A play and joint attention intervention for teachers of young children with autism: A randomized controlled pilot study

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Abstract

The aim of this study was to pilot test a classroom-based intervention focused on facilitating play and joint attention for young children with autism in self-contained special education classrooms. Thirty-three children with autism between the ages of 3 and 6 years participated in the study with their classroom teachers (n = 14). The 14 preschool special education teachers were randomly assigned to one of three groups: (1) symbolic play then joint attention intervention, (2) joint attention then symbolic intervention, and (3) wait-list control period then further randomized to either group 1 or group 2. In the intervention, teachers participated in eight weekly individualized 1-h sessions with a researcher that emphasized embedding strategies targeting symbolic play and joint attention into their everyday classroom routines and activities. The main child outcome variables of interest were collected through direct classroom observations. Findings indicate that teachers can implement an intervention to significantly improve joint engagement of young children with autism in their classrooms. Furthermore, multilevel analyses showed significant increases in joint attention and symbolic play skills. Thus, these pilot data emphasize the need for further research and implementation of classroom-based interventions targeting play and joint attention skills for young children with autism.

Introduction

In developing an intervention plan for a young child with autism, the child's skills must be considered in relation to the early core characteristics of autism: social-communication and repetitive

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behavior or restricted interests (National Research Council, 2001). Specifically, young children with autism have specific difficulty with joint engagement, symbolic play, and joint attention, all of which affect learning and development (Kasari et al., 2008).

Joint engagement, joint attention, and play

Extensive research has shown that joint engagement, joint attention, and symbolic play are significantly delayed in young children with autism. More importantly, all these are associated with later social (Sigman and Ruskin, 1999), cognitive (Mundy et al., 2010; Nelson et al., 2008; Stanley and Konstantareas, 2007), and communication development (Charman et al., 2003; Kasari et al., 2008; Loveland and Landry, 1986; Mundy et al., 1986, 1990; Mundy and Markus, 1997; Sigman and Ruskin, 1999; Tomasello and Farrar, 1986).

Joint engagement. If a child is not purposefully engaged in activities or interactions, the opportunities for learning are dramatically reduced (Iovannone et al., 2003). However, a more important curricular goal for young children with autism is to increase the amount of time children with autism are *jointly* engaged in activities while shifting their attention between the activity and their interaction partners (Kasari et al., 2010). Joint engagement occurs when the child is involved in the same object or event as another person (Adamson et al., 2004). Young children with autism have significant delays in the development of attention states that involve sustaining joint engagement with others (Adamson et al., 2009). In the preschool special education classroom setting, compared to children with other disabilities, children with autism spent significantly more time unengaged and had increased difficulty initiating and participating in social interactions with others (Sigman and Ruskin, 1999; Wong and Kasari, 2012).

Joint attention. Joint attention refers to the ability to shift attention between objects or events and other people in order to share interest and plays an important role in language development (Hobson, 1989; Loveland and Landry, 1986). Specific skills include pointing and showing with coordinated joint looks that involves a child looking at a target object, then making eye contact with another person, and then back to the target object. Compared to typically developing children and children with intellectual disabilities matched on mental age, children with autism have specific deficits in initiating and responding to joint attention (Mundy et al., 1986). Children with autism are more likely to use pointing and attention skills to regulate others' behaviors rather than to share interest (Keen et al., 2002). In the classroom setting compared to children with other disabilities, young children with autism showed fewer responses to and initiations of joint attention bids (Wong and Kasari, 2012).

Play. Symbolic or pretend play involves the representation of objects as something else. Children typically progress developmentally from playing with toys functionally, such as in constructive and manipulative play, to playing with toys symbolically (Lifter et al., 1993). However, in comparison to typically developing peers, children with autism at the same mental ages have significant delays in the development of symbolic play (Jarrold et al., 1993). Children with autism tend to manipulate toys or objects in a rigid or stereotyped manner (Atlas, 1990) rather than spontaneously initiate creative symbolic play activities (Jarrold et al., 1993; Libby et al., 1998). Furthermore, in the school setting, preschool special education teachers tend to focus more on facilitating functional play rather than symbolic play (Wong and Kasari, 2012).

Interventions targeting joint engagement, joint attention, and play

Research shows that laboratory-based interventions can successfully target joint attention and symbolic play for children with autism (Jones et al., 2006; Kasari et al., 2006; Martins and Harris, 2006; Stahmer, 1995; Whalen and Schreibman, 2003). In fact, in one study, Kasari et al. (2006) showed that in their randomized controlled study, not only were children with autism able to spontaneously initiate joint attention with others and generate symbolic play activities as a result of their specific focused interventions, they also had better language outcomes 1 year later (Kasari et al., 2008). However, this treatment was delivered by highly trained graduate students.

In addition to the laboratory-based interventions that successfully target joint engagement, joint attention, and symbolic play for children with autism, literature has emerged showing the ability of caregivers to implement the interventions with positive child outcomes (Rocha et al., 2007; Schertz and Odom, 2007) and large effect sizes (Kasari et al., 2010). Furthermore, recently published randomized controlled trials studying teacher–child dyads have demonstrated positive changes in joint engagement and joint attention through targeted interventions delivered to young children with autism by preschool teachers or paraprofessionals (Kaale et al., 2012; Lawton and Kasari, 2012). In a single-case design study, positive effects for three preschoolers with autism were reported as a result of an intervention targeting social-communication and play implemented individually by a speech–language pathologist and in a group context by a teacher or paraprofessional (Dykstra et al., 2012). Beyond these studies though, little focus has been given to teachers targeting joint attention and play within the daily activities and routines of children with autism in the preschool special education classroom. Furthermore, none of these have examined the impact of a teacher-implemented intervention targeting joint attention and play on individual children nested within classrooms.

Despite the limited intervention research targeting play and joint attention in preschool classroom settings, young children with autism are served by school systems and receive services from practitioners (National Research Council, 2001). In fact, the US Department of Education, Office of Special Education Programs and Data Analysis System (2007) reported that 35,081 preschoolers received special education services under the autism category in 2006. Furthermore, given the lack of emphasis on play and joint attention in early childhood curricula (Wong and Kasari, 2003), and that preschool special education teachers seldom address symbolic play and joint attention directly in their teaching (Wong and Kasari, 2012), a critical gap exists between the promising efficacy data and the translation of that research to the school settings. Therefore, it is important to determine whether positive changes in joint engagement, symbolic play, and joint attention can be achieved through a teacher-implemented intervention in the early childhood classroom setting.

The current study aimed to begin translating research to practice by testing a brief intervention focused on facilitating change in joint attention and play interactions between teachers and young children with autism in self-contained special education classrooms. Specifically, the objectives were to assess changes in the child's engagement, joint attention, and play during and following the intervention by first determining the effects of the intervention as compared to a wait-list control group and then examining more closely children's response to treatment as well as child and teacher variables affecting those outcomes.

Methods

Design

To determine the effects of the intervention, a randomized wait-list control design was utilized to assign teachers to one of three groups (using a random numbers list): (1) symbolic play then joint

attention (SP-JA) intervention, (2) joint attention then symbolic play (JA-SP) intervention, and (3) wait-list control period then further randomized to either SP-JA or JA-SP. To examine individual child growth and variables affecting those outcomes, data from all subjects receiving intervention were analyzed together. Figure 1 shows the study design and enrollment numbers.

Participants

Thirty-four preschool-aged children diagnosed with autism (validated with the Childhood Autism Rating Scale (CARS, Schopler et al., 1988)) began the study with their classroom teachers (n = 14). Recruited from a large metropolitan area through flyers distributed by school districts and local autism professional development conferences and workshops, 14 teachers were given information to distribute to families of children in the classroom who met study inclusionary criteria. Study criteria included that the child had a clinical diagnosis of autism from a licensed psychologist or neurologist, were receiving special education services under the federal category of autism, and did not have additional syndromes.

Participating children ranged in age from 3 to 6 years with mental age scores between 13.25 and 58 months as calculated from the Mullen Scales of Early Learning (MSEL; Mullen, 1995). Reflective of the gender ratio in autism, the children were primarily boys. The sample of children was diverse; 46% of the children were African American and 39% were Hispanic. While only 27% of the caregivers had completed college or had graduate or professional training, 42% of the
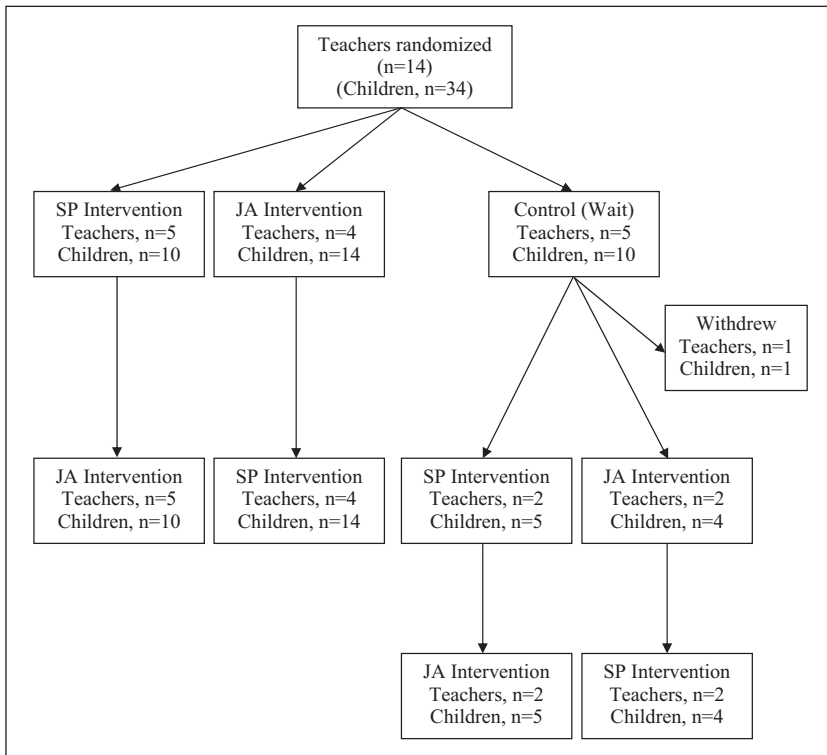

Figure 1. Study design and enrollment.
SP: symbolic play; JA: joint attention.

Table 1. Child demographics.

	JA-SP intervention (n = 14)	SP-JA intervention (n = 10)	Wait-list control (n = 9)	χ²/F
	M (SD)/ frequency (%)	M (SD)/ frequency (%)	M (SD)/ frequency (%)	
Gender				
Male	12 (86%)	9 (90%)	8 (89%)	$\chi^2(2) = 0.11, p = .94$
Female	2 (14%)	1 (10%)	1 (11%)	
Ethnicity				
African American	6 (43%)	5 (50%)	5 (56%)	$\chi^2(4) = 7.54, p = .11$
Hispanic	7 (50%)	5 (50%)	1 (11%)	
Caucasian	1 (7%)	0 (0%)	3 (33%)	
Chronological age (months)	56.21 (10.42)	54.50 (5.06)	59.67 (10.61)	$F(2, 32) = 0.77, p = .47$
Childhood Autism Rating Scale	35.93 (7.49)	39.60 (7.74)	38.89 (6.95)	$F(2, 32) = 0.84, p = .44$
Mullen Scales of Early Learning				
Mental age (months)	36.25 (11.00)	27.39 (14.47)	30.38 (13.19)	$F(2, 26) = 1.15, p = .33$
Receptive language age (months)	38.55 (16.51)	25.29 (15.77)	29.50 (13.58)	$F(2, 26) = 1.75, p = .20$
Expressive language age (months)	29.73 (10.05)	24.00 (16.41)	24.00 (11.22)	$F(2, 26) = 0.68, p = .52$
Early learning composite	59.91 (16.42)	56.14 (15.15)	57.50 (10.61)	$F(2, 26) = 0.16, p = .86$
Mother's highest level of education				
High school or less	4 (29%)	4 (40%)	6 (67%)	$\chi^2(4) = 3.48, p = .48$
Some college/vocational Training	5 (36%)	3 (30%)	2 (22%)	$F(2, 26) = 0.68, p = .52$
College/professional/ graduate	5 (36%)	3 (30%)	1 (11%)	$F(2, 26) = 0.16, p = .86$

SD: standard deviation; SP-JA: symbolic play then joint attention; JA-SP: joint attention then symbolic play.

caregivers had only completed high school or less education. Table 1 shows further demographic information. There were no significant differences between the three groups.

Children participated in the study with their special education teacher. One teacher with one child participant from the wait-list control group was withdrawn from the study since the teacher accepted and relocated to a different job in another area before the scheduled start of intervention. All participating teachers were female and Caucasian. They ranged in age from 23 to 58 years with an average age of 40.92 years and had between 1 and 30 years of teaching experience (mean = 13.12 years) in early childhood special education classrooms. The participating classrooms were all self-contained special education classrooms and had between two and eight children taught by a lead teacher with one to three instructional assistants. Table 2 provides further detailed background information.

Measures

Classroom observation. Direct observations of the children in the intervention group took place in the classroom at three different time points: before intervention began, after four intervention

Table 2. Teacher and classroom demographics.

	JA-SP intervention (n = 5)	SP-JA intervention (n = 4)	Wait-list control (n = 4)	χ^2/F
	M (SD)/frequency (%)	M (SD)/frequency (%)	M (SD)/frequency (%)	
Highest level of education				
Some college	1	0	0	$\chi^2(4) = 9.17, p = .06$
College	0	3	0	
Graduate	3	2	5	
Chronological age (years)	40.50 (10.08)	33.60 (24.48)	37.60 (10.16)	$F(2, 12) = 0.19, p = .83$
Years of teaching experience	9.12 (7.79)	14.20 (13.97)	13.20 (10.08)	$F(2, 12) = 0.25, p = .78$
Number of child study participants in classroom	3.50 (1.29)	2.00 (1.22)	1.80 (.45)	$F(2, 12) = 3.46, p = .07$
Total number of children in classroom	6.12 (2.59)	5.40 (2.61)	7.40 (.89)	$F(2, 12) = 1.11, p = .36$
Number of paraprofessionals in classroom	1.38 (.75)	1.80 (1.10)	1.60 (.55)	$F(2, 12) = 0.29, p = .76$
Special education classroom type				
Autism-specific class	1	3	0	$\chi^2(4) = 7.26, p = .12$
Noncategorical	3	2	3	
Emotional behavioral disorders	0	0	2	
School type				
Public	3	2	3	$\chi^2(4) = 7.26, p = .12$
Charter	0	0	2	
Private	1	3	0	
Community designation				
Urban	1	3	0	$\chi^2(4) = 4.44, p = .11$
Suburban	3	2	5	

SD: standard deviation; SP-JA: symbolic play then joint attention; JA-SP: joint attention then symbolic play.

sessions in one unit, and after four more interventions in the other unit. Children in the wait-list control classrooms were observed at four different time points; the additional time point was at the beginning of the wait period. At each time point, children were observed in their classroom on three separate mornings within a 1-week period. Researchers blind to the study group continuously recorded the presence of specific child behaviors and teacher behaviors toward the target child in 5-min blocks for a total of approximately 45-min (standard deviation (SD) = 22.89) observation time per child. During the classroom observations, approximately 26% of the time was spent in unstructured activities (e.g. free play and recess), about 54% in structured activities (e.g. circle, center activities, individual, or small group instruction), and 15% in other activities (e.g. bathroom and snack). There were no significant differences in the time spent in the different activities between any of the study groups. Data were collected on a Palm V using Elan 2.0.1 (Sanders, 2002), a shareware application designed for behavioral data collection in educational settings. It is

Table 3. Behaviors coded in the classroom observation.

Behavior	Definition
Engagement states	Adapted from Adamson et al. (2004)
Supported joint	Child and another person are actively involved in the same object or toy. The joint engagement is either supported and thus actively maintained by the other person or coordinated where the child initiates or is actively involved with and coordinates attention to both another person and the object to share attention
Joint attention	Adapted from Mundy et al. (1986)
Child RJA	Child responds (attentional or behavioral) to another's bid (show or point to an object) for joint attention
Child IJA	Child initiates (show or point) a bid for joint attention toward another person for sharing purposes
Play	Adapted from Lifter et al. (1993) and Ungerer and Sigman (1981)
Child functional play	Child creates combinations of objects and/or may extend familiar actions with objects in a pretend quality to self, others, or to doll figures
Child symbolic play	Child extends familiar actions to two or more figures or moves the figures as if they are capable of action. The child may use one object to stand in place for another or pretends to use something that is not there. The child may adopt various familiar or fantasy roles in a play theme

RJA: responds to another's bid for joint attention; IJA: child initiates a bid for joint attention.

a date and time-stamp recording application in which templates can be created to record specific variables of interest.

Table 3 describes the different behaviors that were coded. During the 5-min observation blocks, researchers tracked the beginning and ending times of children's engagement with objects and others (e.g. teacher, paraprofessional, therapist, peer, and so on) together. The duration of those times from each observation block were then totaled and divided by the total classroom observation time to calculate the percentage of time children spent in a joint engagement state (Adamson et al., 2004; Bakeman and Adamson, 1984). The average intraclass correlation coefficient between two independent coders for percent time spent in a joint engagement state was .91. The frequency of play and joint attention behaviors were also coded during the same 5-min observation blocks. The number of functional play acts, symbolic play acts, responses to joint attention, and initiations of joint attention were then summed up for each variable and divided by the total classroom observation time. The average intraclass correlation coefficient established between two independent coders was .86, with a range of .81–.92 for the child play and joint attention behaviors.

Early Social-Communication Scales (ESCS). The child's nonverbal initiations and responses to joint attention, behavior regulation or requesting behaviors, and social interactions were scored from this 15-min assessment (Mundy et al., 1986). In this semi-structured videotaped assessment, the child and tester sat across from each other with a set of toys to the side that are visible but beyond reaching distance of the child. The tester, trained to elicit different responses, presented the toys one at a time. The average intraclass correlation coefficient established between two independent coders was .82, with a range of .78–.89 for the joint attention and requesting behaviors.

Structured play assessment. The frequency and level of spontaneous symbolic play behaviors were coded from this videotaped 15-min interaction (Ungerer and Sigman, 1981). While the child and

tester sat facing each other at a table, the tester presented the child with four groups of related toys. These toys include a tea set, dolls, a telephone, a brush, a mirror, doll furniture, a tissue, blocks, a dump truck, and a garage. The average intraclass correlation coefficient established between two independent coders was .86, with a range of .82–.90 for the symbolic play behaviors.

To master a play level, the child had to spontaneously initiate three play acts at a specific level of three different types. For example, to reach mastery at the substitution level, the child displayed a substitution with three different objects (e.g. block as a cookie, paper as a blanket, and toy bed as an airplane). Thus, for each child, we determined the highest mastered level of play they demonstrated on the assessment (not just the highest level of play shown).

CARS. The CARS is a brief rating scale that measures autism in children that includes items drawn from five prominent systems for diagnosing autism (Schopler et al., 1988). Each item covers a particular characteristic, ability, or behavior and is rated on a Likert-type scale.

MSEL. The MSEL assesses language, motor, and perceptual abilities for children birth to about 5 years old (Mullen, 1995). The visual reception, fine motor, expressive language, and receptive language subscales were used to calculate mental age. Furthermore, the language subscales were used to report receptive and expressive language age scores.

Demographic information. The parents/guardians completed a demographic form to obtain the child's chronological age, gender, ethnicity, and the parents' highest level of education.

Teacher Questionnaire. Teachers completed a questionnaire to collect teachers' demographic information (age, gender, ethnicity, highest level of education, and years of related teaching experience) as well as general classroom information (number of students in the classroom and the number of adults in the classroom).

Teacher acceptability of intervention. At the end of intervention, teachers were asked to rate on a 5-point scale a six-item self-report acceptability of intervention measure that included items related to adherence-to-treatment and competence (Kasari, et al., 2010). This measure included four items focused on adherence-to-treatment: (1) finding the time to carry out the learned strategies, (2) found it complex to carry out the learned strategies, (3) found it unnatural to carry out the learned strategies, and (4) found it took a lot of effort or work to carry out the learned strategies. Competence consisted of two items: (1) felt confident in carrying out the learned strategies and (2) felt comfortable carrying out the learned strategies. Items were rescaled and totaled so that higher scores represent higher levels of acceptability of the intervention.

Fidelity. After completing the classroom observations at the beginning and end of the entire intervention period, researchers completed implementation ratings for all the teachers to measure their fidelity in adhering to treatment strategies. Teachers were rated on a 4-point Likert scale for how well they demonstrated each of 13 different objectives that were drawn from the intervention manual. One item related to joint engagement (tries to scaffold to a higher engagement state), six items related to joint attention, and six items related to play. The six items for joint attention and play were similar except for the target skill and are as follows: (1) sets up opportunities for JA-SP, (2) directly teaches JA-SP (for the purpose of JA-SP), (3) prompts for JA-SP, (4) uses least-to-most prompt hierarchy to prompt for JA-SP, (5) models JA-SP, and (6) responds to/reinforces JA-SP. Higher implementation scores represent higher levels of fidelity.

Procedure

After obtaining informed consent to participate, all assessments and observations were completed for each child, teacher, and classroom. The teachers in the intervention groups (SP-JA and JA-SP) began immediately while the teachers in the wait-list control group proceeded as usual for a 4-week wait period before beginning intervention.

Intervention. The eight-session play and joint attention intervention is based on the treatment manual developed by Kasari et al. (2006, 2008) for preschool-aged children with autism in the clinical setting. Table 4 provides a brief overview of the intervention. The treatment utilizes both behavioral strategies and principles of milieu teaching with an emphasis on embedding strategies targeting symbolic play and joint attention into teachers' everyday classroom routines and activities. Additionally, the intervention focused on all children in the classroom who required support in these social-communication areas rather than just the children participating in the study. Teachers were free to discuss any children in the class with play and joint attention needs. However, study data were only collected on the children with parental consent to participate in the research.

The intervention includes an individualized approach where teachers could choose to implement activities for the whole class, in small groups, and/or in a one-on-one individualized setting. As classrooms range in their philosophies, level of support, and children's skills and abilities, teachers were allowed to select and implement the strategies and activities that best fit their needs. For example, in behaviorally based classrooms using discrete trial procedures, teachers were shown how to add play and joint attention programs to existing curricula and how to task analyze those skills. In other classrooms, teachers were introduced to activities/games targeting symbolic play and joint attention that could be incorporated during circle or center time. Additionally, in classrooms with more paraprofessional support, teachers could deliver the intervention in one-on-one settings. In classrooms with more children with higher language and cognitive skills, teachers were able to target play and joint attention through group instruction (see Appendix 1 for examples from the manual). Thus, the intervention focused more on curriculum content (targeting play and joint attention) rather than following a prescribed set of intervention steps.

Each weekly session began with a brief 10–15-min observation by the interventionist in the classroom. The interventionists delivering the intervention were both trained in early childhood special education and had several years of teaching experience. Training sessions then took place and lasted approximately 1 h where the teacher and interventionist met individually in the classroom at a time convenient for the teacher (before or after school, during lunch, or during a planning period). The first session began by introducing the intervention. Subsequent intervention sessions began by discussing the observation that was then followed by a short review and reflection of previous information presented. The second part included a presentation and discussion of new information with multiple exemplars. The interventionist presented the module handout and explained as well as demonstrated the target information and strategies using materials found in the classroom. Finally, the interventionist worked with the teacher together to complete a worksheet individualizing and translating the new information/strategies to the classroom that could be posted as a guide for all classroom staff.

Four sessions focused on play and four sessions focused on joint attention. Thus, teachers randomized to the SP-JA group spent the first 4 weeks learning strategies targeting play before switching to joint attention while teachers randomized to the JA-SP group spent the first 4 weeks learning strategies targeting joint attention before switching to play. Teachers in the wait-list control group did not receive any JA or SP intervention in the first 4 weeks.

Table 4. Intervention units and objectives.

Intervention

Introduction:
- Importance of joint attention and symbolic play for young children with autism
- Philosophy—To provide strategies targeting joint attention and play that complement existing classroom routines and practices

Symbolic play (SP) unit	Joint attention (JA) unit
• Defining and assessing functional and SP	• Defining and assessing responding to JA and initiating JA
• Functional play (combinations, pretend self, and child as agent)	• Responding to JA (responding to shows and points, following gaze)
• SP (substitutions, doll as agent, play sequences, and sociodramatic/fantasy play)	• Initiating JA (coordinated joint looks, show, and point)
• Importance of targeting child's developmental play level	

[a]Teachers create a spreadsheet indicating children's current and target SP-JA levels

• Scaffolding SP	• Scaffolding JA
• Least-to-most system of prompts	• Least-to-most system of prompts
• General prompts	• General prompts
• Specific prompts	• Specific prompts
• Physical prompts	• Physical prompts

[a]Teachers create examples for each level of prompting for children's target SP-JA levels

• Structured SP activities	• Structured JA activities
• Classroom/group activities	• Classroom/group activities
• Create a story—using box of dolls/figures and objects	• Show and share—showing and sharing items pulled out from a surprise box/bag
• Let us pretend—What is it for real? What can it be for pretend?	I spy and you find—teacher describes object/person, child points to it
• Individualized activities	• Individualized activities
• Massed trials with multiple exemplars	• Massed trials with multiple exemplars

[a]Teachers write lesson plans for activities targeting children's SP-JA levels

• Embedding SP activities	• Embedding JA activities
• Set up the play environment	• Set up opportunities for communication
• Allowing the child to initiate/choose play activity	• Allowing the child to initiate communication
• Play within established routines and expand/violate routines	• Imitating and expanding language
• Recognizing and responding to SP acts	• Recognizing and responding to JA

[a]Teachers write a schedule where SP-JA activities are included in the classroom day

SP: symbolic play; JA: joint attention; SP-JA: symbolic play then joint attention.
[a]Indicates the task for teachers to complete with guidance from the interventionist.

Results

Hierarchical linear modeling (HLM 7.0; Raudenbush et al., 2011) was used to statistically analyze a data structure where repeated measures over time (level 1) were nested within children (level 2), which were nested within classrooms (level 3) for dependent variables of joint engagement, joint

attention, and play. In the first phase, the effects of the intervention were examined by comparing the treatment groups to the wait-list control group (n = 14 teachers). In the second phase, data from all participants completing the intervention were examined to determine variables affecting child outcomes (n = 13 teachers).

Intervention effects

Since the wait-list control group did not receive any intervention in the first 4 weeks, comparisons were able to be made between children in classrooms whose teachers received the four-session play intervention, the children whose teachers received the four-session joint attention intervention, and the children whose teachers had not received any intervention yet. While no significant differences were found between the three groups for play and joint attention behaviors during the classroom observations, children whose teachers were randomized to either one of the intervention groups spent significantly more time in a joint engagement state as compared to children whose teachers were in the wait-list control group (β = 8.35, standard error (SE) = 3.36, p = .03, d = .63). Specifically, children whose teachers received the play or joint attention intervention first were spending almost half of the time observed interacting jointly in activities with others while children whose teachers had not received any intervention yet were spending less than a quarter of the observed time in a joint engagement state (see Figure 2).

To examine the effects of the full intervention, data from all 33 children were analyzed at three time points: (1) preintervention: before teachers started the first intervention unit, (2) midintervention: between the two intervention units, and (3) postintervention: after the second intervention unit was completed. Table 5 shows means and SDs for the joint engagement, play, and joint attention variables at the three time points by group (SP-JA and JA-SP). There were no significant differences between the two intervention groups on child demographics, child characteristics, and pretreatment scores.

HLM analyses were conducted to provide an estimate of the linear change in joint engagement as well as the joint attention and play behaviors. Table 5 reports the coefficients and effect sizes describing the main effect of the intervention on the key variables of interest. While the classroom
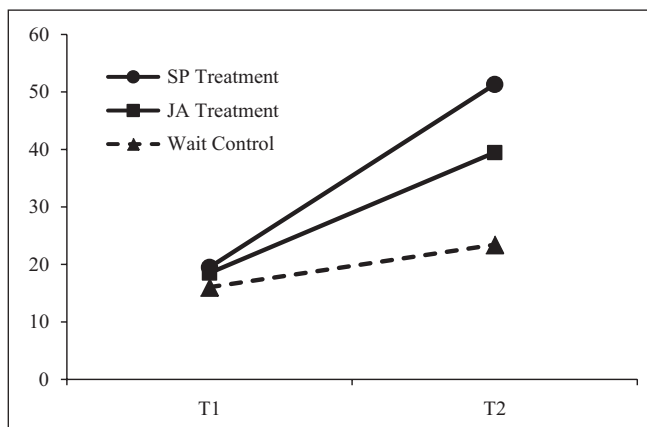

Figure 2. Percent joint engagement by group.
SP: symbolic play; JA: joint attention.

Table 5. Means and SDs at preintervention, midintervention, and postintervention.

	M (SD)						β (SE)	d
	SP-JA intervention (n = 15)			JA-SP intervention (n = 18)				
	Preintervention	Midintervention	Postintervention	Preintervention	Midintervention	Postintervention		
Classroom observation								
Joint engagement (percent time of observation)	15.85 (11.61)	43.65 (26.02)	28.88 (15.38)	22.42 (14.07)	40.31 (19.91)	54.08 (21.86)	11.42*** (2.59)	.41
Joint attention responses (acts/min)	0.51 (0.37)	0.51 (0.43)	0.53 (0.29)	0.28 (0.24)	0.65 (0.51)	0.81 (0.61)	.15* (0.07)	.43
Joint attention initiations (acts/min)	0.06 (0.12)	0.09 (0.17)	0.07 (0.11)	0.11 (0.17)	0.21 (0.25)	0.27 (0.21)	0.06* (.02)	.21
Functional play (acts/min)	0.94 (0.81)	0.64 (0.47)	0.94 (0.77)	0.42 (0.45)	0.52 (0.49)	0.62 (0.69)	0.02 (0.06)	NS
Symbolic play (acts/min)	0.03 (0.08)	0.08 (0.15)	0.15 (0.26)	0.03 (0.05)	0.06 (0.14)	0.10 (0.17)	0.05* (0.02)	.51
ESCS								
Joint attention responses (number of acts)	4.40 (3.22)	—	4.93 (3.49)	6.61 (3.01)	—	8.11 (3.85)	0.26* (0.10)	.23
Joint attention initiations (number of acts)	5.73 (8.70)	—	2.47 (4.00)	10.94 (9.57)	—	6.72 (6.29)	−0.25 (0.14)	NS
Structured play assessment								
Structured play—play level	8.14 (3.82)	—	8.07 (4.53)	8.41 (4.21)	—	8.30 (3.87)	0.78 (0.71)	NS

SD: standard deviation; SP-JA: symbolic play then joint attention; JA-SP: joint attention then symbolic play; SE: standard error; NS: not significant; ESCS: Early Social-Communication Scales.
*$p < .05$, **$p < .01$, ***$p < .001$.

observation showed significant increases in joint engagement, joint attention responses and initiations, and symbolic play acts, the semi-structured assessments (ESCS and structured play assessment) only showed positive changes in responses to joint attention.

Variables affecting treatment response

Further HLM analyses were conducted to examine the extent to which teacher and child variables influenced joint engagement, joint attention, and play outcomes.

Intervention order. Analyses showed significant differences in the percent of time the child spent in joint engagement and for child initiations of joint attention acts based on the intervention content that was first presented to the teachers. Compared to children whose teachers received the symbolic play intervention before the joint attention intervention (SP-JA), children whose teachers received the joint attention intervention first (JA-SP) had higher rates of growth in joint engagement ($\beta = -9.44$, SE = 4.53, $p = .06$) and joint attention initiations ($\beta = -0.09$, SE = 0.04, $p = .03$).

Intervention acceptability and fidelity. Out of a total possible score of 30, teachers' rating of intervention acceptability ranged from 14 to 30 with an average score of 25.96 (SD = 4.96). However, at postintervention, the only significant relationship was between the teachers' ratings of acceptability and children's responses to joint attention ($\beta = 0.04$, SE = 0.02, $p = .03$). Likewise, while fidelity scores, as rated by the research team, increased for all classrooms (from $M = 26.69$ (51% fidelity), SD = 4.07 to $M = 39.23$ (75% fidelity), SD = 3.85; $F(1, 12) = 108.89$, $p < .001$, η^2_p), the only significant relationship for teachers' fidelity was with children's responses to joint attention ($\beta = 0.04$, SE = 0.01, $p = .03$).

Child characteristics. None of the selected variables (chronological age, autism severity as rated by the CARS, and mental age as calculated from the MSEL) were found to have a statistically significant effect on treatment response.

Discussion

The goal of the current study was to begin translating research to practice in testing a classroom-based intervention targeting play and joint attention for young children with autism. Results from the multilevel analyses provide support for the implementation of the intervention by early childhood special education teachers in their classrooms. In examining the effects of the intervention, a major finding was that teachers implementing either the play or joint attention intervention helped their children with autism sustain longer periods of joint engagement in the classroom. Regardless of intervention type, after just four intervention sessions with the teacher, the children in those groups showed significant improvements with a large effect size in joint engagement over the children whose teachers had not received any intervention. These data highlight the effects of intervening on play and joint attention in facilitating greater joint engagement.

While significant increases in play and joint attention were not found after four intervention sessions, after eight intervention sessions, results from the multilevel analyses examining intervention outcomes showed statistically and clinically significant growth in joint attention and symbolic play skills. Throughout the full intervention, significant increases in responding to and initiating joint attention in the classroom were found with small-to-medium effect sizes. The increase in joint attention responses was even generalized to research staff in a testing environment. It is likely that

joint attention initiations are more difficult with unfamiliar adults. Furthermore, after the intervention, children may have been attending more to *responding* to bids for joint attention that resulted in a decrease in joint attention initiations. Perhaps, once the skill of responding to joint attention is mastered with greater fluency, children with autism could then concentrate more on the next developmental step of increasing joint attention initiations.

Although there was a significant increase in symbolic play skills with a large effect size in the classroom, the data showed no significant changes in play level when tested by research staff. Thus, the children may have had more difficulty transferring their learned symbolic play skills in the classroom to new sets of toys. A greater emphasis on generalizing symbolic play skills using a variety of toys and objects may be required to yield significant changes in play level.

While the treatment content did not seem to make a difference after just four intervention sessions, there was a difference after eight sessions. Children whose teachers received the joint attention content before the symbolic play content in intervention showed greater increases in joint engagement and joint attention initiations than children whose teachers received the content in the opposite order. While both skills require children to have recognition and knowledge of others, symbolic play may be a more developmentally advanced skill as it requires a child to transfer and demonstrate that knowledge of others to their play with objects. Therefore, children learning content in a more developmentally appropriate sequence may show better outcomes.

Overall, teachers felt and were able to implement the classroom-based intervention with a high degree of fidelity. With the focus being on adding play and joint attention as important curricular goals, the teachers had the flexibility and power to choose which intervention activities to implement. Therefore, the intervention was feasible for teachers to implement and resulted in positive child outcomes. Furthermore, because of the increases in child joint engagement, joint attention, and play across the different classrooms, it may be that instead of focusing on *how* to teach these social-communication skills, it is more important that play and joint attention *are* being taught in the classroom for young children with autism. All in all, findings from this study highlight the importance of targeting play and joint attention in early childhood curriculum for young children with autism. Additionally, more time may be needed to document greater increases in children's play and joint attention behaviors in the classroom setting. These data are among the first to examine a play and joint attention intervention in a classroom setting for young children with autism using a randomized controlled design and multilevel analysis. Although limited by the small sample size, findings from this study are promising due to the positive outcomes found in early core characteristics of autism after briefly intervening with teachers in the classroom. Data collected with a larger sample size will allow for a more in-depth analysis of factors affecting optimal treatment outcomes at both the teacher/classroom level and child level. Additionally, because this intervention focused on the intervention content or curriculum rather than the specific strategies, the small sample size did not allow for analysis of how the implementation of the intervention was related to children's outcomes. Thus, these pilot data emphasize the need for further research and implementation of classroom-based interventions targeting play and joint attention skills for young children with autism.

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Appendix 1. Examples from manual.

Structured joint attention activity
Sharing time! (show and tell—simplified)
- Materials
  - Any group of items/toys: these can fit with your theme/unit but can also be everyday objects, and items do not have to be related
  - A bag or box to contain all the items: this can also be decorated to fit with your theme/unit
- Procedure
  - Show the students your container, "Look at what I have. I wonder what's inside. Who wants to get something out and show it to the class?"
  - Then either take volunteers or go from child to child to take an item out and give them an opportunity to take out an object and show it to the class
    - For children who are just learning to show, prompt them to lift the object up for the class to see
    - For children who have mastered this, prompt them to show the object and then say something about—label the object or for children who are more advanced, describe it
  - Reinforce for any action that could possibly be interpreted as sharing, especially reinforce eye contact

Embedding joint attention activities
Set up opportunities for communication
- Arrange desired items within your student's range of vision but out of reach
  - When you have an object for the student, present it at your student's eye level
  - Place yourself at the child's level and hold objects near your face
- Set up opportunities to "set the child up" to communicate
  - Many times, teachers understand their students so well that they can anticipate or already know what their children want. Pretend that you do not understand what the child is communicating. This way, the child will have a chance to practice communicating with you
  - Wait for the child to communicate (eye contact, gesture, and verbalization) before you respond
- Model joint attention skills while you play with your child
  - Showing, pointing, and sharing looks
- Use salient language that matches the child's level of language development
  - Talk in a way that the child can understand
    - If the child is using two-word phrases, then use two-word phrases

Structured symbolic play activity
Create a story
- Materials
  - Dolls/figures: this can fit with your theme/unit such as a scarecrow for fall, a snowman for winter, and a leprechaun for St. Patrick's Day
  - Toys/objects: again, this can fit with your theme; perhaps pumpkins for fall, mittens for winter, a black pot for St. Patrick's Day, flowers for spring, and so on, but can also be everyday items that can easily represent something else: blocks, balls, paper, jars, cups, erasers, popsicle sticks, cans, sponges, buttons, ribbon, and so on
- Procedure
  - Show the students the materials, "Look at what I have—we're going to make a story and everyone gets to take a turn to make part of the story."
  - Start off by saying, "Once upon a time, there was a ..."
  - Then either take volunteers or go from child to child to give them an opportunity to pick one or more of the materials and do something with it while you help provide the language for the story
    - Have in mind each child's target play level goal so that you can prompt appropriately
      - For children at the functional play level, prompt them to put things together (e.g. pumpkin on the table and mitten on the snowman)
      - For children at the symbolic play level, prompt them to pretend something is really something else (e.g. cup is a pot of gold and doll is smelling a flower that is really just a button)
    - Have in mind a few scenarios or a storyline that you can prompt (have the children fill in the blank)
      - "What is going to happen next?" "What did he/she do?" "Where are you going to put that?"

(Continued)

Appendix 1. (Continued)

> • "Then he sat on the ___ " and ate a ___ " "And then they saw a ___ "

- Reinforce for play acts and attempted play acts
  - It is okay for children to copy one another but try to encourage new and different ideas
  - Emphasize that some ideas are pretend and might be funny but may not happen in real life
- Finish the story by saying, "The end"

Embedding symbolic play activities
Play within established routines
- Establish routines that
  - Have a predictable sequence of events
    - Put the toy figure in the car, drive the car, and take toy figures out of the car
    - Choose a toy food for the animal to eat. Feed the toy animal
  - Have clearly defined roles
    - The toy figure is placed in the seat of the car. The car is pushed to the dollhouse. The figure is taken out of the car.
    - The toy food goes to the toy animal's mouth
  - Are broken down into small steps to build in repeated opportunities for the student to respond
    - Take out several toy figures and several cars
    - Many food items can be given to the animal
  - Are "marked" by consistent phrases or labels at each step of the routine
    - "The boy wants to go home. Get IN the car. Drive the car. Get OUT of the car. Home!"
    - Look, an apple! EAT the apple. Yummy!
- Alter or violate to introduce new actions and vocabulary to elicit different or more advanced response from the student and encourage creativity and flexibility
  - The car crashes and the toy figure falls out of the car; more figures can ride in the car; the toy dinosaur wants to ride in the car but it is too big; a figure can ride an airplane to the house; a figure can go to school instead of home ...
  - The animal does not like the food (yucky!); the animal wants to go to sleep instead; the animal has to go to the toy house to get the food; another toy animal eats the food first; the animal eats the toy train instead ...