectiveness of a Play Intervention by Abolishing the
Reinforcing Value of Stereotypy for Children with Autism**

Committee:

Mark O'Reilly, Supervisor

Diane Bryant

Jeff Sigafos

Giulio Lancioni

Karrie Shogren

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Reinforcing Value of Stereotypy for Children with Autism**

by

Russell Bennett Lang, B.A; M.Ed.

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In memory of Russell Bennett Cummings and Morris Albert Lang

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**Enhancing the Effectiveness of a Play Intervention by Abolishing the
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Russell Bennett Lang, PhD.

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Supervisor: Mark F. O'Reilly

Children with autism often experience substantial delays in the development of play behavior. Interventions to teach play skills are often complicated by challenging behavior and stereotypy. Previous research has demonstrated a potential relationship between stereotypy, challenging behavior and play in children with autism. However, few research-based methods for addressing stereotypy and challenging during play interventions are available to practitioners. The purpose of this study was to reduce stereotypy and challenging behavior during a play intervention for five children with autism by adding an abolishing operation component to a common research-based procedure for teaching play skills.

The abolishing effect is one of several possible effects of MOs. An abolishing operation is any stimuli or series of events that reduces the value of a particular reinforcer. If an individual has unrestricted access to a particular reinforcer for an extended period of time that stimuli may eventually lose its reinforcing value. Incorporation of the abolishing operation concept into play interventions may allow practitioners to effectively reduce the reinforcing value of stereotypy prior to beginning a play intervention. If the reinforcing value of stereotypy is reduced, then the child may engage in less stereotypy and less challenging behavior when stereotypy is interrupted. By reducing these interfering behaviors, it was hypothesized that a research-based play intervention would be more effective and efficient.

The effects of two conditions were compared. In one condition (abolishing operation condition) the child is allowed to engage in stereotypy freely prior to the implementation of an intervention targeting play skills. In the second condition the same play intervention was implemented without the prior free play period. The levels of functional play, symbolic play, stereotypy, and challenging behavior were compared across these two conditions. Results show decreased levels of stereotypy and challenging behavior and increased levels of functional play in the abolishing operation condition. Symbolic play did not occur following either condition.

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CHAPTER 1

INTRODUCTION

Play is widely acknowledged to be an integral part of human development and a large percentage of typically developing children's time is spent engaged in play (Boutot, Guenther, & Crozier, 2005; Sigelman & Rider, 2006). As children develop, play serves increasingly more complex and essential functions (Rutherford & Rogers, 2003; Williams, 2003). For example, play has been linked to the development of communication skills (Bakeman & Adamson, 1984, Toth, Munson, Meltzoff, & Dawson, 2006), cognition (Piaget, 1962; Rutherford & Rogers, 2003; Vygotsky, 2000), and social and emotional interactions (Erikson, 1951). Delayed or abnormal development of play behaviors can adversely affect an individual across their lifespan (Sigelman & Rider, 2006)

Children with autism and related developmental disabilities often experience substantial delays in the development of play behavior (Baron-Cohen, 1987). In a longitudinal study, Sigafos, Roberts-Pennell, and Graves (1999) reported that while other areas of adaptive behavior showed gains over a 3-year period, there was very little improvement in play among a sample of 13 preschool children with autism. Even when matched with children according to mental age, children with autism engage in significantly more stereotypic and repetitive behaviors and fewer appropriate play behaviors (Wing, Gould, Yeates, &

Brierley, 1977). Indeed, these deficits are central to the definition of autism (DSM-IV; APA, 1994) and items related to play are integral components on autism diagnostic tools (e.g., Autism Diagnostic Observation Schedule, Autism Diagnostic Interview). Deficits in play behavior can further exacerbate the social and communication delays experienced by children with autism. Clearly, teaching play skills is an important goal of early intervention with this population (Jarrold, Boucher, & Smith, 1993).

Given that play deficits are prevalent, persistent, and a core feature of autism, it is not surprising that a considerable amount of intervention research has focused on developing successful procedures for teaching play skills to children with autism (Lang et al., in press; Stahmer, Ingersol, & Carter, 2003; Terpstra, Higgins, & Pierce, 2002). In addition to increases in diversity, flexibility, and spontaneity of play, successful play interventions have also been associated with improvements in socialization, language, cognition, functional use of objects, motor skills, and exercise (Brown & Murray, 2001).

Many researchers and practitioners report that stereotypic behavior (e.g., body rocking, and spinning or mouthing toys) often interferes with attempts to teach play skills (e.g., Baker, 2000; Baker, Koegel, & Koegel, 1998; Honey, Leekam, Turner, McConachie, 2007; Koegel, Firestone, Kramme, & Dunlap, 1974). Interrupting or restricting these stereotypic behaviors during play

interventions may elicit challenging behaviors (e.g., tantrum, aggression, and self injury) (Green & Striefel, 1988) which further complicate interventions. Several recent studies address this issue by collecting data regarding challenging behavior and stereotypy while evaluating interventions designed to increase play skills (e.g., Gillett & LeBlanc, 2007; Hume & Odom, 2007; Paterson & Arco, 2007).

Results of these studies suggest that a negative correlation between stereotypy and play skills may exist for some children. Specifically, as play skills increase, participants often engage in less stereotypy and challenging behavior (e.g., Hume & Odom, 2007; Paterson & Arco, 2007). Additionally, interventions designed to decrease stereotypy or challenging behavior often occasion an increase in functional play behaviors (e.g., Koegel et al., 1974). However, for some children, simply increasing play skills does not seem to affect the occurrence of stereotypy. For example, when Gillett and LeBlanc (2007) collected data concerning play, challenging behavior, and stereotypy no difference between baseline and post play intervention was found for stereotypy, even though levels of appropriate play had substantially increased. Despite this frequently reported problem, few research-based procedures for addressing stereotypy during interventions to teach play skills exist (Lang et al., in press) and additional approaches are required (Rapp, Vollmer, Peter, Dozier, & Cotnoir, 2004). One

potential novel approach involves attempting to reduce stereotypy by eliminating or abolishing the child's motivation to engage in stereotypy.

Stereotypy often occurs because the behavior itself produces pleasant internal consequences for the individual (i.e., automatic reinforcement) (Rapp et al., 2004). One possible relationship between stereotypy, challenging behavior, and play is that when stereotypy is interrupted (e.g., during a play intervention) access to this reinforcement is denied. In these instances, the individual may engage in challenging behavior maintained by negative reinforcement (i.e., the removal of the interrupting agent). This unplanned reinforcement contingency may then compete with the programmed reinforcement of the play intervention. One manner in which this hypothesized relationship could be manipulated is to decrease (or abolish) the reinforcing value of stereotypy. If the motivation to engage in stereotypy is decreased then less negatively reinforced challenging behavior should occur. Reducing the stereotypy and challenging behavior that interferes with play should lead to more efficient and effective play interventions.

Motivating operations (MOs) have been demonstrated to have a powerful influence on reinforcer value and corresponding behavior (Vollmer & Iwata, 1991). MOs may provide a means to alter the value of the automatic reinforcement produced by stereotypy. MOs influence the value of reinforcers in different ways depending on where the individual is on a continuum from

deprivation to satiation with respect to a specific stimulus (Vollmer & Iwata, 1991). For example, if an individual has not been permitted to engage in stereotypy for an extended period of time, then they may be in a state of deprivation in respect to the automatic reinforcement stereotypy provides, subsequently increasing its reinforcing value. Conversely, if the same individual has engaged in stereotypy freely for an extended period of time, then they may be in a state of satiation and the automatic reinforcement from stereotypy may be less valuable. The term used to describe an increase in reinforcer value (as in a state of deprivation) is the reinforcer-establishing effect. When reinforcing value is decreased (as in a state of satiation) it is referred to as the reinforcer-abolishing effect (Michael, 1982, 1993, 2000; O'Reilly et al., 2008).

The reinforcer-establishing effect and the reinforcer-abolishing effect also correspond to changes in behavior. When influenced by the reinforcer-establishing effect, an individual will engage in higher levels of behaviors previously reinforced by that stimulus. This increase in behavior is termed the evocative. Conversely, when influenced by the reinforcer-abolishing effect an individual will engage less in behaviors previously reinforced with that stimulus. This change in responding is termed the abative (Laraway, Snyckerski, Michael, & Poling, 2003; Michael, 1982, 1993, 2000).

Several studies have demonstrated the benefits of incorporating the various influences of MOs into interventions. Procedures designed to increase reinforcer value involve creating states of deprivation (capitalizing on the establishing and evocative effects). This is done when an increase in motivation to engage in a specific behavior is desired. For example, Vollmer and Iwata (1991) identified music as a reinforcer for a specific individual. Two conditions were compared, one in which music was available prior to instruction (satiation) and one in which music was not available prior to instruction (deprivation). Following each of these conditions, music was then used as a reinforcer during the instruction of simple tasks. A higher level of correct responding and task completion was found following deprivation conditions as compared to satiation conditions, suggesting that the availability of music prior to instruction acted as a MO during instruction.

Procedures designed to reduce motivation to engage in a specific behavior involve creating states of satiation. This is done when a reduction in a specific behavior is desired (e.g., reducing challenging behavior). For example, McComas, Thompson, and Johnson (2003) found that challenging behavior functioned to gain access to attention for three participants. When high levels of non-contingent attention were delivered prior to sessions, a state of satiation with respect to attention was created and, challenging behavior was reduced. In comparison when

attention was withheld prior to sessions a state of deprivation was created and challenging behavior functioning to gain attention was increased. These studies and others demonstrate the potential viability of MO intervention components for enhancing the effectiveness of interventions for individuals with developmental disabilities (e.g., Berg et al., 2000, Guiterrez et al., 2007, Klatt, Sherman, & Sheldon, 2000; Langthorne, McGill, & O'Reilly, 2007; McAdam et al., 2005; McGill, 1999; O'Reilly et al., 2007; O'Reilly, Lacey, & Lancioni, 2000; O'Reilly et al., 2008; Wilder & Carr, 1998).

Given the success of previous research, it is reasonable to assume that incorporating the MO concept into other types of interventions may also enhance results. This study will incorporate the MO concept into an existing research-based play intervention in an attempt to enhance effectiveness. Two related MO effects may increase effectiveness. First, the reinforcer-abolishing effect may reduce motivation to engage in stereotypy and second, the abative effect may reduce actual rates of stereotypy. A reduction in the motivation to engage in stereotypy may also reduce challenging behavior occurring when stereotypy is interrupted. Combined, these effects may enhance the efficiency and effectiveness of a researched based play intervention by reducing the occurrence of behaviors that interfere with instruction and compete with programmed reinforcement contingencies. The intervention component assessed in this study will be termed

the Abolishing Operation Component (AOC) as it is designed to capitalize on the abolishing and abative effects of the MO to reduce stereotypy.

Research Questions

This project will address four specific research questions.

1. If an AOC is added to a research-based play intervention will this combined intervention package result in higher levels of functional play than the same research-based intervention without the AOC?
2. If an AOC is added to a research-based play intervention will this combined intervention package result in higher levels of symbolic play than the same research-based intervention without the AOC?
3. If an AOC is added to a research-based play intervention will this combined intervention package result in lower levels of stereotypy during the intervention procedures than the same research-based intervention without the AOC?
4. If an AOC is added to a research-based play intervention will this combined intervention package result in lower levels of challenging behavior during the intervention procedures than the same research-based intervention without the AOC?

CHAPTER 2: REVIEW OF INTERVENTIONS TO INCREASE FUNCTIONAL AND SYMBOLIC PLAY IN CHILDREN WITH AUTISM

In order to determine the potential benefit of adding an AOC to a research-based play intervention, first, a research-based play intervention must be identified. The purpose of this chapter is to review the literature concerning play interventions for children with autism. This review updates older reviews by covering the last 10 years of research targeting functional and symbolic play in children with autism. This review differs from older play intervention reviews in several important ways. First, this review includes all conceptual models (e.g., behaviorism, mentalism, developmental) and intervention environments (e.g., home, school, clinic). Second, in order to ensure certainty of evidence (Schlosser, & Sigafoos, 2007) inclusion was limited to studies demonstrating experimental control. Finally, this is the first review of play studies to report results in quantifiable terms (i.e., PND).

This review is organized as follows. The first section of this chapter (Method) further describes the inclusion and exclusion criteria, details the search procedures, explains how studies were coded, and provides a table of reviewed studies. In the table, studies are grouped into two categories (i.e., studies of functional versus symbolic play). The following section (Results) describes these two categories of studies and reports the findings within each category. The final

section (Discussion) identifies common components of successful play interventions found across categories and provides suggestions for future research.

Findings of the review suggest three components (i.e., modeling, prompting with contingent reinforcement, and child directed or “naturalistic” instruction) underlie the effectiveness of successful play interventions for children with autism. Further, one study (Kasari, Freeman, & Paparella, 2006) evaluated all of these components in one intervention package using a rigorous experimental group design. Therefore, Kasari et al.’s intervention was identified as the having the best available evidence and will be used as the common component in the comparison of a play intervention with and without an AOC.

Method

Search Procedures and Selection Criteria

Systematic computerized literature searches were conducted on two databases: the Educational Resources Information Clearing House (ERIC) and PsychINFO to identify research studies targeting play behaviors in children with autism. The search was limited to English language journal articles published between 1998 and July 2008. Combination of the following search terms were entered into the keywords field: *autism, autistic, symbolic play, sociodramatic play, functional play, object manipulation, toy play, stereotypic play, leisure*

skills, games, and pretend. This initial search resulted in the identification of 425 studies. The titles and abstracts of these studies were then screened for general appropriateness. The reference lists from the resulting 65 studies were then hand searched for additional relevant studies leading to the identification of 73 studies.

These 73 studies were then included or excluded based on the following criteria. To be included a study: (a) contained participants ages 0 to 8 years old diagnosed with autism; (b) included the improvement in toy play as a dependent variable; and (c) experimental control was demonstrated by means of single-case or control-group experimental designs (Kennedy, 2005). Studies in which the intervention procedures were not described in sufficient detail to enable replication or that did not demonstrate experimental control were excluded (e.g., Bernard-Opitz, Ing, & Kong, 2004). In order to ensure that the focus of the intervention was the improvement of play skills, studies in which play was used as a context to increase communication or other social skills were excluded (e.g., Baker, Koegel & Koegel, 1998; Bevill, Gast, Maguire, & Vail, 2001; Kohler, Anthony, Steighner, & Hoyson, 2001; Krantz & McClannahan, 1998; Loncola & Craig-Unkefer, 2005; Shabani et al., 2002). Studies in which the topography of the play behavior was unclear (e.g., “targeted play skill”) or did not require functional or symbolic play were also excluded (e.g., Ingersoll, Schreibman, & Tran, 2003). Fifteen studies met these criteria and are summarized in Table 1.

Table 1. Summary of Reviewed Studies

Citation	<i>n</i>	Independent Variables	Experimental Design	Dependent Variables & Results
I. Functional Play				
D'Ateno, Mangiapanello, & Taylor (2003)	1	Video Modeling	MBL* across toys	<i>Modeled play behaviors</i> increased M ^b PND ^c = 87% (range, 60% to 100%) <i>Novel play behaviors</i> increased with some toys but not with others M ^b PND ^c = 18% (range, 0% to 50%)
Gillet & LeBlanc (2007)	3	Parent-implement Natural Language Paradigm	MBL across part ^a	<i>Functional play</i> increased M PND = 93% (range, 80% to 100%) <i>Stereotypy</i> was not affected by intervention M PND = 0%
Hine & Wolery (2006)	2	Point-of-View Video Modeling	Multiple probe across play behaviors	<i>Modeled play</i> increased M PND = 94% (range, 85% to 100%)
Hume & Odom (2007)	2	TEACHH developed Structured Work Systems	Reversal (ABAB)	<i>On task behaviors</i> increased M PND = 100% <i>Teacher delivered prompts to play</i> decreased M PND = 83.5% (range, 81% to 86%) <i>Number of play materials utilized</i> increased M PND = 100%
Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer (2002)	3	Pairing toy play with reinforcer	MBL across part	<i>Functional play</i> increased M PND = 55% <i>Stereotypy</i> decreased M PND = 33% (range, 0 to 100%) Note: variable rates of behavior in baseline lowered PND Visual analysis of data indicates a more powerful positive effect
II. Symbolic Play				
Barry & Burlew (2004)	2	Social Stories	MBL across part	<i>Teacher delivered prompts to play</i> decreased M PND = 97.25% (range, 94.5% to 100%) <i>Symbolic play</i> increased M PND = 100%
Dauphin, Kinney, & Stromer (2004)	1	Video Enhanced Activity Schedules & Matrix Training	Reversal & Component Analysis	<i>Modeled play behaviors</i> increased <i>Novel play behaviors</i> increased Note: Data could not be converted into PND, Results were positive for both variables.

Table 1. (continued).

Citation	<i>n</i>	Independent Variables	Experimental Design	Dependent Variables & Results
Ingersoll & Schreibman (2006)	5	Reciprocal Imitation Training	MBL across part & behaviors	<i>Total symbolic play</i> increased M PND = 29% (range, 0 to 60%) <i>Spontaneous symbolic play</i> increased M PND = 27% (range, 0 to 63%) Note: 1 of the 5 parts made no improvements
Kasari, Freeman & Paparella, (2006)	21	Combined Behavioral Drill & Milieu Teaching	F Statistics in mixed effect regression models	Significant group x time interaction, play intervention group showed significantly greater improvements over time in both functional and symbolic play skills compared to a joint attention intervention group and a no treatment control group
MacDonald, Clark Garrigan, & Vangala, (2005)	2	Video Modeling	Multiple probe across toys	<i>Modeled behaviors</i> increased M PND = 100% <i>Novel play behaviors</i> decreased Note: Only means were reported for novel play behaviors, therefore PND calculation is not possible
Morrison, Sainato, Benchaaban, & Endo, (2002)	4	Correspondence Training, Activity Schedules	MBL across part	<i>On task symbolic play</i> increased M PND = 100%
Newman, Reinecke, & Meinberg, (2000)	2	Self Management	MBL across part	<i>Variability of play</i> increased M PND = 91.5% (range, 90% to 93%)
Paterson & Arco (2007)	2	Video Modeling	Reversal embedded into a MLB across toys	<i>Appropriate play</i> increased M PND = 100% <i>Stereotypy</i> decreased M PND = 100%
Reagon, Higbee, & Endicott (2006)	1	Video Modeling	MBL across play scenarios	<i>Model behaviors</i> increased M PND = 100% Note: Only 1 baseline data point
Zercher, Hunt, Schuler & Webster (2001)	2	Integrated Play Therapy	MBL across part	<i>Symbolic play</i> increased M PND = 72% (range, 50% to 94%)

* Multiple baseline

^aParticipants^b Mean^c Percent Non-Overlapping Data*Italics* denote the name of the dependent variable

Coding and Summary of the Studies

The 15 studies were coded using a data sheet designed specifically for this review (Appendix A). Every article was read in its entirety and pertinent information was extracted and recorded on the data sheet.

Each study was classified into one of two possible categories according to the type of play skill targeted for intervention. The two categories of play skills were (a) functional play and (b) symbolic play (termed in some studies as “pretend play”, “sociodramatic play” or “imaginative play”). A study was classified as functional play if the behavior targeted involved use of a toy in a manner consistent with its intended function preserving the unique physical properties of the toy (Kasari et al., 2006). Examples of functional play include (a) placing puzzle pieces into a puzzle, (b) stringing beads, and (c) looking at a picture book. These studies are presented in the first section of Table 1.

A study was classified as symbolic play if the behavior targeted involved any of the following (a) use of one object to stand for another object (e.g., a hairbrush used as a microphone), (b) appears to use something that is not present (e.g., strums an imaginary guitar), (c) uses a toy figure as if it were capable of performing actions (e.g., makes a teddy bear dance and sing), (d) uses a toy as a prop (e.g., a book becomes a ramp for a car), or (e) adopts a role or persona that does not belong to the child (e.g., acts as if they are the parent, teacher, or other

super hero). When a study targeted both functional and symbolic play, that study was classified as symbolic because symbolic play is considered to be more advanced. These studies are presented in the second section of Table 1.

For each study in the review, Table 1 summarizes the following variables: (a) number of participants (b) independent variable intended to increase play skills (c) experimental design and (d) effectiveness of the intervention. Other dependent variables that are not directly related to play are not listed (e.g., language and social skills). Intervention effectiveness is reported as either percentage of non-overlapping data (PND), the statistical findings reported by the author (e.g., Kasari et al., 2006), or when baseline data prevented the use of PND, visual analysis of the results are reported (e.g., Dauphin, Kinney, & Stomer, 2004).

PND is one method of synthesizing single subject data (Scruggs & Mastropieri, 1998). A higher PND suggests that the participant's behavior changed in the desired direction (e.g., increased play skills or decreased stereotypy) during or following intervention. A lower PND suggests that the intervention may have failed to change behavior in the desired direction. While several other methods for synthesizing single subject data exist (e.g., Standard Mean Difference, Percentage Reduction Measure) a recent review and empirical

comparison of these methods found consistent results across methods (Olive & Smith, 2005). Therefore, PND was chosen for its simplicity.

To calculate PND for behavior reduction, the lowest baseline data point is identified. Next, the data points in the intervention phase that fall below the lowest baseline point are counted. This number is then divided by the total number of data points in the intervention phase (data points below lowest baseline point + data points equal to and above lowest baseline point). The quotient is then converted to a percentage by multiplying by 100%. For behaviors in which an increase is desired, the highest baseline point is identified and identical calculations are made; except that the number of intervention data points above (instead of below) the highest baseline point is used as the divisor. PND cannot be calculated when a zero quantity is in the baseline of reduction studies or a maximum possible quantity is found in behavior increase studies (Olive & Smith, 2005). When a design contains more than one baseline phase (e.g., an ABAB design), the lowest or highest baseline point was identified across all baseline phases.

When single subject data cannot be converted into PND, due to the presence of an extreme baseline point, the methodology used by Machalicek et al. (2008) was utilized to describe results as positive, negative, or mixed. "Positive" meant that all the participants experienced some improvement from baseline

levels during or following intervention. “Mixed” meant that, although one or more participants experienced some improvement, one or more participants did not. “Negative” meant that none of the participants in the study benefited from the intervention. No study in this review reported negative findings.

The remainder of this chapter is organized into three sections: (a) results, (b) discussion, and (c) future research. The results section presents an overview of the studies within each category (i.e. functional or symbolic play) and two studies are discussed in detail to illustrate the interventions that typify the category. The discussion section evaluates the reviewed studies towards identifying common components of successful play interventions. The final section highlights possible areas of future research.

Results

Increasing Functional Play

Five studies ($n = 11$ participants) evaluated interventions designed to increase the functional play skills of children with autism (D’Ateno, Mangiapanello, & Taylor, 2003; Gillet & Leblanc, 2007; Hine & Wolery, 2006; Hume & Odom, 2007; Nuzzolo-Gomez, Leonard, Ortiz, Rivera & Greer, 2002). Two of these studies evaluated the use of video modeling (D’Ateno et al.; Hine & Wolery). Other independent variables included natural language paradigm (Gillet & LeBlanc), structured work systems (Hume & Odom), and pairing (Nuzzolo-

Gomez et al.). Dependent variables, other than functional play included, stereotypy (Gillett & LeBlanc; Nuzzolo-Gomez et al.) verbal communication variables (D'Ateno et al.; Gillett & LeBlanc), off task behavior (Hume & Odom), and teacher delivered prompts (Hume & Odom). All of these studies used single-case experimental designs (e.g., ABAB reversal design, multiple-baseline) (Kennedy, 2005). The three studies that assessed social validity reported that parents and educators found the interventions to be successful, acceptable, and targeting important skills (Gillett & LeBlanc; Hine & Wolery; Hume & Odom). Maintenance data was collected in two studies. Acquired play skills were maintained at 1 month (Hume & Odom) and 2 months (Hine & Wolery). Generalization of newly acquired play skills to new toys and settings was reported in one study (Hine & Wolery). Across all the functional play studies, the mean PND for increasing functional play skills was 88% (range, 60% to 100%). This indicates that, on average, participants improved more than the best baseline point across 88% of the intervention and post intervention sessions.

Hine and Wolery (2006) evaluated the effects of video modeling on increasing toy-play skills of two children with autism (ages 30 months and 43 months). The targeted play skills involved using a toy gardening set and a toy cooking set. Point-of-view video model tapes were made by holding the camera at the child's eye level without including the child's body in the camera shot. This

camera angle was used to show the environment as the child would see it if they were performing the targeted behaviors. The effects of point-of view video modeling were evaluated in a multiple probe design across both participants and both sets of toys. The intervention was effective at increasing the participants' engagement in the modeled behaviors (M PND = 94% range, 85% to 100%).

Hine and Wolery (2006) also collected generalization, social validity, and maintenance data. Generalization probes showed mixed results. Both children demonstrated the ability to generalize to new play materials but only one participant generalized to a second environment. Social validity was evaluated by a group of 10 graduate students for each participant. Graduate students watched pre/post training videos and rated the children's play behaviors on a 5 point Likert Scale. Raters concluded, that in the post-training videos, children were more engaged, used multiple actions/materials, played appropriately, enjoyed the activity, and needed less help than during baseline videos. Maintenance data shows that the participants still engaged in the modeled behaviors two months after the intervention had ceased.

Gillett and LeBlanc (2007) evaluated the effects of a natural language paradigm (NLP) intervention implemented by participants' parents, on increasing the appropriate play and decreasing the inappropriate play of three children with autism between the ages of 4 and 5 years. Appropriate play was defined as "using

the toy in the manner it was intended”. Inappropriate play included “use of the toy in a stereotyped manner”. The modified NLP procedures used in this study consisted of six steps; (a) displaying three toys to the child, (b) preventing access to these toys, (c) providing an action model for 5s and then a vocal model, (d) reinforcing appropriate child responses with access to the selected toy, (e) repetition with a novel modeled play behavior, and (f) continued play modeling throughout sessions. A multiple baseline across participants was used to evaluate the effects on appropriate and inappropriate play behaviors. Results showed that all three parents learned to correctly implement the NLP intervention and that, while appropriate play increased (M PND = 93% range, 80% to 100%), levels of inappropriate play remained the same from baseline to intervention (PND = 0%) suggesting no reduction in inappropriate play. Social validity data was collected via written questionnaire from two of the three parents who found the intervention to be "very useful", "very easy", and "very helpful".

Increasing Symbolic Play

Ten studies, including 42 participants (21 from Kasari et al., 2006), evaluated interventions designed to increase the symbolic play skills of children with autism (Barry & Burlew, 2004; Dauphin et al., 2004; Ingersoll & Schreibman, 2006; Kasari et al.; McDonald, Clark, Garrigan, & Vangala, 2005; Morrison, Sainato, Benchaaban, & Endo, 2002; Newman, Reinecke & Meinberg,

2000; Paterson & Arco, 2007; Reagon, Higbee, & Endicott, 2006; Zercher, Hunt, Schuler, & Webster, 2001). Three of these studies evaluated some form of video modeling (MacDonald et al.; Paterson & Arco; Reagon et al.). Other independent variables included Social Stories™ (Barry & Burlew), activity and matrix training (Dauphin et al., 2004), reciprocal imitation training (Ingersoll & Schreibman), behavioral drill and milieu teaching (Kasari et al.), activity schedules (Morrison et al.), self management (Newman et al.), and integrated play therapy (Zercher et al.). Dependent variables, other than symbolic play, included stereotypy (Paterson & Arco), off-task behavior (Morrison et al., 2002), and teacher delivered prompts (Barry & Burlew). All studies, with the exception of Kasari and colleagues, used single subject designs. Kasari and colleagues utilized a group design. The mean PND across the symbolic play studies that used single subject designs was 86% (range, 27% to 100%). This indicates that, on average, participants improved symbolic play skills more than the best baseline point across 86% of the intervention and post intervention sessions.

The five studies that assessed social validity reported that parents and educators found the interventions to be “successful”, “acceptable”, and “targeting important skills” (Barry & Burlew, 2004; Ingersoll & Schreibman, 2006; Morrison et al., 2002; Paterson & Arco, 2007; Reagon et al., 2006; Zercher et al., 2001). Maintenance data was collected in four studies. Acquired play skills were

maintained at one week (Paterson & Arco), one month (Ingersoll & Schreibman; Newman et al.) and two months (McDonald et al.). Generalization of new play skills to (a) new settings was reported in two studies (Barry & Burlew; Ingersoll & Schreibman), (b) new toys in two studies (Ingersoll & Schreibman; Paterson & Arco), (c) new play partners in three studies (Ingersoll & Schreibman; Kasari et al.; Reagon et al.) and to (d) new combinations of play behaviors in one study (Dauphin et al., 2004).

Ingersoll and Schreibman (2006) evaluated the effects of a naturalistic behavioral intervention on the language, imitation, joint attention, and pretend (i.e., symbolic) play skills of five children with autism. Naturalistic behavioral interventions are a hybrid of behavioral techniques (e.g., prompting, shaping, contingent reinforcement) and child lead teaching procedures (e.g., incidental teaching, milieu teaching, pivotal response training). The intervention used in this study consisted of five phases. In the first phase, the therapist used the following two strategies (a) contingent imitation (in which the therapist imitated the child's actions and language) and (b) linguistic mapping (in which the therapist provided a verbal description of the actions of the child). In the second phase, requests for the child to imitate the therapist were interspersed with the therapist's contingent imitation of the child. For example, the therapist would move the toy in the same manner as the child for several repetitions and would then prompt the child to

imitate the therapist's novel movement with the toy. In the third phase, more novel and familiar movements were modeled with familiar toys. In the fourth phase, novel and familiar movements were again modeled with the same toy and familiar movements were modeled with novel toys. In the final phase, novel movements were modeled with novel toys. During each phase systematic prompting for the modeled behavior was used and reinforcement in the form of praise was given contingent on the child's imitation of the play behavior. Each phase lasted two weeks.

A single-subject multiple-baseline design across participants (Kennedy, 2005) was used to evaluate the effects of the intervention. Symbolic play was defined in two ways (a) total pretend play ("child performs a distinct action with miniature objects, directs a pretend action towards self, adult or inanimate object, uses object as if it were another object, attributes properties to an object which it does not have or refers to an object that is not present") and (b) spontaneous pretend play (child performs a pretend play scheme that is not imitative of a therapists movements within the last 30 seconds). Average total pretend play increased (M PND = 29 %, range 0 to 60%). Average spontaneous pretend play increased (M PND = 29%, range 0 to 90%). However, the overall results were mixed because one out of the four participants did not have any gains in play behaviors.

Newman, Reinecke, and Meinberg (2000) implemented a self-management intervention designed to increase the variability of play behaviors in three children with autism. The self-management intervention consisted of first teaching the participants to take a penny following novel play responses by providing verbal prompts and contingent social praise. The pennies were traded in for reinforcers following the play sessions. Once the participants learned to collect the penny following novel play behaviors the therapist stopped providing the verbal prompts and praise.

A single-subject multiple-baseline design across participants (Kennedy, 2005) was used to evaluate the effects of the self-management intervention. All three participants learned to engage in a variety of novel play behaviors. Average number of different play behaviors per session increased (M PND = 94 %, range 90% to 95%). Follow-up data, collected one month after the intervention had been removed, indicated that the participants continued to engage in less repetitive and more dynamic topographies of play.

Discussion

Identification of Common Components of Successful Play Interventions

The most common intervention component found in studies targeting both functional and symbolic play is modeling of appropriate play behavior. Modeling was a component in three of the five functional play studies and eight of the ten

symbolic play studies. Modeling involves the participant attending to another person (in vivo or on film) engaging in the targeted behavior. Modeling has been shown to be effective in teaching many complex skills to children with autism, such as conversational speech (Charlop & Milstein, 1989) and perspective taking (Charlop & Daneshvar, 2003). Modeling has been identified in other reviews as a promising practice for increasing the play behaviors of children with autism (Stahmer et al., 2003). This review provides additional and quantifiable support for this assertion.

Given the evidence supporting the use of modeling to teach children with autism functional and symbolic play, it would seem that modeling is an important instructional strategy for teaching play. However, the use of modeling to increase play behaviors has been criticized by some researchers who reason that imitative behaviors may not be true forms of play because they lack spontaneity (e.g., Luckett et al., 2007). This concern is compounded when the modeling also involves some form of vicarious reinforcement (i.e., the observer witnesses the model receive reinforcement for their behavior) (Bandura, 1965) because many feel play should be internally motivated (Luckett et al.).

Hine and Wolery (2006) offer several reasons for targeting modeled actions as dependent variables in a play intervention. First, an increase in appropriate play behaviors (even if imitative) may reduce stereotypic or

challenging behaviors. Second, an increase in recognizable behaviors should also increase the number of appropriate behaviors on which an adult can comment. This leads to an increase in opportunities for language instruction. Third, an increase in modeled behavior should reduce apparent differences between the child with autism and his typically developing classmates. This may allow for an increased opportunity for inclusion in social activities.

The next most common component used in both functional and symbolic play interventions was systematic prompting and contingent reinforcement of the target behavior. The combination of prompting and reinforcement was used in two of the five functional play studies and seven of the ten symbolic play studies. Prompting and reinforcement were implemented both from a discrete trial instructional format (e.g., Kasari et al., 2006) and from a child directed instructional format (e.g., Ingersoll & Schreibman, 2006).

Prompts are behaviors provided by the instructor that increase the likelihood that the participant will engage in the desired behavior. Prompts vary from highly intrusive (e.g., physically guiding the participants hand to manipulate the toy appropriately) to very covert (e.g., the teacher uses her eye gaze to signal to the participant what item is used next in a play sequence). All studies in which prompts were used employed a least-to-most prompting hierarchy. In this system the least intrusive prompt (e.g., eye gaze) is used first and more direct prompts

(e.g., physical guidance) are used only when the lesser prompts fail to produce the desired behavior.

Contingent reinforcement was used in all of the studies that included prompting. Contingent reinforcement involves providing the participant with a reward (pleasant consequence) following the occurrence of the target behavior. A reinforcer can come in many forms, for example, preferred edible items (e.g., Hine & Wolery, 2006) or praise from an adult (e.g., Barry & Burlew, 2004). When a behavior is reinforced it is more likely to occur again.

Some have suggested that approaches that involve external reinforcement (reinforcement delivered from the environment) do not teach “play” but instead teach a child to merely appear to be playing (e.g., LUCKETT et al., 2007) because play is internally motivated (Garvey, 1991; Wolfberg, 2003). Several studies in this review that utilize contingent reinforcement also collected maintenance data. In these instances, reinforcement was used in the initial teaching of play behaviors, but was then withdrawn when the intervention phase ended. The participants in these studies continued to engage in the new play behaviors for as long as two months without programmed external reinforcement (e.g., Hine & Wolery, 2006; Ingersoll & Schriebman, 2006). While the numbers of participants in each of these studies are limited, it does suggest play behaviors initially paired

with external reinforcers may become “internally reinforcing” over time (Nuzzolo-Gomez et al., 2002).

Another common strategy used in both functional and symbolic play interventions was child directed or “naturalistic” instruction. Interventions containing this component involved attending to the participant’s focus, imitating the participant’s play behaviors (even if stereotypic), identifying toys the participant prefers for use in the intervention, and conducting the intervention in a natural play setting (e.g., on the floor as opposed to seated at a desk). Naturalistic instruction is an integral part of the Natural Language Paradigm (Gillett & Leblanc, 2007), Reciprocal Imitation Training (Ingersoll & Schreibman, 2006), Milieu Teaching (Kasari et al., 2006), and Integrated Play Therapy (Zercher et al., 2001). Strategies such as these have been identified in other reviews as a promising practice for increasing the play behaviors of children with autism (Stahmer et al., 2003). This review provides additional and quantifiable support for this assertion.

Kasari et al. (2006) evaluated a play intervention consisting of all three of the above identified components (i.e., modeling, prompting with contingent reinforcement, and naturalistic teaching) in a rigorous experimental design. Specifically, Kasari et al. randomly assigned 58 children with autism between 3 and 4 years old to a play intervention group ($n = 21$), a joint attention intervention

group ($n = 20$), or a no treatment control group ($n = 17$). The impact on play skills (and joint attention, although only the results related to play will be discussed in this review) were then compared across the three groups. The symbolic play intervention consisted of modeling, systematic prompting and reinforcing of play skills followed by milieu teaching. The Milieu teaching component of the same intervention consisted of (a) following the child's lead and interest in activities, (b) talking about what the child was doing, (c) repeating back what the child said and expanding on it, (d) staying close in proximity and making eye contact, and (e) making environmental adjustments designed to encourage engagement. All three groups demonstrated improvements in play over time. However, the group that received the play intervention showed significantly more diverse types of play and a greater overall frequency of play compared to both the joint attention and the control group.

Despite concerns that the nature of play precludes the use of external motivators (reinforcement), prompting, and modeled examples, no recent research has been conducted without using these components in some manner to teach play skills to children with autism. However, recent research does suggest that these components may in some instances be best used within a child-directed instructional format and within natural environments (e.g., on the floor as opposed to seated at a desk). Additionally, there seems to be little difference in the manner

in which functional play and symbolic play is taught. Therefore, when designing any play intervention, practitioners should strongly consider incorporating these three common components of play interventions reviewed above.

Future Research

A number of interventions to teach functional and symbolic play behaviors to children with autism have been examined, and several research questions have emerged from this review. First, no research identified in this review or in past reviews attempts to isolate the effects of any one single component within a multi-component play intervention. Hine and Wolery (2006) evaluated the effects of video modeling without any additional prompting or reinforcement. However, only one of the two participants improved. The second participant did not improve until contingent reinforcement was added (i.e., small edible given following occurrence of the modeled behavior). Such an example demonstrates the necessity of a better understanding of how to initially design these interventions in order to be most efficient and effective. Future research could be conducted in which common components are systematically evaluated individually and then in tandem in order to identify the most effective and parsimonious play intervention tailored to the specific characteristics of the child.

Second, many researchers and practitioners report that stereotypic behavior (e.g., rocking, spinning and mouthing toys) often interferes with

attempts to teach play skills (Baker, 2000; Honey, Leekam, Turner, & McConachie, 2007; Koegel, Firestone, Kramme, & Dunlap; 1974). Blocking or interrupting these stereotypic behaviors may elicit challenging behavior (e.g., tantrum, aggression, self injury) (Green & Striefel, 1988) further complicating play interventions. Several of the reviewed studies address this issue by collecting data regarding challenging behavior and stereotypy while evaluating interventions designed to increase play skills (e.g., Gillett & LeBlanc, 2007; Hume & Odom, 2007; Paterson & Arco, 2007).

Results of these studies suggest that a negative correlation between stereotypy and play skills may exist for some children. However, when inappropriate behavior decreases following a successful play intervention, the exact mechanism of action for the decrease is often not apparent beyond the assertion that the more time spent playing appropriately leaves less time available during the session for challenging behavior and stereotypy. Evidence of such a relationship is also suggested when an intervention designed to decrease challenging behaviors also occasions an increase in appropriate play behaviors (e.g., Koegel et al., 1974). However, this is not always the case. For example, Gillett and LeBlanc (2007) successfully increased play behaviors, but found no difference in challenging behavior and stereotypy between baseline and intervention. Such an example highlights the need for future research concerning

the relationship between stereotypy, challenging behavior, and play in children with autism.

CHAPTER 3

METHOD

The purpose of this chapter is to describe this project's methodology. In the first section, the participant characteristics and the various locations in which the project was implemented are described. The next section details the toy selection process and lists the specific toys utilized. In the third section, the dependent variables, data collection procedures, interobserver agreement formula and data, and the treatment fidelity measures and data are given. The fourth section details the procedures for identifying a behavioral indicator of satiation, and the final section, describes the experimental design, independent variables, and session procedures.

Participants

Five children diagnosed with autism participated in this study. Table 2 reports participants' information including age, ethnic background (as reported by the family), score on the Childhood Autism Rating Scale (CARS; Schloper, Reichler, Devellis, & Daly, 1980), age equivalence score on the Vineland Adaptive Behavior Rating Scale (reported years: months). All participants were diagnosed by physicians or school districts independent of this project. All participants were between the ages of three and eight years old and scored in the moderate to severe range on the CARS. Only children who engaged in high levels

of stereotypy during a free play period were eligible to participate. This was done to ensure that stereotypy was maintained by automatic reinforcement as opposed to social contingencies. Topographies of stereotypic and challenging behaviors were identified through parent and teacher report and confirmed via direct observation in the natural environment.

Sue was an eight year old Caucasian female diagnosed with autism. At the time of the study, Sue was beginning to demonstrate vocal approximations (e.g., "baah" for ball) and some emerging signs (e.g., cookie, water, and eat). She scored a 47.5 on the CARS, placing her in the "severe autism" range. When left alone in a room with toys (observed from a distance to ensure safety), Sue would flap her hands rapidly near her face and rapidly spin toys in small circles on flat surfaces. When this stereotypy was interrupted she would scream loudly, drop to the floor, or pull away from the interventionist.

Johnny was a four year old Caucasian male diagnosed with autism. At the time of the study, Johnny communicated with simple hand gestures (e.g., pointing or reaching towards items he desired). He scored a 52 on the CARS placing him in the "severe autism" range. When left alone in a room with toys, Johnny would hold the toy near his face and move it from side to side. When this behavior was interrupted, Johnny would cry and/or attempt to leave the intervention area.

Rusty was a seven year old Asian-American male diagnosed with autism. At the time of the study, Rusty communicated by simple words and phrases (“I want cookie”). He scored a 43 on the CARS placing him in the “severe autism” range. When left alone in a room with toys Rusty would line toys up in a straight line and repeatedly count them aloud. When this behavior was interrupted, Rusty would push away from the therapist and attempt to leave the assessment area.

Karen was a four year old Indian-American female diagnosed with autism. At the time of the study, Karen communicated by simple phrases (e.g., “Can I have blocks?”). She scored a 43 on the CARS placing her in the “severe autism” range. When left alone in a room with toys Karen would pick up two items hold them close to her face and repeatedly tap them together making a soft banging sound. When this behavior was interrupted, Karen would cry, scream, and fall to the floor.

Dorothy was a five year old Hispanic-American diagnosed with autism. At the time of the study, Dorothy communicated using single words (“crayons?”). She scored a 42 on the CARS placing her in the “severe autism” range. When left alone in a room with toys, Dorothy would lay flat on her stomach while rocking back and forth. She would also pick up one toy at a time, verbally label the item, and it put it down. This behavior would continue until she had cycled through all available toys (e.g., pick up a doll and say “doll” then put the doll down and pick

up the next toy) When these behaviors were interrupted, Dorothy would cry and scream.

Table 2. Participant Characteristics

Participant	Age	Ethnicity Gender	CARS Score
Sue	8	Caucasian Female	47.5
Johnny	4	Caucasian Male	52
Rusty	7	Asian Male	43
Karen	4	Indian Female	43
Dorothy	5	Hispanic Female	42

Settings

The setting for each participant was chosen based on teacher and parent preference and the availability of space within the school or home. Each setting was indoors with a minimum space of three meters by three meters. All settings were places that the participant was normally allowed or expected to play (e.g., classroom, bedroom, living room, or play room). No other children or adults,

other than those involved in the research, were present during sessions. All children had prior experience within their setting.

Materials

Toys and Toy Selection

Each participant used a different set of toys. The participants' chronological age and developmental level were considered in tandem when selecting toys. The age appropriateness of toys was determined by observing the play of same age typically developing children attending the same or similar schools. Only the toys used by these children were considered for use in the study. An example of an age appropriate toy is an action figure or doll for a five year old. A non-example is a rattle for an eight year old. Second, the toys selected were developmentally appropriate. Specifically, the child was physically capable of using the toy in its intended manner (Lifter, Sulzer-Azaroff, Anderson, & Cowdery, 1993). An example of a developmentally appropriate toy is a set of big wooden blocks for a child with limited fine motor skills and pica. A non-example is small Legos © for the same child. Finally, only toys considered appropriate by participants' parents and teachers were considered.

Once possible toys were identified the participants were allowed to choose which toys they preferred. In order to evaluate the participants' preference for the toys being considered, first each toy was given one at a time to the participant for

two minutes. This was done to ensure that the child had enough prior experience with the toy. Second, a paired choice preference assessment was conducted (Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin 1992). This assessment consisted of presenting two toys at a time to the participant and recording which toy the participant selected. Every combination of two toys was presented in a randomized sequence. The possibility of position bias was controlled for by systematically varying which side (i.e., left or right) each toy was placed.

The participants' selection was indicated by which toy the participant touched first. When the participant touched one of the toys, the other toy was removed and the participant was given 10 seconds of free access to the selected toy. If the participant did not touch either toy within five seconds both toys were removed and the next pair of toys was presented. If the participant touched both toys at once then both toys were removed and then presented again after a five second pause. The most frequently selected toys were used during the sessions. Table 3 reports the setting and specific toys used for each participant.

Table 3. Implementation Setting and Play Materials

Participant	Setting	Toys
Sue	Assessment room on school campus	Plastic cooking set, plastic food, kitchen center, model train, a doll with hair brush and hair clips
Johnny	Assessment room on school campus	Model train, puppets, wooden puzzle, paper and markers, and wind-up motorized walking robots
Rusty	Regular classroom	Electronic cash register, animal maze, magnetic numbers, and grocery store items
Karen	Regular classroom	Break the Ice © board game, plastic building blocks, and wooden puzzles
Dorothy	Regular classroom	Musical instruments, Magna Doodle ©, Grocery store items, paper and crayons, puppets, and plastic animals

Data Collection Materials

Data was collected using data sheets designed specifically for this study (Appendix B) and a pencil. Intervals were timed with a Timex © wrist watch that could be set to beep every 10 seconds. This beep signaled the changing of data collection intervals.

Dependent Variables

Four target behaviors were selected as dependent variables, (a) functional play, (b) symbolic play, (c) stereotypy, and (d) challenging behavior. Functional play is defined as, use of play materials in a manner consistent with their intended function (Libby, Powel, Messer, & Jordan, 1998). Symbolic play is defined using the classifications of play provided by (Kasari, et al., 2006) and consists of one or a combination of the following four behaviors (a) use of one object to stand for another object (e.g., a hairbrush used as a microphone), (b) appears to use something that is not present (e.g., strums an imaginary guitar), (c) uses a toy figure as if it were capable of performing actions (e.g., makes a teddy bear dance and sing), (d) adopts a role or persona that does not belong to the child (e.g., acts as if they are the parent, teacher, or similar super hero).

The operational definitions of stereotypy and challenging behavior were individualized for each participant. Table 4 reports these specific operational definitions.

Table 4. Operational Definitions of Stereotypy and Challenging Behavior

Participant	Stereotypy	Challenging Behavior
Sue	Placing the toy on flat surface and spinning the toy so that it rotates in rapid circles	Loud vocalizations substantially above the conversational level (i.e., screams) and falling rapidly to the floor by buckling both knees
Johnny	Holding a toy near eyes and repeatedly swinging it back and forth	Throwing toys at least three feet and/or loud vocalizations substantially above the conversational level (i.e., screams)
Rusty	Placing one toy in front of another until a straight line of at least three toys is created, then repeatedly and verbally counting the toys	Places hands on furniture or therapist and pushes and/or lets body fall to the ground
Karen	Picking up two toys, holding them close to her ear and tapping them together making a soft banging sound	Loud vocalizations substantially above the conversational level (i.e., screams) and/or falling to the ground by buckling both knees
Dorothy	Repeatedly picking up toys and verbally labeling them	Loud vocalizations substantially above the conversational level (i.e., screams)

Measurement

Data Collection

A 10 second partial interval procedure was used to record the occurrence of each of the target behaviors (Kennedy, 2005). Data was collected by trained graduate students. Data collectors were trained in two phases. In the first phase the first author provided the data collectors with written descriptions of the target behaviors and answered questions. In the second phase, data collectors coded video tapes of children playing. Once coded, the first author and the data collectors reviewed the results and discussed any discrepancies between data collectors. This process was repeated until all data collectors agreed on at least 90% of intervals.

Interobserver Agreement

Two data collectors independently observed at least 20% (range, 20% to 33%) of all sessions with each participant. Data from the two observers were compared for agreements and disagreements. An agreement was scored when both observers recorded an occurrence or nonoccurrence. Any discrepancy between the observer's scoring resulted in a disagreement. Interobserver agreement on each target behavior was calculated for each session using the formula:

$$\text{Interobserver Agreement} = \frac{\text{Agreement}}{\text{Agreements} + \text{Disagreements}} \times 100$$

The mean IOA combined across all sessions, dependent variables, and participants was 94% (range, 87% to 100%). Table 5 reports the mean and range for each target behavior and each participant individually.

Table 5: Mean Interobserver Agreement

Participant	Functional Play	Symbolic Play	Stereotypy	Challenging Behavior
Sue	92%	100%	92%	92%
Johnny	95%	100%	97%	92%
Rusty	90%	95%	95%	87%
Karen	95%	100%	88%	93%
Dorothy	90%	100%	95%	90%

Treatment Fidelity

Treatment fidelity data was collected during 33% of sessions for Johnny, 100% of sessions for Rusty, and 50% of sessions for Karen and Dorothy. Treatment fidelity data was not collected for Sue. A 10 second partial interval procedure was used to record errors in intervention implementation on the treatment fidelity data sheet (Appendix C). Because the intervention consisted of three main components (i.e., prompting, reinforcement, and interrupting stereotypy, three possible types of errors were recorded. A “prompting error” was scored if the implementer failed to delivery a prompt or failed to use the correct prompting hierarchy (e.g., failed to provide a model of the play behavior prior to a physical prompt). A “stereotypy error” was scored if the implementer failed to interrupt stereotypy. Finally, a “reinforcement error” was scored if the implementer failed to provide the programmed reinforcement. Table 6 displays the percent of correct implementation (100% - error percentage) for individual participants and components during each of the two intervention conditions (i.e., AOC and No AOC).

Table 6. Treatment Fidelity in the AOC and No AOC conditions

Participant	AOC			No AOC		
	Prompt	Reinforce	Stereotypy	Prompt	Reinforce	Stereotypy
Johnny	95%	97%	93%	90%	90%	88%
Rusty	90%	97%	91%	91%	91%	91%
Karen	91%	93%	84%	90%	89%	88%
Dorothy	94%	96%	96%	93%	90%	100%

Independent Variable: Abolishing Operation Component

The independent variable is an abolishing operation component (AOC) added to a research based intervention designed to increase play skills. The AOC is an additional component implemented prior to the regular play intervention. The AOC is intended to reduce the reinforcing value of the stereotypy by allowing the participants to engage in stereotypy freely until they engage in a systematically determined behavioral indicator of satiation.

Identifying a Behavioral Indicator of Satiation

The AOC requires that a specific behavior that signals when the participant is satiated be identified in order for the implementer to know when to

end the AOC and begin teaching play skills. In order to identify behavioral indicators of satiation, teachers and/or parents were asked to identify each participant's rejecting topographies (i.e., behaviors used to refuse an item). To verify that participants used these behaviors to reject, each participant was exposed to two conditions: a highly preferred toy access condition and a low preferred toy access condition. Each condition was 10 min long and was conducted five times. In the highly preferred toy condition, the participant was presented with a highly preferred toy (identified via paired choice preference assessment) and, data were collected on the frequency of rejecting behavior. In the low preferred toy condition, the participant was presented with the least preferred toy per the results of the paired choice preference assessment. Procedures during this condition were identical to those used in the highly preferred toy condition. The frequency of the rejecting behavior was then compared across conditions in an alternating treatment design (Kennedy, 2005). If the rejecting behavior occurred more in the low preferred toy condition as compared to the high preferred toy condition then the behavior was considered to be an indicator of satiation. If the behavior did not occur more with the low preferred toy than the preference of the toys was reassessed and/or a new hypothesized rejecting topography was identified and evaluated.

Experimental Design

In order to evaluate the effects of the AOC, first a baseline of all dependent variables was recorded. After a stable pattern in the data was established an alternating treatment design was used to compare a play intervention with an AOC to an identical play intervention without an AOC (Kennedy, 2005).

Baseline

Baseline sessions were 10 min periods of play. The participant had free access to the toys, received no demands, and the therapist provided verbal praise noncontingently at a minimum rate of once every 10 sec. Data on the occurrence of all dependent variables was collected but occurrence of these target behaviors was ignored by the therapist. Once a stable pattern in the data was identified (minimum of 3 sessions), baseline was ended and the child began the alternating treatment phase.

Play Intervention without AOC

Chapter Two's literature review identifies three components commonly used in successful play interventions (i.e., modeling, prompting with contingent reinforcement, and child directed naturalistic instruction). These three components were used together as an intervention package by Kasari et al (2006). Kasari et al.'s randomized control group study found this package to be effective for teaching play skills. The procedures used in that study represent the best

available research-based practice for teaching play skills and are therefore used in this current study.

Specifically, the therapist created an environment in which multiple sets of the preferred toys were spread out and easily available to the participant. The participant was free to approach any of the toys, and the therapist followed the child's lead. The therapist then modeled appropriate play with the toys. The child was prompted to imitate the behavior of the therapist and was reinforced with praise contingent on engaging in appropriate play behaviors. Initially, the therapist targeted functional play skills and simple one-step play routines. As the child began to consistently imitate the behavior, the therapist increased the complexity of the modeled behaviors to symbolic and multi-step play behaviors. For example, if the participant approached a set of toy cars the therapist would initially prompt the child to roll the car along the ground. After the child did this several times, the therapist would imitate having two cars race and crash, and then finally to jump on a pretend ramp. All occurrences of challenging behavior and stereotypy were interrupted and redirected back to appropriate play. All occurrences of appropriate play behavior not previously modeled by the therapist were highly praised and then imitated by the therapist.

Play Intervention with AOC

In this condition the same play intervention described above was implemented. The only change between conditions was the presence or absence of a pre-session free access period (i.e., the AOC). During the pre-session free access the therapist provided an environment containing all the selected toys spread out and easily available. Participants were allowed to engage in any behavior they chose. All occurrences of stereotypy and challenging behavior were ignored and praise was given noncontingently at a minimum rate of once every 10 seconds. This free access session continued until the participant stopped interacting with the toys and engaged in the rejecting topography. Once this occurred the therapist began implementing the play intervention described above.

CHAPTER 4

RESULTS

This chapter presents the results of the alternating treatment design comparing the AOC to the No AOC. Each dependent variable (i.e., functional play, symbolic play, stereotypy, and challenging behavior) is presented in a separate panel for each individual participant.

Figure 1 displays the results for Sue. The top panel displays the percentage of intervals Sue engaged in functional play behaviors. During baseline functional play was rare ($M = 3\%$, range, 0% to 10%). Once Sue began receiving intervention, play behaviors increased in both the AOC and No AOC conditions. However the AOC condition contained higher levels of functional play ($M = 56\%$, range, 33% to 76%) than the No AOC condition ($M = 39\%$, range, 25% to 54%). Additionally, both conditions showed an upwards trend in overall levels of play over time with little variability.

The second panel of Figure 1 displays the percentage of intervals in which Sue engaged in symbolic play. No symbolic play occurred in baseline during either the AOC or No AOC conditions.

The third panel displays the percentage of intervals Sue engaged in stereotypy. During baseline stereotypy was high ($M = 81\%$, range, 66% to 90%). Once Sue began intervention, stereotypy decreased in both conditions. However,

the AOC condition had lower overall levels ($M = 28\%$, range, 15% to 60%) than the No AOC condition ($M = 44\%$, range, 27% to 66%). Additionally, both conditions showed a downwards trend in levels of stereotypy over time with little variability.

The bottom panel displays the percentage of intervals Sue engaged in challenging behavior. During baseline challenging behavior was low ($M = 5\%$, range, 0% to 10%). Once Sue began intervention, challenging behavior remained consistent in the AOC condition (range 0% to 9%) but increased in the No AOC condition ($M = 13\%$, range, 0% to 33%). Additionally, the occurrence of challenging behavior during the No AOC condition was more variable than during the AOC condition.

Examination of Sue's results across phases suggests an immediate intervention effect for both functional play and stereotypy. This effect is evident in the first intervention data point in both the AOC and No AOC conditions for these dependent variables. However, the step up for functional play and the step down for stereotypy are more substantial in the AOC condition. Additionally, the slope of the increasing trend in functional play appears to correspond to slope of the decrease in stereotypy.

Sue

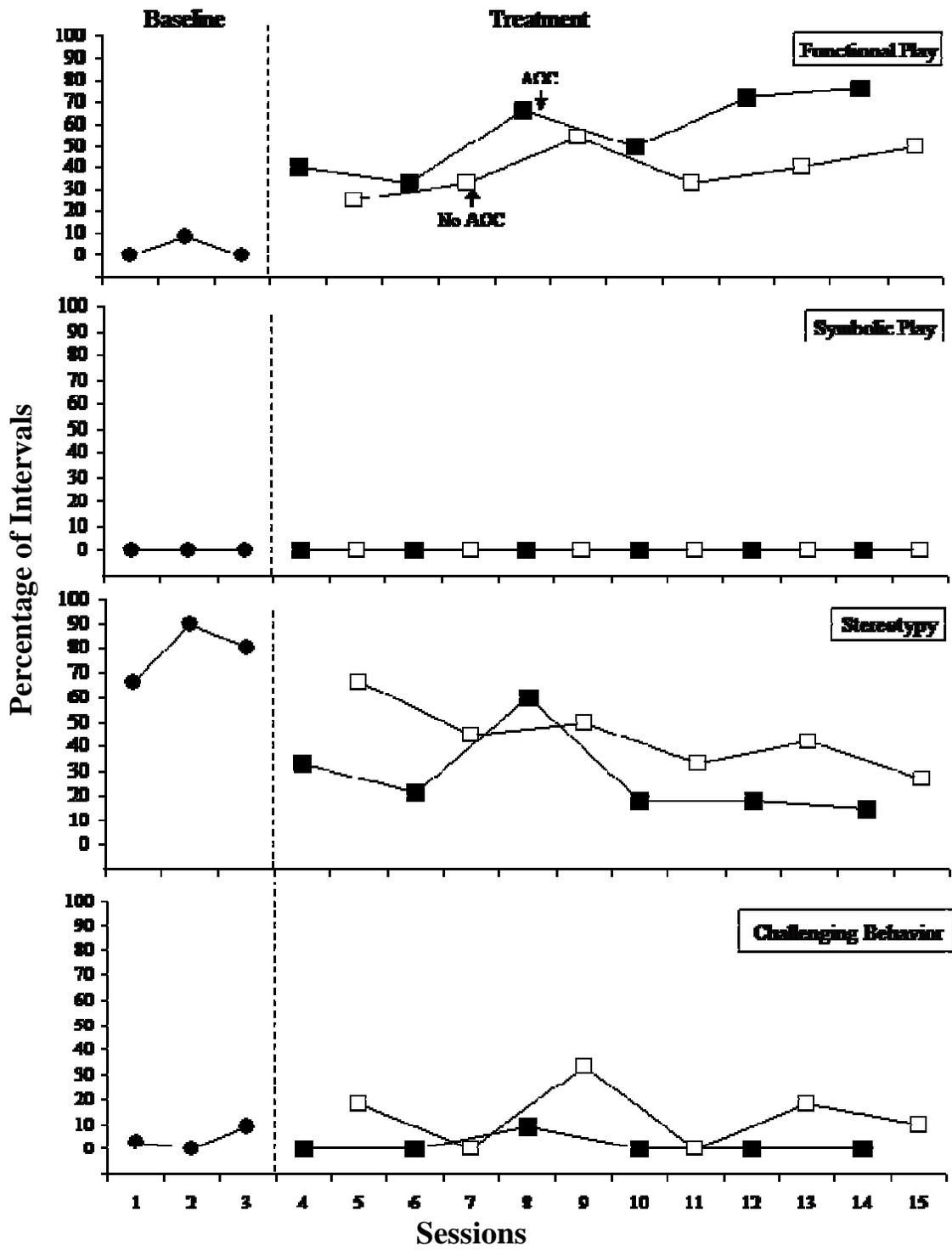


Figure 2 displays the results for Johnny. The top panel displays the percentage of intervals Johnny engaged in functional play behaviors. During baseline functional play did not occur. After seven intervention sessions (combined AOC and No AOC) play behaviors increased in the AOC condition (13%). Play behaviors did not increase in the No AOC condition until the 13th session (13%). Overall, the AOC condition contained higher levels of functional play ($M = 17\%$, range, 0% to 48%) than the No AOC condition ($M = 7\%$, range, 0% to 23%). After, play behavior emerged, both conditions showed an increase in overall levels of play over time. Additionally, there was little variability in responding during either condition.

The second panel of Figure 2 displays the percentage of intervals in which Johnny engaged in symbolic play. No symbolic play occurred in baseline during either the AOC or No AOC conditions.

The third panel displays the percentage of intervals Johnny engaged in stereotypy. During baseline stereotypy was high ($M = 77\%$, range, 75% to 82%). Stereotypy remained relatively consistent throughout intervention ($M = 67\%$, range, 42% to 87%). Except, during the last three AOC sessions when stereotypy decreased slightly ($M = 47\%$, range, 42% to 50%). Overall, the AOC condition had lower overall levels of stereotypy ($M = 61\%$, range, 42% to 82%) than the No AOC condition ($M = 73\%$, range, 58% to 87%). Additionally, the AOC

condition has a downwards trend suggesting that the rates of stereotypy were improving over time.

The bottom panel displays the percentage of intervals Johnny engaged in challenging behavior. During baseline challenging behavior was low ($M = 14\%$, range, 8% to 20%). Once Johnny began intervention, challenging behavior increased in both conditions. In both conditions challenging behavior was highly variable ranging from 0% to 53% in consecutive sessions. Despite this variability, the AOC condition had lower overall levels of challenging behavior ($M = 20\%$, range, 0% to 50%) compared to the No AOC condition ($M = 37\%$, range, 0% to 53%). In both condition

Examination of Johnny's results across phases suggests he was slower to acquire functional play and slower to reduce stereotypy than Sue. However, similar to Sue, Johnny's decrease in stereotypy appears to correspond to his increase in functional play as both behaviors seemed to share the same gradual trends as they changed in the desired direction.

Johnny

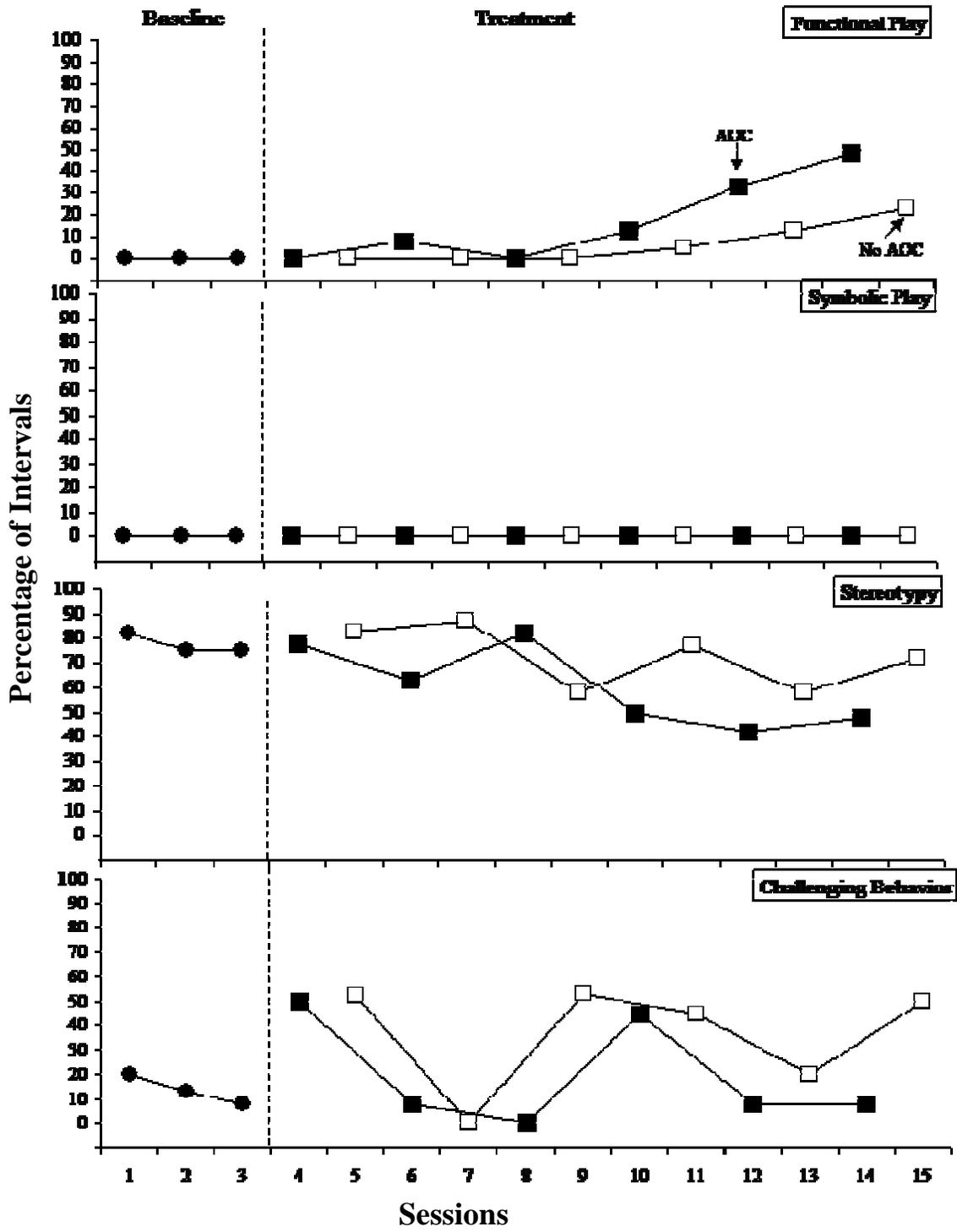


Figure 3 displays the results for Rusty. The top panel displays the percentage of intervals Rusty engaged in functional play behaviors. During baseline functional play was infrequent ($M = 29\%$, range, 17% to 45%). Once Rusty began receiving intervention, play behaviors immediately increased in both the AOC and No AOC conditions ($M = 51\%$, range, 33% to 71%). The AOC and No AOC contained very similar levels of functional play (AOC: $M = 63\%$, range, 57% to 71%) (No AOC: $M = 59\%$, range, 33% to 68%). Once intervention began the increased levels of functional play remained somewhat consistent, showing no overall trend of increasing or decreasing over time. However, the level of functional play was highly variable during the No AOC condition ranging from 67% to 33% in consecutive sessions. Comparatively, the AOC condition was more stable never varying more than 11% across all the AOC sessions.

The second panel of Figure 3 displays the percentage of intervals in which Rusty engaged in symbolic play. No symbolic play occurred in baseline and symbolic play was exceedingly rare in both the AOC and No AOC conditions ($M = 1\%$ of intervals in each).

The third panel displays the percentage of intervals Rusty engaged in stereotypy. During baseline stereotypy was high ($M = 54\%$, range, 33% to 77%). During intervention the AOC condition had lower overall levels of stereotypy ($M = 41\%$, range, 33% to 50%) than the No AOC condition ($M = 61\%$, range, 50% to

68%). The intervention levels of stereotypy in both conditions remained consistent, neither increasing nor decreasing over time. Additionally, there was very little variability in either condition with all data points remaining within a window of 17%.

The bottom panel displays the percentage of intervals Rusty engaged in challenging behavior. During baseline challenging behavior was low ($M = 2\%$, range, 0% to 8%). Once Rusty began intervention, challenging behavior remained consistent in the AOC condition but increased in the No AOC condition ($M = 13\%$, range, 5 % to 21%). The level of challenging behavior during the No AOC condition gradually reduced overtime, but was never returned to baseline levels and remained consistently higher than AOC condition.

Examination of Rusty's results across phases suggests an immediate intervention effect for functional play. However, stereotypy only seemed to respond to the AOC condition. This is somewhat dissimilar to the results for Sue and Johnny in that the change in functional play does not seem to directly correspond to the levels of stereotypy. Additionally, the comparative difference between the AOC and No AOC's in relation to functional play (PND = 10%) appears considerable less than the difference between the condition's effects on stereotypy (PND = 0%).

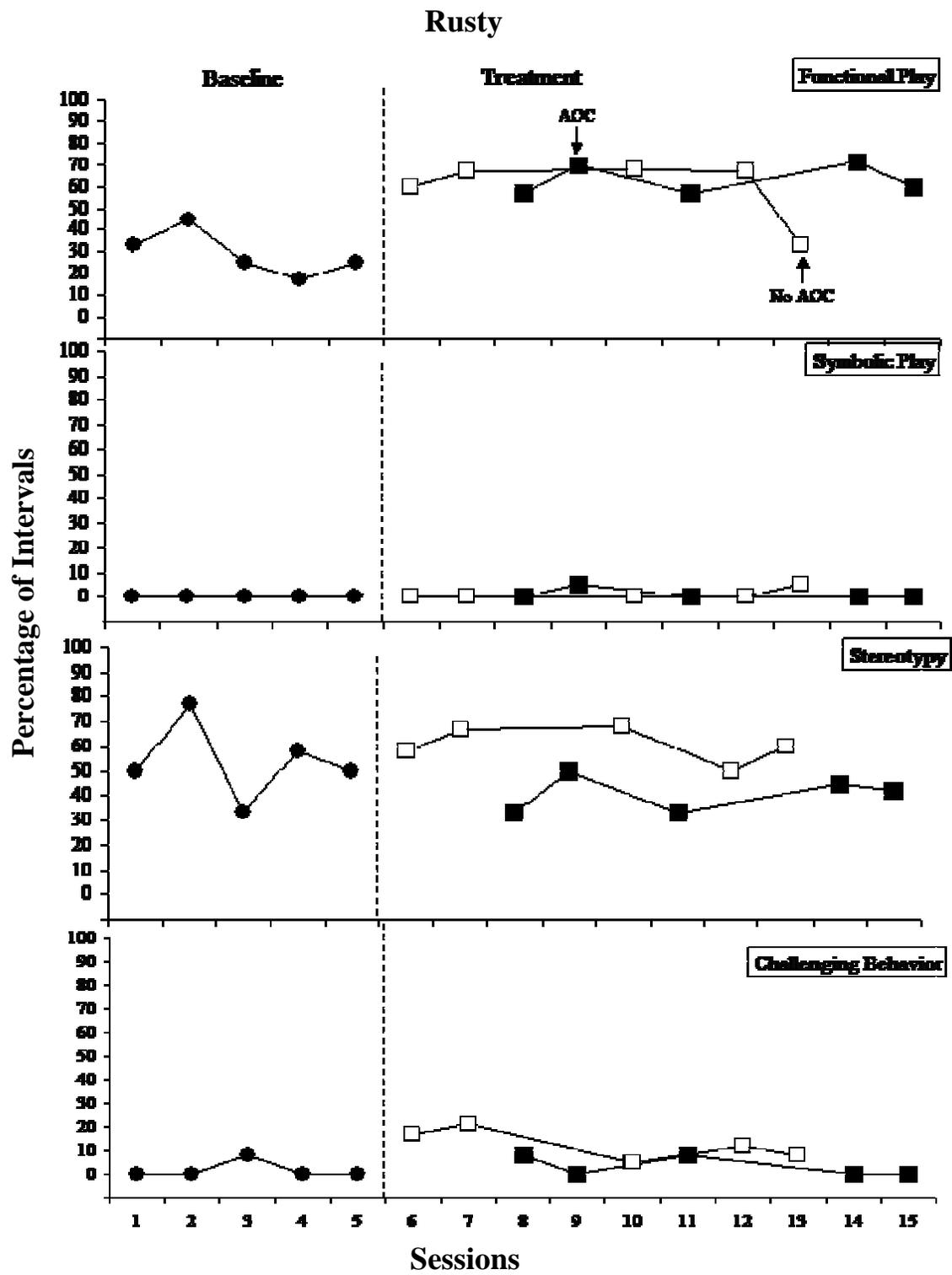


Figure 4 displays the results for Karen. The top panel displays the percentage of intervals Karen engaged in functional play behaviors. During baseline functional play did not occur. Once Karen began receiving intervention, play behaviors increased in both the AOC and No AOC conditions. However the AOC condition contained higher levels of functional play ($M = 37\%$, range, 17% to 50%) than the No AOC condition ($M = 31\%$, range, 17% to 45%). Additionally, both conditions showed increasing trends in overall levels of play over time with little variability.

The second panel of Figure 4 displays the percentage of intervals in which Karen engaged in symbolic play. No symbolic play occurred in baseline or during either the AOC or No AOC conditions.

The third panel displays the percentage of intervals Karen engaged in stereotypy. During baseline stereotypy was high ($M = 98\%$, range, 98% to 100%). Once Karen began intervention, stereotypy substantially decreased in both conditions. The AOC condition had lower overall levels ($M = 40\%$, range, 21% to 58%) than the No AOC condition ($M = 64\%$, range, 58% to 71%). Additionally, levels of stereotypy had a decreasing trend over time in the AOC condition but the initial reduction remained relatively consistent in the No AOC condition with little variability.

The bottom panel displays the percentage of intervals Karen engaged in challenging behavior. During baseline challenging behavior was low ($M = 1\%$, range, 0% to 5%). Once Karen began intervention, challenging behavior increased slightly in the AOC condition ($M = 12\%$, range, 5% to 18%) but increased substantially in the No AOC condition ($M = 32\%$, range, 21% to 45%). This increase remained consistent across sessions within each condition with little variability and no overlap.

Examination of Karen's results across phases suggests an immediate intervention effect for both functional play and stereotypy. This effect is evident in the first intervention data point in both the AOC and No AOC conditions for these dependent variables. However, the step up for functional play and the step down for stereotypy are more substantial in the AOC condition. Additionally, the slope of the increasing trend in functional play appears to correspond to slope of the decrease in stereotypy.

Karen

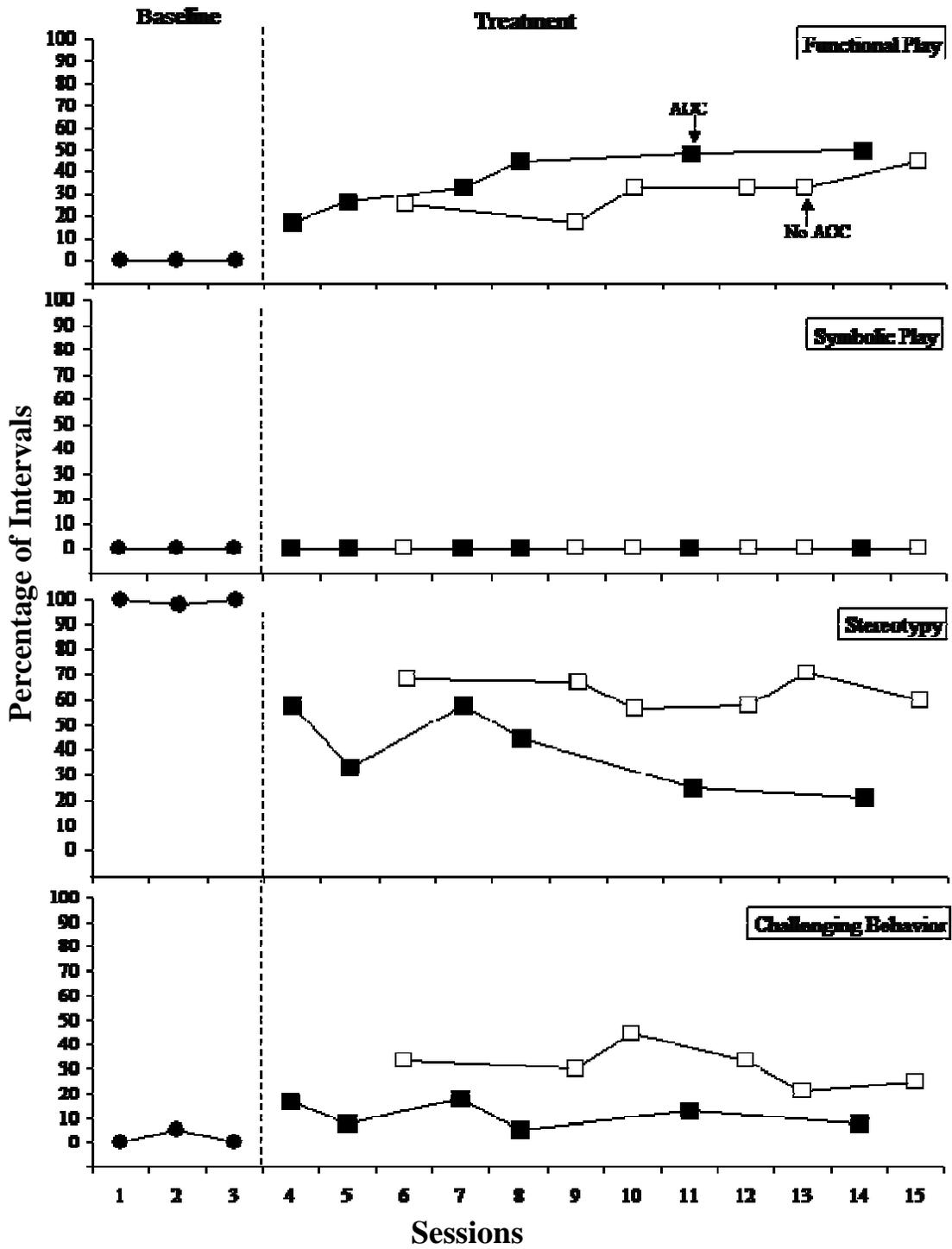


Figure 5 displays the results for Dorothy. The top panel displays the percentage of intervals Dorothy engaged in functional play behaviors. During baseline functional play was low ($M = 26\%$, range, 24% to 30%). Once Dorothy began receiving intervention, play behaviors increased in both the AOC and No AOC conditions. However the AOC condition contained higher levels of functional play ($M = 68\%$, range, 45% to 88%) than the No AOC condition ($M = 39\%$, range, 8% to 55%). The AOC condition showed an increasing trend in overall levels of play over time. Comparatively, the No AOC condition was much more variable with a 47% decrease in the last session resulting in a percentage lower than baseline levels.

The second panel of Figure 2 displays the percentage of intervals in which Dorothy engaged in symbolic play. No symbolic play occurred in baseline. Symbolic play was rare during intervention but only occurred during the AOC condition ($M = 2\%$, range, 5% to 8%).

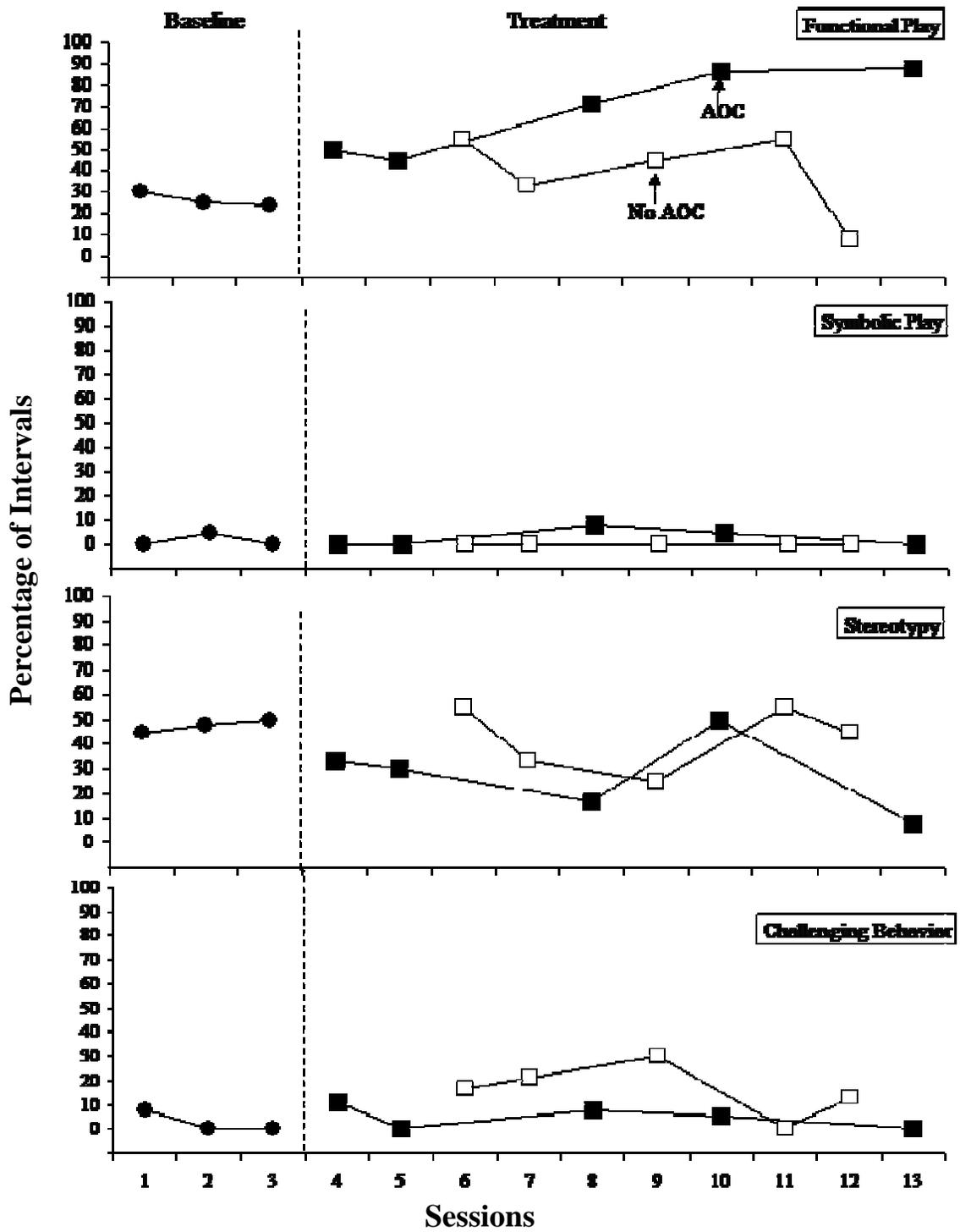
The third panel displays the percentage of intervals Dorothy engaged in stereotypy. During baseline stereotypy was high ($M = 48\%$, range, 45% to 50%). Once Dorothy began intervention, stereotypy decreased in the AOC condition ($M = 27\%$, range, 8% to 50%) but remained comparable to baseline levels with high variability in the No AOC condition ($M = 43\%$, range, 25% to 55%). Levels of

stereotypy decreased in the AOC condition over time with considerable less variability (data point in session 10 is an exception).

The bottom panel displays the percentage of intervals Dorothy engaged in challenging behavior. During baseline challenging behavior was low ($M = 3\%$, range, 0% to 8%). Once Dorothy began intervention, challenging behavior remained steady in the AOC condition ($M = 5\%$, range, 0% to 11%) but increased and became more variable in the No AOC condition ($M = 16\%$, range, 0% to 30%).

Examination of Dorothy's results across phases suggests an immediate intervention effect for functional play in both conditions and stereotypy in the AOC condition. Additionally, the slope of the increasing trend in functional play appears to correspond to slope of the decrease in stereotypy for the AOC but no such correspondence is evident in the No Aoc.

Dorothy



CHAPTER 5

DISCUSSION AND CONCLUDING COMMENTS

The purpose of this study was to evaluate the effectiveness of an abolishing operation component (AOC) added to an intervention designed to increase the play skills of children with autism. Towards this purpose, the effects of two conditions were compared. In the AOC condition, a participant was allowed to engage in stereotypy freely prior to the implementation of an intervention designed to increase play skills. This free period lasted until the child engaged in a predetermined rejecting topography. Occurrence of the rejecting topography suggested the child was in a state of satiation in terms of the automatic reinforcement produced by the stereotypy. In the No AOC condition, the same play intervention was implemented without the prior free period. The levels of functional play, symbolic play, stereotypy and challenging behavior were compared across conditions. The hypothesis was that this period of time in which stereotypy was allowed (i.e., the AOC) would, at least briefly, reduce the child's motivation to engage in stereotypy. This reduction in motivation would then reduce the actual occurrence of stereotypy and the challenging behavior that occurs when stereotypy is interrupted. Because these behaviors are known to interfere with play, their reduction should increase the effectiveness and efficiency of an intervention designed to teach play skills.

In this chapter, four specific research questions are addressed. a) If an AOC is added to a research-based play intervention will this combined intervention package result in higher levels of functional play than the same research-based intervention without the AOC? b) Will it result in higher levels of symbolic play? c) Will it reduce stereotypy? d) Will it reduce challenging behavior? This chapter will first address the results of this study in relation to each of the four research questions. Second, the limitations of this study are discussed. Finally, a summary and directions for future research are offered.

Functional Play

If an AOC is added to a research-based play intervention will this combined intervention package result in higher levels of functional play than the same research-based intervention without the AOC?

Functional play was defined as the use of a toy in a manner consistent with its intended function preserving the unique physical properties of the toy (Kasari et al., 2006). Examples of functional play included (a) placing puzzle pieces into a puzzle, (b) coloring on paper with crayons, and (c) looking at a picture book. The play intervention, which was identical in both the AOC and No AOC conditions, seemed to increase all participants functional play skills. This supports the positive findings of previous research in which components of this intervention

have been evaluated (Brown & Murray, 2000; Kasari et al., 2006; Stahmer et al., 2003).

Across the five functional play studies reviewed (D'Ateno, et al., 2003; Gillett & LeBlanc, 2007; Hine & Wolery, 2006; Hume & Odom, 2007; Nuzzolo-Gomz, et al., 2002), the mean PND for increasing functional play skills was 88% (range, 60% to 100%). This indicates that, on average, participants improved more than the best baseline point across 88% of the intervention and post intervention sessions. Using the same methods, when PND is calculated from the results of this study, the mean PND for increasing play skills in the AOC condition is 93% (range, 67% to 100%). In the No AOC condition the mean PND is 82% (range, 50% to 100%). The AOC condition not only outperformed the No AOC condition, but it also outperformed the average functional play intervention reviewed in Chapter Two.

For all five participants the AOC condition lead to either faster acquisition of functional play skills, more frequent functional play behaviors, or more consistent use of functional play skills (e.g., Rusty) than the No AOC condition. When designing an intervention to teach functional play to a child with autism who engages in stereotypy, this data set suggests two points. First, modeling, prompting with contingent reinforcement, and naturalistic instruction are potential

effective intervention components. Second, it may be beneficial to allow the child to engage in stereotypy freely for a period of time prior to intervention.

Symbolic Play

If an AOC is added to a research-based play intervention will this combined intervention package result in higher levels of symbolic play than the same research-based intervention without the AOC?

Symbolic play was defined as any of the following (a) use of one object to stand for another object (e.g., a hairbrush used as a microphone), (b) appears to use something that is not present (e.g., strums an imaginary guitar), (c) uses a toy figure as if it were capable of performing actions (e.g., makes a teddy bear dance and sing), (d) uses a toy as a prop (e.g., a book becomes a ramp for a car), or (e) adopts a role or persona that does not belong to the child (e.g., acts as if they are the parent, teacher, or other super hero). The play intervention used in this study did not have any detected effect on the symbolic play of the participants. This seems contrary to the review of symbolic play interventions presented in Chapter Two. Across the 11 symbolic play studies reviewed in (Barry & Burlew, 2004; Dauphin et al., 2004; Ingersol & Schreibman, 2006; Kasari et al., 2006; MacDonald et al., 2005; Morrison et al., 2002; Newman et al., 2000; Pateroso & Arco, 2007; Reagon et al., 2006; Zercher et al., 2001), the mean PND was 86% (range, 27% to 100%). This indicates that, on average, participants improved

symbolic play skills more than the best baseline point across 86% of the intervention and post intervention sessions.

One plausible explanation for the lack of symbolic play in the current study is the level of functioning and the severity of disability of the participants. This study specifically recruited participants classified as having “severe autism” on the CARS. This was done to ensure minimal play skills prior to intervention. Symbolic play is a more sophisticated type of play than functional play and occurs later in development (Sigelman & Rider, 2006). It is likely that symbolic play was not detected in this study because the children were not yet capable of the abstract thought and imagination these play behaviors require. Indeed, a deficit in abstract thinking is a core characteristic of autism (DSM-IV; APA, 1994).

A second potential reason symbolic play was not detected in this study is difficulty in identifying the occurrence of symbolic play. Because imagination and abstract representations occur within the child’s brain the phenomena are not directly observable. In previous research targeting symbolic play, data collectors were able to use the child’s language to determine what the child was thinking (e.g., Paterson & Arco, 2007). For example, a child may touch a puzzle piece to a stuffed animal’s mouth while thinking the bear is eating a sandwich. However, unless the child also says, “yum, eat the sandwich Mr. Bear” the observer has no

way of knowing the puzzle piece was representing another object. Data collectors in this study were instructed not to code symbolic play unless they were confident of its occurrence. Because many of the participants had limited language, some occurrences of symbolic play may have been missed.

As a result of the lack of symbolic play no definitive statements concerning the difference between the AOC and No AOC conditions can be made.

Stereotypy

If an AOC is added to a research-based play intervention will this combined intervention package result in lower levels of stereotypy during the intervention procedures than the same research-based intervention without the AOC?

Stereotypy, for this study, was defined as repetitive or invariant behavior maintained by automatic reinforcement (Rapp et al., 2004). Automatic reinforcement was identified as maintaining stereotypy for the participants in this study by examining the baseline levels of stereotypy. The baseline sessions were identical to the play condition of a functional analysis, which is one method for identifying automatic reinforcement (Hanley, Iwata, & McCord, 2003). Preferred items and attention were freely available and no task demands were given. Therefore the occurrence of stereotypy was most likely due to internal (or

automatic) as opposed to social reinforcers. Examples of stereotyped behaviors include, a) placing a toy on a flat surface and spinning the toy so that it rotated in rapid circles, b) picking up two toys, holding them close to the ear and tapping them together making a soft banging sound, and c) repeatedly picking up toys and verbally labeling them. Stereotypy is known to interfere with the instruction of play skills and, when interrupted may lead to other more intense challenging behaviors (e.g., Baker, 2000; Baker et al., 1998; Honey et al., 2007; Koegel et al., 1974).

Two implications concerning stereotypy arise from this data set. First, for four of the five participants, stereotypy decreased as functional play increased. This data set provides evidence of a negatively correlated relationship between stereotypy and play skills. The possible existence of such a relationship suggests that one method for effectively treating stereotypy may be to teach children to play. This logic is supported by findings in previous research (e.g., Gillett & LeBlanc, 2007; Hume & Odom, 2007; Paterson & Arco, 2007). Because interventions designed to decrease stereotypy may be more complex than interventions designed to increase play skills, in some instances, teaching play skills may be a preferable alternative. When considering what functional play skills to teach, it may be beneficial to consider the putative stimulus product of a particular child's stereotypy and attempt to match this stimulus with some aspect

of toy play. For a description of a matched stimulus intervention for stereotypy see Rapp et al. (2004).

The second implication involves the comparative occurrence of stereotypy following the AOC versus the No AOC conditions. Following the AOC condition, the mean PND for the reduction of stereotypy was 70% (range, 0 to 100%) compared to a 51% (range, 0 to 83%) in the No AOC condition. It is possible that allowing a child to engage in stereotypy freely prior to providing instruction in play skills (as was done in the AOC condition) may decrease the level of stereotypy during subsequent play instruction. This, in turn, may make it easier to engage the child and prompt functional play during the intervention session. The motivating operation concept (which includes abolishing operations) offers a potential explanation for this finding (Laraway et al., 2003).

MOs influence the value of reinforcers in different ways depending on where the individual is on a continuum from deprivation to satiation with respect to a specific stimulus (Vollmer & Iwata, 1991). For example, if an individual has not been permitted to engage in stereotypy for an extended period of time, then they may be in a state of deprivation in respect to the automatic reinforcement stereotypy provides, subsequently increasing its reinforcing value. Conversely, if the same individual has engaged in stereotypy freely for an extended period of time, then they may be in a state of satiation and the automatic reinforcement

from stereotypy may be less valuable. The term used to describe an increase in reinforcer value (as in a state of deprivation) is the *reinforcer-establishing effect*. When reinforcing value is decreased (as in a state of satiation) it is referred to as the *reinforcer-abolishing effect* (Michael, 1982, 1993, 2000; O'Reilly et al., 2008).

The reinforcer-establishing effect and the reinforcer-abolishing effect also correspond to changes in behavior allocation. When influenced by the reinforcer-establishing effect, an individual will engage in higher levels of behaviors previously reinforced by that stimulus. This increase in behavior is termed the evocative effect. Conversely, when influenced by the reinforcer-abolishing effect an individual will engage less in behaviors previously reinforced with that stimulus. This change in responding is termed the abative effect (Laraway, Snyckerski, Michael, & Poling, 2003; Michael, 1982, 1993, 2000).

Because the AOC condition allows the individual to engage freely in stereotypy, it is possible that the stereotypy was less reinforcing during the subsequent intervention session and thus the child allocated less responding to stereotypy and more responding to functional play. In other words, the reinforcer-abolishing effect may have reduced the reinforcing value of stereotypy and created a window of opportunity for increasing the child's engagement in functional play skills.

Challenging Behavior

If an AOC is added to a research-based play intervention will this combined intervention package result in lower levels of challenging behavior during the intervention procedures than the same research-based intervention without the AOC?

Challenging behavior, for this study, was defined as disruptive or dangerous behavior maintained by social functions (Sigafos, Arthur, & O'Reilly, 2003). The participants in this study engaged in challenging behavior maintained by social functions. This is evident in the low or nonexistent levels of challenging behavior in baseline (Hanley, Iwata, & McCord, 2003). Examples of challenging behaviors include, a), loud vocalizations substantially above the conversation level, b), falling rapidly to the floor by buckling both knees, and c) throwing toys at least three feet. Challenging behavior is known to interfere with the instruction of play skills (e.g., Gillett & LeBlanc, 2007; Hume & Odom, 2007; Paterson & Arco, 2007)

The data from this study suggests it may be possible to reduce challenging behavior during intervention sessions by allowing individuals to freely engage in stereotypy prior to interventions. For each of the participants challenging behavior increased from baseline to intervention. This increase was expected because the intervention required delivering tasks demands and interrupting stereotypy. These

two components created a situation in which challenging behavior maintained by negative reinforcement was likely. However, the intervention sessions following the AOC condition contained fewer occurrences of challenging behavior than the No AOC conditions for all participants.

One explanation for this finding is that stereotypy is often hypothesized to occur because the behavior itself produces pleasant internal consequences for the individual (i.e., automatic reinforcement) (Rapp et al., 2004). When stereotypy is interrupted (e.g., during a play intervention) access to this source of automatic reinforcement is denied and challenging behavior may occur in an attempt to remove the interrupting agent. The lower levels of challenging behavior during the AOC condition may be the result of less stereotypy being interrupted by physical prompting and/or the reduced reinforcing value of stereotypy. However, because the incidents of interruption were not recorded, these possibilities must be considered with caution.

Limitations

The data presented in this study, while promising, has several limitations and cautions which should be addressed. First, this current study did not collect maintenance or generalization data regarding the acquired play skills. Therefore, this study can not demonstrate sustained improvements in play skills in the absence of the intervention. However, the purpose of this study was not to assess

the effects of the play intervention common to both the AOC and No AOC conditions. In fact, this specific play intervention was chosen because it already had a solid research-base demonstrating its effectiveness (Kasari et al., 2004). The purpose of this study was to offer a potential improvement to this intervention, specifically, a method for addressing stereotypy during the intervention.

A second related limitation is that definitive statements regarding the effectiveness of the play intervention itself can not be made solely from this data set. Only Rusty's baseline was longer than three sessions (due to variability in stereotypy) and the implementation of the intervention was not staggered. Therefore, while the alternating treatment design provided experimental control for the comparison of the AOC to the No AOC condition, the effect of the play intervention itself is only evaluated in a non-experimental AB design (Kennedy, 2005).

Caution should also be taken when considering the possible explanations for the observed differences between the AOC and No AOC conditions for two reasons. First, an empirical demonstration of the functional properties of challenging behavior and stereotypy was not included in this study (e.g. functional analysis procedures). This concern is somewhat assuaged because the baseline phase was identical to a functional analysis play condition (Hanely, Iwata, & McCord, 2003). Therefore, because challenging behavior was low

during the baseline phase, it was not likely automatically maintained. Additionally, stereotypy was high during baseline suggesting it was indeed maintained by automatic reinforcement (Kahng & Iwata, 1998). However, without comparison functional analysis conditions these conclusions are not certain. Second, the MO concept is one possible conceptualization of the underlying causes of the obtained results and caution should be taken when considering this interpretation. While this data set does demonstrate that the play behaviors were elevated and stereotypy reduced following the AOC condition, it does not eliminate other possible explanations for this finding. However, the MO concepts do provide some research base for this assertion and this explanation seems reasonably parsimonious.

Finally, while differences between the AOC and No AOC conditions were found, no measure of the magnitude of this difference in terms of clinical significance is available. Because both conditions produced the desired increase in functional play and decrease in stereotypy over varying amounts of time, it is possible that the additional intervention component is not efficient in terms of the benefits versus the additional time required for implementation.

Future Research

The data presented here are heuristic and additional research investigating these hypothesized relationships is warranted. Directions for future research are

offered below. First, a replication of this study involving additional participants and different contexts could further the line of research utilizing the MO concept in existing interventions and instructional strategies. These future studies could collect data during the AOC condition's free access period in order to observe the changes to stereotypy in the absence of the play intervention procedures over time. Such an investigation could address whether satiation alone is sufficient to reduce stereotypy or if a replacement behavior (such as play skills) is required.

Second, if the AOC condition does in fact create a state of satiation in which the reinforcing value of stereotypy is reduced and the effectiveness of interventions are increased, then how long does this state last? Research addressing this question is needed to determine the efficiency of the AOC. The longer the period of satiation lasts the more instruction can be implemented during that time. However, if it takes too much time to reach satiation and the beneficial state is too brief, then AOC interventions may only be practical in severe cases following treatment failure.

Third, play should be a pleasant activity and the person engaged in play should find the experience enjoyable. While it is known that play behaviors can be taught, it is not known if these behaviors in and of themselves produce happiness or in any way affect an individual's mood. Several indices of happiness and mood rating scales are available (e.g., Carr, McLaughlin, Giabobbe-Grieco, &

Smith, 2003; Lancioni, Singh, O'Reilly, Oliva, & Basili, 2005). Future research could use these tools to collect data on participants' moods both before the acquisition of play skills and after. Such data could contribute to the debate concerning whether behavioral approaches are actually teaching children to "play" or just to engage in play-like behaviors without the corresponding joy play should produce (Lockett et al., 2007).

Finally, further exploration of similarities and differences between "appropriate" play and stereotypy would be interesting and potentially useful in arriving at a better understanding of autism and stereotypy. On the surface, stereotypy and "appropriate" play could be seen as similar, or at least occurring for the same reasons (automatic reinforcement). However, research regarding the specific reinforcing properties of stereotypy suggests that stereotypy produces either pleasurable tactile, audio, or visual sensations (positive automatic reinforcement) or ameliorates some pain or discomfort (negative automatic reinforcement) (Rapp et al., 2004). Comparatively, the play of typically developing children seems to be less about sensory stimulation and instead seems to be automatically reinforced by private thoughts (imagination). While these imaginative play schemes could also be classified as positive automatic reinforcement they would seem qualitatively different than the sensory stimulation produced by stereotypy. Future research exploring this relationship

would likely be complex, but could yield fascinating new strategies in the treatment of stereotypy and the understanding of play.

Summary

The purpose of this study was to reduce stereotypy and challenging behavior during a play intervention for five children with autism by adding an AOC to a common research-based procedure for teaching play skills. Results indicated that adding an AOC to a play intervention package may increase the effectiveness and efficiency of the intervention. Specifically, results show decreased levels of stereotypy and challenging behavior and increased levels of functional play following the AOC. While these results are indeed promising and suggest that such an approach to handling stereotypy may be effective, future research addressing the magnitude of effect and further analyzing the relationship between stereotypy and play is warranted before definitive statements concerning this approach can be made.

APPENDIX A

Literature Review Coding Sheet

Citation:

Funding Source:

Research Question:

PARTICIPANT INFO:

N = _____

Child	Diagnosis	Age	Gender	Ethnicity
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Independent Variable:

Dependent Variable:

Type of Play: Functional Symbolic/Pretend Sociodramatic Social

Research Design:

Assessment:

Setting:

PND:

Participant

- 1:
- 2:
- 3:
- 4:
- 5:
- 6:
- 7:
- 8:
- 9:
- 10:

Implementer: _____

Describe Training: Y or N

Fidelity Data:

Notes:

Social Validity: Y or N

Concerning Treatment Procedures: Y or N

Concerning Outcome: Y or N

Notes:

Discuss Maintenance of Treatment: Y or N

Measure Maintenance: Y or No

How Long: _____

Did Effects Maintain: Yes No Some Decline Some Increase

Notes:

APPENDIX B

Dependent Variable Data Collection Sheet

Date: _____
 Participant: _____
 Session: _____

	1	2	3	4	5	6	7	8	9	10
0_10	Sym									
	Fun									
	Stereo									
	CB									
11_20	Sym									
	Fun									
	Stereo									
	CB									
21_30	Sym									
	Fun									
	Stereo									
	CB									
31_40	Sym									
	Fun									
	Stereo									
	CB									
41_50	Sym									
	Fun									
	Stereo									
	CB									
51_60	Sym									
	Fun									
	Stereo									
	CB									

Sym = Symbolic, Fun = Functional, Stereo = Stereotypic, CB = Challenging Behavior

Rely: _____

Operational Definitions

Symbolic Play:

Functional Play:

Stereotypy:

Challenging Behavior (CB):

Session Results

Percent Intervals / IOA

Symbolic Play: _____ / _____

Functional Play: _____ / _____

Stereotypy: _____ / _____

Challenging Behavior: _____ / _____

APPENDIX C

Fidelity of Implementation Data Collection Sheet

Implementer: _____

Participant: _____

Date: _____

1	2	3	4	5	6	7	8	9	10
S P R									
S P R									
S P R									
S P R									
S P R									
S P R									

S = An error in interrupting or redirecting stereotypy

P = An error in prompting play behaviors

R = An error in delivering reinforcement

NOTES:

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VITA

Russell Bennett Lang was born in Nacogdoches, Texas on August, 22 1978. He is the son of Morris Lang and Karen Garrett. After graduating from Reicher Catholic High School in 1997, he enlisted in the United States Marine Corps and served from 1997 till 2001 on active duty. During this time he served as a radio operator for the 24th Marine Expeditionary Unit aboard the USS Trenton and completed a Mediterranean Float that included a tour in the Kosovo Campaign. In 2002 he attended McLennan Community College in Waco, Texas, where he earned an Associates of Arts. He attended the University of Texas at Austin earning a Bachelor's of Arts in Psychology and Educational Psychology in 2004 and a Master's in Education with emphasis in Special Education in 2005. He entered the doctoral program in special education in 2005. He was the 2008 recipient of the Texas Association of Behavior Analysis Scholarship in recognition of his research project "Discrepancy in Functional Analysis Results across Settings: Implications for Intervention Design". He has co-authored a number of peer-reviewed articles in the field of intellectual disabilities and autism spectrum disorders.

Permanent Address: 2901 B Burning Oak Austin TX 78704

This dissertation was typed by the author