J Autism Dev Disord (2006) 36:655–664
DOI 10.1007/s10803-006-0108-z

ORIGINAL PAPER

The Collateral Effects of Joint Attention Training on Social Initiations, Positive Affect, Imitation, and Spontaneous Speech for Young Children with Autism

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Published online: 30 June 2006

Abstract Joint attention may be a core deficit in autism which underlies the abnormal development of later emerging social-communication behaviors. Given this theory, researchers have suggested that teaching young children with autism to engage in joint attention may lead to collateral increases in other non-targeted social-communication behaviors. In this study, children with autism participated in a 10-week joint attention training program and collateral changes in non-targeted behaviors were assessed. Following participation in the intervention, positive collateral changes were observed in social initiations, positive affect, imitation, play, and spontaneous speech. Results support the hypothesis that teaching joint attention skills leads to improvement in a variety of related skills and have implications for the treatment of young children with autism.

Keywords Joint attention · Language · Social skills · Play · Imitation

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Introduction

Although researchers are still searching for the cause of autism, there is no lack of discussion on what might be the core psychological deficits in this disorder. Since Leo Kanner's initial description of autism in 1943, many researchers have advocated that one of the core disturbances in autism is in social communication (e.g. Baron-Cohen, 1995; Kasari, Freeman, & Paparella, 2001). One of the earliest social impairments noted in children with autism is their lack of joint attention during infancy and early childhood. Joint attention can be broadly defined as the ability to coordinate attention between an object and a person in a social context (Adamson & McArthur, 1995). Many researchers believe that joint attention may be a core deficit in children with autism negatively affecting their development in language, play, and social interactions (e.g. Charman et al., 1997).

According to Sigman and Capps (1997), three criteria must be met to identify a core deficit in a particular disorder: (1) Specificity (i.e. the deficit should be specific to the disorder and not found in other disorders); (2) universality (i.e. the deficit should be present in all children with the disorder); and (3) primacy (i.e. the deficit should emerge in the early stages of development). In children with autism, all of these criteria appear to be met in terms of joint attention and other early social-communication skills. First, these deficits have been shown to be specific to the disorder. Studies that have looked at joint attention deficits in other childhood disorders have not found similarities to children with autism (e.g. Loveland & Landry, 1986; Ruskin, Kasari, Mundy, & Sigman, 1994). Second, joint attention deficits appear to be present in most children with autism (Kasari et al., 2001). Finally, joint attention is one of the earliest emerging social behaviors and thus meets the criteria for primacy. According to the criteria proposed by Sigman and Capps (1997), joint attention appears to be a reasonable candidate for a core deficit in autism.

Research supports a link between autism and the development of other later-emerging social-communication behaviors. Recent theories of social development have paid particular attention to the role of joint attention (e.g. Baron-Cohen, 1995; Mundy & Crowson, 1997; Striano & Rochat, 1999), most notably its relationship with the development of higher level social behaviors such as intersubjectivity (Mundy & Hogan, 1994) and theory of mind (e.g. Baron-Cohen, 1995). In addition to social development, joint attention has also been linked to the development of language. Researchers hypothesize that young children use joint attention skills to attend to language cues in their environment (Bruner, 1974) and that joint attention may act as a precursor to higher social-cognitive abilities essential in language development (Bates, Benigni, Bretherton, Camioni, & Volterra, 1979). In addition, protodeclarative joint attention (i.e. purpose of sharing rather than requesting) may be associated with the development of receptive and expressive language (Mundy & Gomes, 1998). Joint attention has also been linked to the development of play, although not as strongly (e.g. Mundy & Sigman, 1989). Specifically, affective information in joint attention allows the child to develop the symbolic representation needed to acquire symbolic and pretend play. In addition to play, affective information from joint attention may be important in the acquisition of object imitation (Meltzoff & Moore, 1994).

Although behavioral interventions for children with autism have been effective for language, play, imitation, and social behaviors (e.g. Koegel, Koegel, & Schreibman, 1991; Lovaas, 1987), few studies have attempted to teach joint attention behaviors. Pierce and Schreibman (1995) reported increases in joint attention following a peer-oriented behavioral intervention. In another study, increases in joint attention were observed in children with autism when their parents imitated them during play but joint attention initiations were not observed when the environment was not structured in this manner (Lewy & Dawson, 1992). Most studies, however, have not reported significant changes in joint attention following treatment (e.g. Rocha, Sherer, Paredes, & Schreibman, 1999). It is important to note these studies did not directly target joint attention skills. In order to affect increases in spontaneous joint attention, many researchers posit that joint attention behaviors should be targeted directly (e.g. Mundy, 1995).

Given the association between joint attention skills and later emerging social-communication behaviors, researchers have suggested that targeting joint attention skills may also lead to collateral changes in non-targeted social-communication behaviors (e.g., Mundy, 1995). However, few empirical studies have attempted to directly test this assumption.

Some researchers have directly targeted joint attention behaviors in young children with autism with promising results. Increases in showing, pointing, and sharing were observed in one child with autism after joint attention training in an early intervention study by Kasari et al. (2001). In addition, significant gains in language were also observed for this child. This study contributes significantly to the literature in that it demonstrates that joint attention can be trained and that there might be some collateral changes in language.

In our previous work, we used a multiple-baseline design across five young participants with autism to determine the efficacy of a joint attention intervention. This study demonstrated that with developmental maturation (2–10 weeks of baseline), children with autism did not improve in their joint attention skills (Whalen & Schreibman, 2003). Prior to starting treatment, developmental norms in typical children were assessed to establish training criteria. Following baseline, all five children were successfully taught to respond to joint attention initiations from the experimenter and four of the children were taught to initiate protodeclarative pointing and coordinated joint attention. Targeted behaviors successfully generalized to unstructured and structured assessments with the experimenters and with each child's mother.

The primary purpose of the present study was to examine collateral changes in social initiations, positive affect, play, imitation, and language following participation in a joint attention training program (Whalen & Schreibman, 2003), to determine whether teaching joint attention skills leads to collateral changes in non-targeted social-communication skills.

Method

Participants

A total of 10 preschool-aged children participated in this investigation. Four children with autism participated in an early intervention program designed to target joint attention deficits (Whalen & Schreibman, 2003). The average chronological age of the children with autism was 4 years, 2 months with an average mental age equivalent of 1 year, 5 months using the Bayley Scales of Infant Development, Second Edition (Bayley, 1993). The average language-age equivalent for participants was 1 year, 5 months using the Bayley and the MacArthur Communicative Development Inventory (CDI; Fenson et al., 1993). All participants met criteria for autism using the Childhood

Autism Rating Scale (CARS; Schopler, Reichler, DeVellis, & Daly, 1980) (average score: 31) and the Gilliam Autism Rating Scale (GARS; Gilliam, 1995) (average score: 93) and were required to have a diagnosis of autism or another autistic spectrum disorder provided by an outside physician or psychologist using DSM-IV criteria (American Psychiatric Association, 1994). In addition, because joint attention behaviors do not develop in typical children until about 12–14 months, the participants with autism had nonverbal mental ages above this level. All children with autism were recruited from a waiting list for participation in the UCSD Autism Research Laboratory or from referrals from other research and clinical facilities in the San Diego area on a first come, first serve basis (See Table 1 for Participant Characteristics). A fifth child with autism participated in the original intervention study but was unable to master the targeted joint attention initiations and did not complete the intervention study (Whalen & Schreibman, 2003) and was thus not included in the current study.

Design

A single subject, multiple baseline design across participants was implemented (Kazdin, 1973). This type of design has the advantage of controlling for developmental maturation, exposure to the treatment setting, and allows for measurement of several concurrent behaviors. In addition, this design is advantageous for looking at individual differences in the effectiveness of an intervention, and focuses on practical significance versus statistical significance. As required for this design, baselines were staggered across participants and ranged from 2 to 10 weeks in length with 10 weeks being approximately equal to the length of the intervention. For each participant, data were obtained during baseline, treatment, post-treatment, and at 3-month follow-up.

Setting

This research was conducted in the UCSD Autism Research Laboratory. Baseline, treatment, and assessment sessions took place in rooms in the laboratory that included a small table, two to three small chairs, toys, pictures on the walls, and a one-way observation mirror with a viewing room on the other side from which sessions were videotaped for behavioral coding.

Procedure

Each child was administered pre-treatment assessments (See Assessments section and Table 2) and then participated in baseline for two to ten weeks according to the multiple baseline design. The joint attention treatment used naturalistic behavior modification techniques which incorporated components from Discrete Trial Training (e.g., Maurice, Green, & Luce, 1996) and Pivotal Response Training (PRT, Koegel, O'Dell, & Koegel, 1987; Koegel, Schreibman, Good, Cerniglia, Murphy & Koegel, 1989). Treatment consisted of two phases. In the first phase, *Response* Training, the child was taught to respond appropriately to joint attention bids of the experimenter, including placing the child's hand on an object, tapping an object, showing an object, following a point, and following gaze. Behaviors were taught in order and mastery of each target behavior at 80% correct over four consecutive sessions was required before teaching the next behavior. This phase took roughly 3 weeks for each child. In the second phase, *Initiation* Training, the child was taught to initiate joint attention bids to the experimenter, including coordinated gaze shifting and protodeclarative pointing. Mastery of each behavior at 30% of opportunities for coordinated gaze shifting and 15% of opportunities for protodeclarative pointing was required before teaching the next behavior. Mastery criteria was based on behavioral observations of six typical children. This phase took roughly 2 weeks for each child. For a more complete description of the intervention, see Whalen and Schreibman (2003).

Assessments were administered at post-treatment and 3 months later for follow-up. Language and play probes (see below) were administered throughout baseline and treatment to assess collateral changes as the child progressed

Table 1 Participant characteristics at intake

Child	Chronological[a] age	Mental age[a] (Bayley)	Language age[a] (MacArthur CDI)	Autism severity (CARS)[b]	(GARS)[c]	Baseline length
Typical average	2–4 (1–7 to 2–10)	2–5 (1–9 to 3–1)	2–8 (1–8 to 3–4)	N/A	N/A	N/A
Carrie	4–0	1–7	1–4	31.5	90	2 weeks
David	4–3	1–4	1–4	31	90	4 weeks
Alex	4–1	1–4	1–4	32.5	105	6 weeks
Brandon	4–4	1–9	2–1	30	90	10 weeks

[a]In years-months

[b]Range of autism severity on the CARS: 15–29 = non-autistic, 30–36 = mildly moderately autistic, 37–60 = severely autistic

[c]Range probability of autism on the GARS: 90–110 = average probability of autism

Table 2 Performance on the unstructured Joint Attention Assessment, ECSC, Empathic Response Assessment, and Structured Play Assessment at pre-treatment, post-treatment, and follow-up

		Pre-treatment	Post-treatment	Follow-up
Social initiations	Typical average	15 (0–53)		
Unstructured Joint Attention Assessment[a]	Carrie	0	18	15
	David	0	6	5
	Alex	0	25	0
	Brandon	0	4	4
Positive affect	Typical average	22 (0–47)		
Unstructured Joint Attention Assessment[a]	Carrie	0	20	5
	David	0	20	10
	Alex	0	20	10
	Brandon	0	10	0
Social responding	Typical average	3 (3–3)		
Structured Joint Attention Assessment[b]	Carrie	3	3	3
	David	1	3	3
	Alex	2	3	3
	Brandon	3	3	3
Social initiations	Typical average	2.6 (2–3)		
Structured Joint Attention Assessment[b]	Carrie	2	3	2
	David	1	3	3
	Alex	1	3	3
	Brandon	2	3	2
Response	Typical average	2.8 (2–3)		
Empathic Response Assessment[c]	Carrie	3	2	1
	David	0	2	3
	Alex	1	3	3
	Brandon	1	2	2
Reaction	Typical average	2.3 (0–3)		
Empathic Response Assessment[c]	Carrie	3	3	3
	David	2	3	3
	Alex	2	3	3
	Brandon	2	3	3
Structured Play Assessment[d]	Typical average	85 (0–100)		
	Carrie	40	60	80
	David	0	60	60
	Alex	40	80	80
	Brandon	60	80	80

[a]Percent of intervals

[b]Scores range from 1 (basic actions directed toward experimenter (e.g. eye gaze, protest, etc.) to 3 (reciprocal exchanges such as turn-taking, following simple commands, etc.)

[c]Scores range from 0 (No Reaction) to 3 (Appropriate Reaction)

[d]Percent correct of functional and symbolic play with no prompting from experimenter

through the program. Social behaviors were scored during all sessions (including language and play probes).

Dependent measures

In our previous paper (Whalen & Schreibman, 2003), we presented data on changes in behaviors that were directly targeted during the joint attention intervention. These behaviors included joint attention responding and protodeclarative initiations. In the current study, we present changes in collateral behaviors which were not directly targeted during the joint attention intervention. These behaviors include social initiations, positive affect, empathic response, play, imitation, and language. Thus all dependent variables presented in this study are considered collateral behaviors.

Collateral changes in behavior were measured at pre-treatment, post-treatment, and at a 3-month follow-up on a variety of assessments. In addition, language and play probes were administered throughout baseline and treatment to assess collateral changes as the child progressed through the program. Six typically developing children (mean age = 2 years, 4 months) were also measured on all assessments and during a single language and play probe to establish developmental norms.

All assessments and language and play probes were administered by the first author and trained undergraduate research assistants. Assessments and language and play probes were videotaped and later coded by trained undergraduate research assistants. Interobserver reliability was collected and reported for 33% of all sessions and assessments. Kappa statistic was utilized to assess reliability. All kappa statistics were between .85 and 1.0 on all assessments. The advantage of using this statistic is that chance agreement is removed.

Assessments

(1) *Unstructured Joint Attention Assessment* (adapted from Loveland & Landry, 1986): The purpose of this assessment was to measure the child's ability to respond correctly to the protodeclarative joint attention bids of the researchers and to measure the child's unprompted joint attention behaviors (showing, pointing, supported, and coordinated joint attention). Assessment time was approximately 30-min for each child and involved playing with the child in a relatively unstructured setting (no table and chairs, no demands on the child, and free access to toys). Two researchers were present during the assessment. The first researcher played with the child and administered joint attention probes (e.g. pointed to a picture on the wall) while the second researcher recorded the child's responses (e.g. child looked at the picture or did not) and assisted the first researcher. Social initiations of the child and positive affect directed toward the experimenter were coded from the videotapes of the assessment to measure collateral changes in social behaviors using 10-s interval scoring.

(2) *Structured Joint Attention Assessment* (adapted from the Early Social Communication Scales; Mundy, Sigman, Ungerer, & Sherman, 1996; Siebert & Hogan, 1982): This measure is prevalent in the joint attention literature and is used to assess a variety of joint attention and social interaction behaviors in a structured, laboratory environment. Children were seated at a table facing the experimenter on the other side of the table in a room with pictures on the wall and toys on a bookshelf behind the experimenter. Each toy was presented one at a time to the child to determine if and how the child requested items and to assess social behaviors such as joint attention and turn-taking. In this study, social responding and social initiations were measured to assess collateral changes in social behaviors. This assessment was scored using similar criteria to that established in the literature, in which a child receives a 0 if he or she did not meet the minimum criteria for a 1, 1 for basic actions directed toward experimenter (e.g. eye gaze, protest, etc.), 2 for combining eye contact and gesture, using pointing, reaching, etc., and 3 for reciprocal exchanges such as turn-taking, following simple commands, etc. (Mundy et al., 1996; Siebert & Hogan, 1982).

(3) *Empathic Response* (Charman et al., 1997): The purpose of this assessment was to measure the child's empathic response toward an adult who pretended to have been injured by a toy hammer. The experimenter was not allowed to use any verbal cues but was required to rely on facial expressions and noises to convince the child that they had been injured. Data were recorded on whether or not the child discontinued playing with the hammer toy, whether or not the child looked at the experimenter, and whether or not the child appeared to be upset about the experimenter's ''injury.'' One point was given for each of these behaviors exhibited by the child (range one to three points). In addition, the child's reaction to the ''injury'' was scored as either concerned (three points), indifferent (two points), or positive affect (one point). All scores were based on a single trial.

(4) *Structured Play Assessment* (Charman et al., 1997): Functional and symbolic play were measured in this assessment. Children were presented with toys that had a functional purpose (such as a doll and a spoon where the child was expected to feed the doll with the spoon) and toys with a symbolic purpose (a doll and a block where the child was expected to pretend the block was food and was expected to feed it to the doll). The children were measured on their ability to engage in functional or symbolic play either on their own or with prompts from the experimenter. Percent correct with no prompting, with a verbal prompt, and with modeling was scored for all participants. Scores are reported as an average across four trials (two functional, two symbolic) for each child.

Language and play PRT probes

During baseline and treatment, 10-min probe sessions targeting either play or language were administered (weekly during baseline and every other week during treatment) for each child with autism. The purpose of these probes was to assess the collateral changes in play and language throughout the child's participation in the study. PRT was implemented during the play and language probe sessions. PRT is a research-based behavior modification procedure which enhances motivation by using naturalistic reinforcement, child-choice of tasks, turn-taking, reinforcement of attempted responses, and interspersing of maintenance tasks (i.e. mastered tasks) with acquisition tasks (i.e. tasks which have not been mastered) (Koegel et al., 1991).

The probe sessions were kept short (i.e. 10 min) in order to avoid treatment effects from language and play PRT. Although both language and play PRT have been shown to be effective (e.g. Koegel et al., 1987; Stahmer, 1999) in increasing language and play behaviors, no changes were expected with 10-min probes weekly and no child demonstrated increases in these behaviors during baseline (2–10 weeks). These probes assisted in differentiating developmental maturation and treatment effects (if any) in play and language (during baseline) from changes due to the acquisition of joint attention behaviors (during and following joint attention training). Language PRT sessions were coded for spontaneous speech and play PRT sessions coded for functional and symbolic play and imitation using 10-s interval scoring. All sessions were also coded for social initiations and positive affect directed toward the experimenter.

Results

Collateral changes in social behaviors

Social behaviors were assessed during the Unstructured Joint Attention Assessment, Structured Joint Attention Assessment, and Empathic Response Assessment (see Table 1), and the language and play PRT probes. On the Unstructured Joint Attention Assessment, none of the participants with autism exhibited any instances of social initiations or positive affect directed toward the experimenter at pre-treatment. However, all four participants showed increases in social initiations and positive affect at post-treatment with Carrie (18%) and Alex (25%) showing frequency of social initiations at or above levels of average of typical children (15%). Carrie (20%), David (20%), and Alex (20%) demonstrated positive affect at levels similar to typical children (average 22%). No dramatic changes in social initiations from post-treatment to follow-up were observed for Carrie, David, or Brandon but Alex had a significant decrease. All participants showed a decrease in their positive affect at follow-up.

On the Structured Joint Attention Assessment, all four participants with autism received a higher social initiation score at post-treatment (similar to average of typical children) than pre-treatment. Only two children (David and Alex) received higher social responding scores at post-treatment due to ceiling effects for Carrie and Brandon at pre-treatment. All four participants received the same score as typical children in social responding at post-treatment. Although Carrie and Brandon received higher scores at follow-up than baseline in social initiations, they both received a lower score at follow-up than at post-treatment. David and Alex showed no change from post-treatment to follow-up in their social responding or social initiations during the Structured Joint Attention Assessment.

On the Empathic Response Assessment, three of the children with autism exhibited an improvement on their empathic response and emotional reaction from pre-treatment to post-treatment David appeared indifferent (2-point reaction) to the experimenter at pre-treatment and showed a severe deficit in his empathic response compared to typical children. Following treatment, David showed improvement in his response and appeared concerned (3-point reaction) about the ''injury.'' Alex also showed a positive change in his empathic response score and in his reaction to the ''injury.'' Brandon demonstrated the same pattern as David and Alex by increasing his empathic response score and showing a more appropriate reaction to the ''injury.'' David, Alex, and Brandon maintained appropriate empathic responses at follow-up and all three showed concern at the experimenter's ''injury.'' Carrie showed no deficit in her response compared to typical children and appeared concerned about the experimenter's ''injury'' at pre-treatment. Although still showing concern (3-point reaction) toward the experimenter, Carrie's response score decreased at post-treatment and again at the 3-month follow-up.

Collateral changes in play and imitation

Changes in functional and symbolic play were assessed using the Structured Play Assessment and play PRT probes. On the Structured Play Assessment, improvement was observed for all participants from pre- to post-treatment with Alex and Brandon demonstrating scores similar to typical children at post-treatment. All four participants maintained their scores and Carrie increased to scores similar to typical children at follow-up.

On the play PRT probes, frequency of spontaneous imitation during PRT probes increased for all participants. Baseline averages for imitation ranged from 0% (Carrie and David) to 10% (Brandon and Alex) with an overall average of 3% for children with autism. At post-treatment, imitation increased to an average of 20% with all four children performing at about the same rate. Follow-up imitation rates dropped slightly for all four children with an average rate of 18%. No changes in the rate of functional or symbolic play were observed.

Collateral changes in language

Language changes were measured during language PRT probe sessions. Significant changes in language were not observed during baseline for any of the participants but all four participants showed increases in spontaneous speech by post-treatment and these skills were somewhat maintained at follow-up (See Fig. 1). Rates of spontaneous speech during baseline ranged from near 0% (David) up to 65% for one session for Brandon. The average rate of spontaneous speech for children with autism during baseline was 20%. All four children showed increases in their spontaneous speech with a post-treatment average of 55% ranging from 25% (David) to 80% (Brandon). Slight drops in spontaneous speech were observed at follow-up for all four children (See Fig. 1).

Discussion

Previous research has suggested a correlational link between joint attention skills and other social-communication skills in typically developing children and children with autism. This study offers additional support for the relationship between joint attention skills and the development of other social-communication behaviors in young children with autism. In addition, it suggests that joint attention is a particularly important treatment target because it can lead to changes in a variety of important skills without having to target them directly.

Collateral changes in social behaviors

Research suggests that joint attention is involved in the acquisition of more advanced social behaviors (Baron-Cohen, 1995). In this study, social initiations, positive affect, and empathic response were measured for the purpose of testing this possibility. Increases in social initiations were observed for all four participants completing the intervention in both structured and unstructured environments and differences were comparable to typical children. These data suggest that joint attention may be important for increasing social initiations. However, several studies have reported changes in social initiations by targeting it directly (e.g. Kamps et al., 1992) although few studies have reported collateral changes when targeting other behaviors.

Disturbances in affect have been considered an important factor in the study of autism since Kanner (1943) first described the disorder. Recent research has paid particular attention to positive affect in social situations (e.g. Bieberich & Morgan, 1998; Joseph & Tager-Flusberg, 1997). Smiling and positive affect toward another person may be interpreted as a type of social sharing (Kasari, Sigman, Mundy, & Yirmiya, 1990) and is considered to be an important factor for discriminating joint attention gestures from requesting behaviors. In the present study, increases in positive affect were observed in all participants and post-treatment responses resembled averages of typical children. These changes were unlikely due to developmental maturation since no positive changes were observed for any of the participants during baseline. In fact, all participants showed no positive affect (compared to 20% in typical children) prior to beginning the intervention even after 2–10 weeks in baseline. The collateral changes in positive affect suggest support for the theory posited by Kasari et al. (1990) that joint attention may be strongly associated with other social behaviors, such as positive affect.

Previous research has shown that children with autism demonstrate a profound deficit in empathic responses compared to typical children (Charman et al., 1997). In this study, positive changes were observed for all participants in their empathic response to a staged ''injury'' by the experimenter during toy play. Similar to positive affect, empathic responses require the ability to attend to the social cues of another person and to respond appropriately.

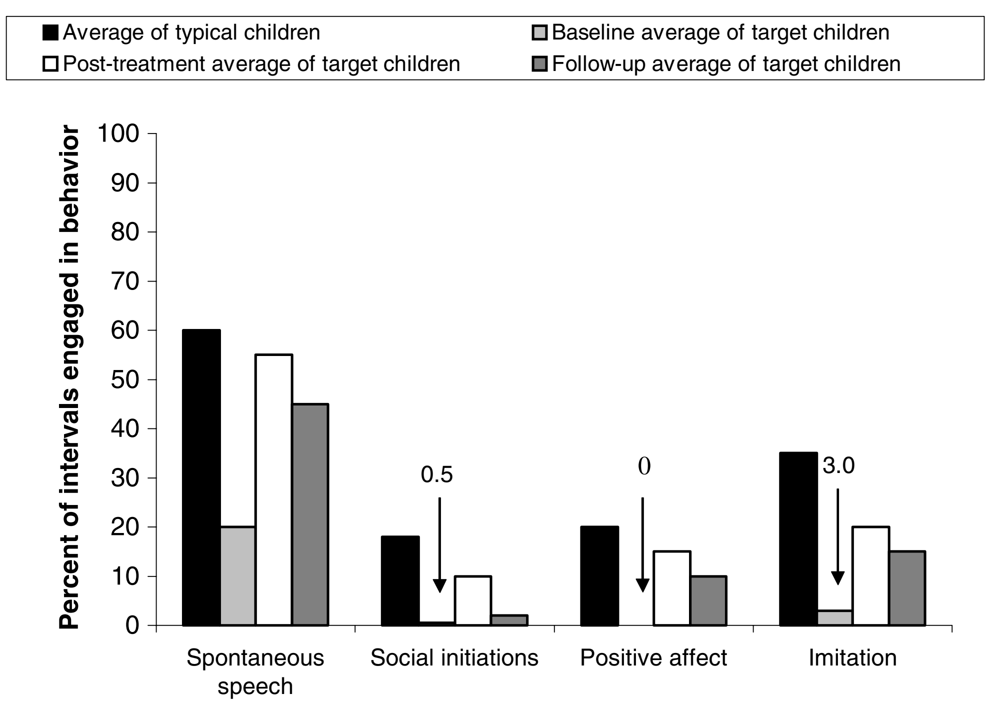

Fig. 1 Changes in spontaneous speech, social initiations, positive affect, and imitation during baseline, post-treatment, and 3-month follow-up. Average of six typical children are shown for each behavior as a reference for developmental norms

Teaching joint attention skills may enhance the comprehension of such social cues and thus may be important to the development of social responses such as positive affect and empathy.

Collateral changes in play and imitation

There is considerable evidence that children with autism are severely impaired in their symbolic and pretend play skills (e.g. Baron-Cohen, 1987) and many researchers believe that this deficit may be closely tied to joint attention deficits in children with autism (e.g. Mundy, Sigman, & Kasari, 1990). In this study, positive changes were observed in play during a structured assessment; however changes in spontaneous play skills were not observed during the play PRT probes. This finding may suggest that joint attention and play are not directly linked, or that different mechanisms underlie the other social-communication skills and play skills. For example, it is possible that changes in the reward value of the social context which occurred by teaching joint attention skills increased social, affective, and language behaviors, but changes in symbolic play skills require advances in representational skills. Another possibility may be that joint attention and symbolic play may be related, but that it takes longer for changes to emerge in spontaneous play skills than in other social-communication behaviors. The fact that improvements were seen on the Structured Play Assessment and in imitation on the play PRT probes lends some support to this theory. Perhaps given a longer time, these changes would begin to be evident in the children's *spontaneous* play.

Collateral changes in language

Although the relationship between joint attention and play is unclear, the significance of joint attention in the development of language is strongly established in the literature. In this study, substantial gains in spontaneous speech were observed for all four participants following the training of joint attention initiations and frequency of spontaneous speech resembled that of typical children. These data support the hypothesis that joint attention may be developmentally linked to language. Because baselines were administered for 2–10 weeks with no significant changes during this time, language gains were unlikely to be attributed to developmental maturation alone.

Conclusions and future research

The results from this research may contribute significantly to the study of joint attention, language, play, social development, and autism. First, this study was one of the first to begin to test the hypothesis that teaching joint attention may lead to gains in other skills. This was done by assessing collateral changes in language, play, and social behaviors following treatment. By using long baselines (2–10 weeks), this study was able to show that significant changes were unlikely to be attributed to developmental maturation alone and that collateral changes observed were likely to be attributed to the joint attention intervention. Although not conclusive, this suggests support for the hypothesis that joint attention is linked to the development of other behaviors.

Although this study has some important implications in the treatment of young children with autism, there were limitations. First, although this study offers evidence that teaching joint attention skills can lead to collateral changes in social-communicative behaviors in children with autism, it does not address what mechanism or mechanisms are responsible for these changes. For example, it is possible that teaching joint attention skills leads to an increase in social motivation, which in turn affects the development of other social-communication skills. Or, perhaps joint attention training leads to increased attention to social stimuli, making children more responsive to their social partner. It is also possible the joint attention training results in a specific set of cognitive skills which also affects the development of other behaviors. Additional research is needed to discern which mechanisms are responsible for the development of other social-communication behaviors.

Second, decreases in many of the collateral behaviors were observed from post-treatment to follow-up. Although this supports the notion that developmental maturation may not be sufficient for positive changes in language and certain social behaviors in children with autism, it also shows that just teaching joint attention may not be enough to maintain these positive changes. It will be critical for future researchers to design interventions in which positive changes are more likely to be maintained at follow-up (e.g. parent training).

Finally, due to the small sample sizes, the observed differences may not be representative of the population. Large group designs and longitudinal studies should be implemented which train joint attention and assess collateral changes over time. Future studies should also begin to look at why children with autism are so impaired in joint attention skills. Is this deficit related to an underlying attention deficit or social understanding deficit? What are the neurological correlates? These types of questions would help to unravel the mystery of whether or not there is a core deficit in autism and whether or not that core deficit might be joint attention or perhaps, a more general attention deficit.

Acknowledgements This research was funded in part from support by U.S. Public Health Grant No. MH39434 from the National Institute of Mental Health. This paper was also supported by a center grant from the National Institute of Mental Health No. U54MH066399, which is part of the NIH STAART Centers Program. We are grateful to all of the families who participated in this research. We also are appreciative of the undergraduate research assistants who helped in the implementation of this study.

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