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Review of Interventions to Increase Functional and Symbolic Play in Children with Autism

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Abstract: Play is widely acknowledged to be an integral part of human development and children with autism often experience substantial delays in the development of play behaviors. This review updates older reviews by covering the last 10 years of research targeting functional and symbolic play in children with autism. The review differs from other reviews concerning play by including all conceptual models and intervention environments, while also limiting inclusion to studies demonstrating experimental control. Additionally, this is the first review of play studies to report results in quantifiable terms (e.g. PND). Studies are grouped into two categories (i.e. studies of functional versus symbolic play). Three components (i.e. modeling, prompting with contingent reinforcement, and child directed or "naturalistic" instruction) appear related to successful play interventions. The results of this review suggest that these components underlie the effectiveness of successful play intervention for children with autism.

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 vital functions (Rutherford & Rogers, 2003; Williams, 2003). For example, play has been linked to the development of sensory processing systems (Ruff, 1984), 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 aversely 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, Sigafoos, 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 and related developmental disabilities. 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 au-

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tism and make play an important area for early intervention (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 (Terpstra, Higgins, & Pierce, 2002; Stahmer, Ingersol, & Carter, 2003). In addition to increases in diversity, flexibility, and spontaneity of play skills, successful play interventions have also been associated with improvements in socialization, language, cognition, functional use of objects, motor skills, and exercise (Brown & Murray, 2001).

In the current review, we aim to assist practitioners with implementing evidence-based practice, by reviewing research that has focused on teaching play to children with autism. This focus is important because children with autism are known to have more profound and global deficits in play (Boutot et al., 2005). In addition, unlike previous reviews, we have aimed for a more inclusive and comprehensive review by including studies derived from a range of conceptual models (e.g. behaviorism, developmental, sensory integration) (cf. Luckett, Bundy, & Roberts, 2007; Stahmer et al., 2003), and settings (e.g. school or home based interventions) (cf. Terpstra et al., 2002). To ensure the certainty of evidence, which is important for guiding evidence-based practice (Schlosser & Sigafoos, 2007), we limited the current review to studies in which experimental control was demonstrated and summarized results in quantifiable terms.

Method

Search Procedures and Selection Criteria

Systematic computerized literature searches were conducted on two databases: the Educational Resources Information Clearing House (ERIC) and Psych*INFO* 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 a total 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). Also excluded were studies in which play was used as a context to increase communication or other social skills because the focus of these interventions was not on improving play skills (e.g. Baker, Koegel & Koegel, 1998; Bevill, Gast, Maguire, & Vail, 2001; Kohler, Anthony, Steighner, & Hoyson, 2001; Krantz & McClannahan, 1998; Loncola & Craig-Unkefer, 2005; Shabani, Katz, Wilder, Beauchamp, Taylor, & Fisher, 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 (provision of sensory stimulation) were also excluded (e.g. Ingersoll, Schreibman, & Tran, 2003).

Fifteen studies met the inclusion criteria. These 15 studies included a total of 53 participants. Table 1 provides a summary of each included study.

Coding and Summary of the Studies

The 15 studies were coded using a data sheet designed specifically for this review (available from the first author upon request). 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

TABLE 1

Studies Categorized into Functional and Symbolic Play Behaviors, Lists Number of Participants, Independent and Dependent Variables, Experimental Design, and Results in Percent Non-overlapping Data (PND) or as Reported by Authors

Citation & Category	*n*	*Independent Variables*	*Experimental Design*	*Dependent Variables & Results*
I. Functional Play				
D'Ateno, Mangiapanello & Taylor (2003)	1	Video Modeling	MBL* across toys	*Modeled play behaviors* increased M[b] PND[c] = 87% (range, 60% to 100%) *Novel play behaviors* 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]	*Functional play increased* M PND = 93% (range, 80% to 100%) *Stereotypy* was not affected by intervention M PND = 0%
Hine & Wolery (2006)	2	Point-of-View Video Modeling	Multiple probe across play behaviors	*Modeled play increased* M PND = 94% (range, 85% to 100%)
Hume & Odom (2007)	2	TEACHH developed Structured Work Systems	Reversal (ABAB)	*On task* behaviors increased M PND = 100% *Teacher delivered prompts to play* decreased M PND = 83.5% (range, 81% to 86%) *Number of play materials utilized* increased M PND = 100%
Nuzzolo-Gomez,Leonard, Ortiz,Rivera & Greer (2002)	3	Pairing toy play with reinforcer	MBL across part	*Functional play* increased M PND = 55% *Stereotypy* 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	*Teacher delivered prompts to play* decreased M PND = 97.25% (range, 94.5% to 100%) *Symbolic play* increased M PND = 100%
Dauphin, Kinney & Stromer (2004)	1	Video Enhanced Activity Schedules & Matrix Training	Reversal & Component Analysis	*Modeled play behaviors* increased *Novel play behaviors* increased Note: Data could not be converted into PND, Results were positive for both variables.
Ingersoll & Schreibman (2006)	5	Reciprocal Imitation Training	MBL across part & behaviors	*Total symbolic play* increased M PND = 29% (range, 0 to 60%) Spontaneous s*ymbolic play increased* M PND = 27% (range, 0 to 63%) Note: 1 of the 5 parts made no improvements in play skills
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	*Modeled behaviors* increased M PND = 100% *Novel play behaviors* decreased Note: Only means were reported for novel play behaviors, therefore PND calculation is not possible

TABLE 1—(*Continued*)

Citation & Category	*n*	*Independent Variables*	*Experimental Design*	*Dependent Variables & Results*
Morrison, Sainato, Benchaaban & Endo, (2002)	4	Correspondence Training, Activity Schedules	MBL across part	*On task symbolic play* increased M PND = 100%
Newman, Reinecke & Meinberg, (2000)	2	Self Management	MBL across part	*Variability of play* increased M PND = 91.5% (range, 90% to 93%)
Paterson & Arco (2007)	2	Video Modeling	Reversal embedded into a MLB across toys	*Appropriate play* increased M PND = 100% *Stereotypy* decreased M PND = 100%
Reagon, Higbee & Endicott (2006)	1	Video Modeling	MBL across play scenarios	*Model behaviors* increased M PND = 100% Note: Only 1 baseline data point
Zercher, Hunt, Schuler & Webster (2001)	2	Integrated Play Therapy	MBL across part	Symbolic play increased M PND = 72% (range, 50% to 94%)

* Multiple baseline
[a] Participants
[b] Mean
[c] Percent Non-Overlapping Data
Italics denote the name of the dependent variable

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. Examples of functional play include (a) placing puzzle pieces into a puzzle, (b) using toy tools to build (c) stringing beads, (d) stirring a bowel with a spoon in a toy cooking set (e) 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 a parent, teacher, or 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 on increasing play behaviors. 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, the authors' visual analysis of the results are reported (e.g. Dauphin et al., 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 (i.e. increased or decreased) 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 used 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 no participants in the study benefited from the intervention. No study in this review reported negative findings.

This review 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., 2003; Hine & Wolery, 2006). Other independent variables included natural language paradigm (Gillett & LeBlanc, 2007), structured work systems (Hume & Odom, 2007), and pairing (Nuzzolo-Gomez et al., 2002). Dependent variables, other than functional play included, stereotypy (Gillett & LeBlanc, 2007; Nuzzolo-Gomez et al., 2002) verbal communication variables (D'Ateno et al., 2003; Gillett & LeBlanc, 2007), off task behavior (Hume & Odom, 2007), and teacher delivered prompts (Hume & Odom, 2007). All of these studies used single-case experimental designs (e.g., ABAB reversal design, multiple-baseline), 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, 2007; Hine & Wolery, 2006; Hume & Odom, 2007). Maintenance data was collected in two studies. Acquired play skills were maintained at 1 month (Hume & Odom, 2007) and 2 months (Hine & Wolery, 2006). Generalization of newly acquired play skills to new toys and settings was reported in one study (Hine & Wolery, 2006). Across all the functional play studies, the mean PND for increasing functional play skills was 88% (range, 60% to 100%). This indicates that participants improved more than the best

baseline point across 88% of the intervention and post intervention sessions, on average.

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 first targeted play skill involved using a toy gardening set to dig holes, put soil into empty pots, and plant toy flowers. The second play skill involved using a toy cooking to set the table and perform cooking motions with the toys (e.g. stir a bowel). Point-of-view video model tapes were made by holding the camera at the child's eye level without including any people 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 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 old. 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 3 parents learned to correctly implement the NLP intervention and that while appropriate play increased (*M* PND = 93% range: 80% to 100%) and that levels of inappropriate play (i.e. challenging behavior or stereotypy) remained the same from baseline to intervention (PND = 0%) suggesting no reduction in inappropriate play. Social validity data was collected via written questionnaire from 2 of the 3 parents who found the intervention to be "very useful", "very easy", and "very helpful".

Increasing Symbolic Play

Ten studies, including a total of 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; Kasrai et al., 2006; 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., 2005; Paterson & Arco, 2007; Reagon et al., 2006). Other independent variables included Social Stories™ (Barry & Burlew, 2004), activity and matrix training (Dauphin et al., 2004), reciprocal imitation training (Ingersoll & Schreibman, 2006), behavioral drill and milieu teaching (Kasari et al., 2006), activity schedules (Morrison et al., 2002), self management (Newman et al., 2000), and integrated play therapy (Zercher et al., 2001). Dependent variables, other than symbolic play, included stereotypy (Paterson & Arco, 2007), off-task behavior (Morrison et al., 2002), and teacher delivered prompts (Barry

& Burlew, 2004). All studies, with the exception of Kasari and colleagues (2006), used single subject designs. Kasari and colleagues (2006) 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 1 week (Paterson & Arco, 2007), 1 month (Ingersoll & Schreibman, 2006; Newman et al., 2000) and 2 months (McDonald et al., 2005). Generalization of new play skills to (a) new settings was reported in two studies (Barry & Burlew, 2004; Ingersoll & Schreibman, 2006), (b) new toys in two studies (Ingersoll & Schreibman, 2006; Paterson & Arco, 2007), (c) new play partners in three studies (Ingersoll & Schreibman, 2006; Kasari et al., 2006; Reagon et al., 2006) 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 2 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 s). Average total pretend play increased (Mean PND = 29 %, range 0 to 60%). Average spontaneous pretend play increased (Mean PND = 29%, range 0 to 90%). However, the overall results were mixed because 1 out of the 4 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 3 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 1 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 3 of the 5 functional play studies and 8 of the 10 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., 2007).

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: potentially allowing 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 2 of the 5 functional play studies and 7 of the 10 symbolic play studies. Prompting and reinforcement were implemented both from a discrete trail 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 teacher or parent 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 the play sequence). All studies in which prompts were used employed a least-to-most prompting hierarchy. In this system the least intrusive prompt is used first and more direct prompts 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, 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).

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 result 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. While all three groups demonstrated improvements in play over time, the group that received the play intervention showed significantly more diverse types of play and a greater overall play level over time compared to both the joint attention and the control group. Thus the play intervention produced significantly more types of symbolic play and greater overall play than either the joint attention or 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 are taught. Therefore, when designing any play intervention, practitioners should strongly consider incorporating the 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 in the literature. This review suggests that the most commonly used strategies are modeling, systematic prompting with contingent reinforcement, and naturalistic teaching procedures. 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 restricting 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. 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). 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. 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.

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functional adaptive skills that prepare the child for increased responsibility and independence; reduction of disruptive or maladaptive behavior by using empirically supported strategies, including functional assessment; cognitive skills, such as symbolic play and perspective taking; and. traditional readiness skills and academic skills as developmentally indicated. Specific Strategies. A variety of specific methodologies are used in educational programs for children with ASDs.Â Detailed reviews of intervention strategies to enhance communication,9,17â€“20 teach social skills,21â€“24 and reduce interfering maladaptive behaviors21,25,26 have been published in recent years. Brief descriptions of selected methodologies are provided below. Applied Behavior Analysis. PDF | Play is widely acknowledged to be an integral part of human development and children with autism often experience substantial delays in the development of play behaviors. This review updates older reviews by covering the last 10 years of research targeting functional and...Â This review updates older reviews by covering the last 10 years of research targeting functional and symbolic play in children with autism. The review differs from other reviews concerning play by including all conceptual models and intervention environments, while also limiting inclusion to studies demonstrating experimental control. Additionally, this is the first review of play studies to report results in quantifiable terms (e.g. PND). Fifty-eight children with autism between the ages of 3 and 4 were randomly assigned to a joint attention intervention, a symbolic play intervention, or a control group that did not receive either intervention. All children were enrolled in ABA classrooms. In the joint attention and symbolic play interventions, each child received 30-minute sessions 5 days a week for 5-6 weeks. Sessions consisted of discrete-trial teaching followed by a more child-directed interaction. Children in the joint attention group increased their joint attention skills while children in the play group increased their s...