

# The Effects of a Developmental, Social–Pragmatic Language Intervention on Rate of Expressive Language Production in Young Children With Autistic Spectrum Disorders

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Developmental, social–pragmatic (DSP) interventions are based on the study of interactions between typically developing infants and their mothers. Despite the fact that DSP approaches are firmly grounded in developmental theory, there is limited research on the efficacy of these interventions for promoting social-communicative behavior in young children with autism. This study used a single-subject, multiple-baseline design to examine the effectiveness of a DSP language intervention on three children with autistic spectrum disorders (ASD). Results indicate the children exhibited increases in their use of spontaneous speech with the therapist as well as with their parents, who had not been trained in the intervention. These findings provide preliminary support for the effectiveness of language therapy using a developmental, social–pragmatic approach with young children with ASD.

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The developmental, social–pragmatic model is a naturalistic strategy for teaching social-communication skills to young at-risk children and children with disabilities (Prizant, Wetherby, & Rydell, 2000). This model has also been referred to as the interactive model (Tannock & Girolametto, 1992) or the child-oriented approach (Fey, 1986). Included in this class of social-communication strategies are specific interventions such as the Hanen approach (Manolson, 1992; Sussman, 1999), the SCERTS model (Prizant, Wetherby, Rubin, & Laurent, 2003), the ECO model (MacDonald, 1989), the floor time/DIR model (Greenspan & Wieder, 1998), responsive interaction (Kaiser et al., 1996), and responsive teaching (Mahoney & Perales, 2003). The developmental,

social–pragmatic (DSP) model is derived from research on typical child development that indicates a relationship between caregivers' responsiveness and their child's level of social-communication development (Bornstein, Tamis-LeMonda, & Haynes, 1999; Hoff-Ginsberg & Shatz, 1982; Mahoney & Perales, 2003; Prizant et al., 2000). The DSP model is based on the theory that language develops within strong, affect-laden interactions between the child and the adult, and it emphasizes the function of the child's communication (i.e., requesting, protesting, sharing, commenting, etc.) over the form (i.e., eye gaze, gestures, vocalizations, facial expressions, body postures, language; Bates, 1976; Bates & MacWhinney, 1979; Prizant & Wetherby, 1998; Prizant et al., 2000).

DSP interventions share several common characteristics (Prizant et al., 2000). First, teaching follows the child's lead or interest; the adult engages in child-initiated interactions that are based on the child's interests and attention. Second, the adult arranges the environment to encourage initiations from the child. Common strategies include playful obstruction (i.e., briefly interrupting an activity the child is doing), sabotage (i.e., omitting necessary items needed for an activity), violating familiar routines (i.e., changing the way a child likes to do things), and in sight–out of reach (i.e., displaying desired items so that the child cannot access them himself).

Third, all communicative attempts, including unconventional (e.g., jargon, echolalia, hand leading, nonverbal protests) and preintentional (e.g., reaching and grabbing, eye gaze, crying, facial expressions, body postures) communication, are responded to as if they were purposeful. For exam-

ple, if a child led the adult by the hand to the refrigerator and looked at the milk, the adult would infer that the child wanted milk and give it to the child. Similarly, if a child began to cry or throw a toy during an interaction, the adult might infer that the child wanted the adult to stop what he or she was doing and would respond by discontinuing the offending behavior.

Fourth, emotional expressions and affect sharing are emphasized by the adult. The adult exaggerates his or her affective gestures and facial expressions and labels the child's emotional response. For example, if the child is having a tantrum, the adult might respond by making a "mad" face and saying "You're mad" to describe the child's emotion. Fifth, language and social input are adjusted to facilitate communicative growth. The adult uses simplified language around the child's attentional focus. Common indirect language stimulation strategies include vocal imitation, descriptive modeling, self-talk, parallel talk, and expansion.

DSP approaches share several common techniques with naturalistic behavioral interventions such as milieu teaching (Alpert & Kaiser, 1992; Kaiser, Yoder, & Keetz, 1992), incidental teaching (Hart & Risley, 1968; McGee, Krantz, Mason, & McClannahan, 1983), and pivotal response training (PRT; Koegel, O'Dell, & Koegel, 1987; Koegel et al., 1989), which also recognize that language emerges in a social context. The commonalities include an emphasis on teaching to the child's attentional focus, manipulating the environment to create opportunities for communication, and providing natural consequences for communication (Wilcox & Shannon, 1998).

There are several differences between DSP approaches and naturalistic behavioral approaches. First, many DSP approaches focus on increasing social interactions and general communication ability (e.g., turn-taking, initiations) and do not make a distinction between specific forms (e.g., eye gaze, gestures, vocalizations, facial expressions, body posture, language; Fey, 1986). For example, floor time/DIR emphasizes increasing *circles of communication*, which are defined as back-and-forth communication or engagement. In the Interdisciplinary Council on Developmental and Learning Disorders' (ICDL) *Clinical Practice Guidelines*, Greenspan and Wieder described the communication goals of floor time/DIR in the following way:

[If] a child moves his toy car and the partner moves another car parallel to it or says "Where are we going?" or "Can my dolly have a ride in your car?," the partner is opening a communication circle. If the child gestures or verbalizes in response, building on his behavior by saying "We go to the house!" or simply bangs his car into the partner's car while giving a knowing look, he is closing that circle of communication. Even when a child responds with a simple "No" or "Shh!" or by turning away, he is closing the circle of communication. The goal is to facilitate a continuous flow of circles in both unstructured and semistructured interaction. Sometimes these circles will involve only the simplest back-and-forth gestures, such as looking, smiling, or pointing. (ICDL, 2000, pp. 262–263)

In contrast, naturalistic behavioral interventions target specific communication forms (e.g., sign for "more," two-word phrases,

plural forms), although the adult may target multiple behaviors at a time (Kaiser et al., 1992).

Second, DSP approaches do not directly elicit the child's production of a response. In DSP approaches, the adult responds to all of the child's communicative attempts, including preintentional and nonconventional, as purposeful. For example, if a child reached or vocalized toward an object, the adult would respond by providing the desired item and modeling a more complex response. In contrast, in naturalistic behavioral procedures, the adult prompts the child for an elaborated response after the child makes an initial communicative attempt (Kaiser et al., 1992). Thus, if a child reached and vocalized toward an object, the adult might prompt the child to say the name of the item before delivering it.

Finally, although many detailed descriptions of this type of intervention approach have been published (e.g., Greenspan & Wieder, 1998; MacDonald, 1989; Mahoney & MacDonald, in press; Manolson, 1992), there is very limited controlled, empirical evidence supporting the use of DSP techniques for teaching language skills to young children with language difficulties. Research has shown that DSP techniques can lead to improvements in adult-child interactions (Girolametto, 1988; MacDonald, 1989; Mahoney & Perales, 2003); however, research has not yet conclusively established that DSP approaches positively influence child language behavior (for a review, see Tannock & Girolametto, 1992). In contrast, naturalistic behavioral approaches have a substantial body of research documenting their effectiveness at increasing language skills (e.g., Kaiser et al., 1992). Despite the lack of strong evidence to support the effectiveness of DSP interventions on child language use, there has continued to be strong support in the field for their use based on their theoretical foundations (e.g., Fey, 1986).

In response to criticisms that highly structured, behaviorally based programs may inhibit the spontaneous use of skills in children with autistic spectrum disorders (ASD), there has been an increased interest in approaches that target spontaneous communication. The National Research Council (2001) underscored this interest by making spontaneous functional communication its first educational priority for children with autism. DSP approaches purport to specifically target spontaneous functional communication; thus, research that can assess the effect of these approaches on spontaneous functional communication skills in children with autism is strongly warranted. The only study to examine the effectiveness of a DSP approach on the spontaneous communication skills of children with autism is a chart review reported by Greenspan and Wieder (1997). This review evaluated the outcomes of 200 children with autism or related symptomology whose parents were trained in floor time over a 2- to 8-year period. This review offers some promising results, indicating that 58% of children evidenced "very good outcomes," including engaging in "spontaneous communication at a preverbal and verbal level." However, there were no formal measures of child language. The methodological shortcomings inherent in a chart review

limit any conclusions regarding the effectiveness of a DSP approach for improving language skills in children with autism.

Many DSP approaches currently advocated for use with children with autism were designed to be used by parents to increase social-emotional functioning (e.g., Greenspan & Wieder, 1998; Mahoney & Perales, 2003) and communication skills (Manolson, 1992) in their children with special needs. As DSP approaches have become more popular in the treatment of children with ASD, they are increasingly being implemented by intervention providers themselves, rather than by a trained parent (e.g., Surfas, 2004). The increased interest in the use of DSP strategies by interventionists necessitates documenting the efficacy of this approach as used by professionals.

In summary, controlled studies that support the effectiveness of DSP approaches for promoting language skills in children with language or developmental delays are lacking. Given the wide appeal of DSP approaches for use with young children with language impairments, it is important to empirically evaluate the efficacy of this approach. It is especially necessary to evaluate the efficacy of this approach for children with autism, as it has been suggested that this type of intervention may be least effective for children who exhibit unresponsive or passive interaction styles (Fey, 1986; Tannock & Girolametto, 1992), which are commonly seen in children with autism. This study examines whether a DSP approach increases the rate of expressive language with a therapist in young children with ASD and whether these skills generalize to interactions with the children's parents.

## Method

### Participants

Three boys with ASD participated in this study. The children were diagnosed with an autistic spectrum disorder by an outside professional using criteria from the *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition—Text Revision (DSM-IV-TR)*; American Psychiatric Association, 2000). The *Autism Diagnostic Interview—Research (ADI-R)*; Lord, Rutter, & Le Couteur, 1994) was also administered to the caregivers. On this assessment, two children met criteria for autistic disorder and the third met criteria for pervasive developmental disorder—not otherwise specified (PDD-NOS). All participants were administered the standardized language assessment by a speech-language pathologist associated with this project (see Table 1 for participant characteristics). Jack and David were administered a developmental assessment by a clinical psychologist associated with this project. Paul had just received a developmental evaluation from his school district's school psychologist, so his score on that assessment was used. Participants were recruited from a waiting list for speech-language therapy services at a center specializing in intervention for young children with communication disorders.

Jack was 3 years 10 months old and had a diagnosis of autistic disorder. At intake, Jack's language was largely scripted, consisting primarily of immediate and delayed echolalia. His spontaneous speech consisted mainly of three- and four-word phrases to request desired items and activities. Jack and his older brother lived with their mother, who worked part-time and was on public assistance. During his participation in this study, Jack did not receive any additional services; on completion, he was enrolled in the public early intervention program. Jack's mother participated in the generalization sessions. She was unable to be contacted for the 1-month follow-up observation. She chose not to observe the baseline or treatment sessions.

David was 2 years 6 months old and had a diagnosis of autistic disorder. At intake, he would periodically imitate single words and spontaneously label objects in his environment with word approximations; however, his language was rarely directed toward others. David lived with his mother and father. His mother was employed as a lawyer and his father stayed at home to raise David. David received early intervention services throughout this study, which involved a 2-hr home visit twice a month. David's father participated in the generalization sessions and chose to observe all sessions.

Paul was 2 years 8 months old and had a diagnosis of PDD-NOS. Paul used primarily single words to request and label items. He lived with his mother and father and older brother. His mother worked part-time as a social worker and his father recently had been laid off from a position in the computer industry. Throughout this study, Paul received early intervention services that consisted of 6 hr in a group setting and 1 hr in a one-to-one setting per week. Paul's father participated in the generalization sessions. He was unable to participate in the follow-up observation with Paul because he began a new job during the 1-month break. Paul's father chose to observe all of the baseline and treatment sessions.

Like many DSP interventions, no specific language targets were identified for any of the children in this study. Rather, the therapist focused on increasing social interactions and general communication ability (e.g., turn-taking, initiations) with all of the participants.

TABLE 1  
Participant Characteristics at Intake

Child	Chronological age	Mental age	Expressive language age <sup>a</sup>	Diagnosis <sup>b</sup>
Jack	46 mos.	25 mos. <sup>c</sup>	15 mos.	Autism
David	30 mos.	19 mos. <sup>c</sup>	12 mos.	Autism
Paul	32 mos.	22 mos. <sup>d</sup>	14 mos.	PDD-NOS

<sup>a</sup>Preschool Language Scales-3 (Zimmerman, Steiner, & Pond, 1992). <sup>b</sup>Autism Diagnostic Inventory-R (Lord, Rutter, & Le Couteur, 1994). <sup>c</sup>Bayley Scales of Infant Development (Bayley, 1993). <sup>d</sup>Brigance Inventory of Early Development-Revised (Brigance, 1991).

## Therapist Training

All therapy was conducted by the second author. The therapist was a board-certified speech–language pathologist who had more than 7 years of experience working with young children with ASD. The therapist had received training in several DSP approaches over the course of her graduate training and received 48 hr of training and supervision in floor time/DIR through the ICDL, the national organization that provides training and supervision in these techniques. Training included an initial workshop and attendance at the DIR certificate program’s summer workshop. Supervision was conducted via 1-hr phone consultations in which the therapist received feedback from an ICDL-certified supervisor. Feedback was based on videotaped sessions of the therapist implementing floor time/DIR. The therapist received feedback on videotapes with other clients as well as with the children participating in this study.

## Setting and Materials

All baseline, treatment, and generalization sessions were conducted in a small treatment room at a center specializing in speech–language therapy. The structured observations were conducted in a larger treatment room containing a small table, cabinets, and reclining chair. Each room had a one-way mirror through which the assessments and treatment were filmed. Developmentally appropriate toys for each session were chosen based on the child’s preference. Toys included pretend food, balls, balloons, cars, books, ball chutes, trains, puppets, figurines, pom-poms, blocks, and so forth. In each session, several toys were made accessible to the child, while other toys were kept in a small cabinet and on a shelf in the child’s view. The child could request the items that were not accessible at any time.

## Experimental Design and Procedure

A single-subject, multiple-baseline design was conducted across participants (Hersen & Barlow, 1976). Participants attended the center 2 days per week for 50-min sessions throughout baseline and treatment. Baseline lengths were chosen a priori and were 2, 4, and 6 weeks. Participants were randomly assigned to the different baselines, after which all participants received 10 weeks of language therapy using a DSP approach.

**Baseline.** Baseline sessions consisted of free play with a therapist. During baseline, the therapist sat facing the child and attended to the child’s play. Every 30 s, on average, the therapist made a verbal or nonverbal initiation to the child. For verbal initiations, the therapist asked the child a question related to the activity in which the child was engaged. For example, if the child was pushing a car, the therapist might ask, “What color is your car?” For nonverbal initiations, the ther-

apist modeled an action with a toy with which the child was engaged. For example, if the child was pushing a car, the therapist might model placing a “driver” in the car. The child was not required to respond to these initiations. The therapist complied with requests and acknowledged comments made by the child; however, she did not attempt to engage the child in additional interactions.

**Treatment.** The DSP intervention used in this study was adapted from published material on several well-known DSP approaches including floor time/DIR (Greenspan & Wieder, 1998), Hanen (Manolson, 1992), the SCERTS model (Prizant et al., 2000), and responsive teaching (Mahoney & Perales, 2003). Several main treatment components were selected for this intervention, including (a) following the child’s lead, (b) setting up the environment to evoke initiations from the child, (c) treating all of the child’s communicative attempts as purposeful, (d) emphasizing appropriate affect, and (e) using indirect language stimulation techniques. If the children engaged in challenging behavior such as throwing toys, the therapist acknowledged their emotion (e.g., “I see you are mad”) and redirected the child to another activity. Very few challenging behaviors occurred during baseline or treatment, and all children responded to redirection.

The following is an example of how the intervention components worked together. The therapist might place several preferred toys on the ground and other preferred toys on a shelf in the child’s view and then wait to see which toys he approached. The therapist would then follow his lead to that toy. For example, if the child started to push a car, the therapist might pick up another car and imitate his play, driving her car behind his. In an attempt to evoke communication, the therapist might drive her car in front of the child’s to block his path. If the child attempted to move her hand so that he could continue driving, the therapist would respond to this communicative attempt by moving her car and modeling a more sophisticated response, “Move car.” If the therapist did not move fast enough and the child expressed negative emotion, such as yelling, the therapist would acknowledge his frustration by emphasizing appropriate affect (“You’re mad”). Throughout the interaction, the therapist would use indirect language stimulation to describe the child’s play (e.g., “Push the car. Push. Push car. Push the car”).

**Generalization.** Once a week throughout baseline and treatment, generalization was assessed by observing each child during a 10-min free play session with his parent. Parents were instructed to “play with your child as you do at home” and were not explicitly trained in the intervention techniques. The toys made available during the generalization sessions were the same as those used during baseline and treatment. Follow-up visits were conducted 1 month after the conclusion of treatment, during which time the child participated in the structured observation with the therapist and parent.

## Fidelity of Implementation

Fidelity of implementation was developed from published material on DSP interventions as well as videotapes of treatment sessions used by the therapist for individual supervision with a member of the ICDL. Fidelity was collected on five intervention strategies using a 5-point rating scale (see the Appendix). Overall fidelity was determined by averaging the scores obtained on each intervention strategy for each observation. Fidelity of implementation was considered to have been achieved if the average fidelity rating for each observation was at least a 4 out of 5 (80% correct) across all observations.

Fidelity of implementation was collected on 10% of the therapist's treatment sessions and all of the structured observations (see later sections). The therapist met fidelity on all sessions observed, with an overall average fidelity rating of 4.5 (range = 4.2–4.8). To determine whether the parents learned the intervention techniques through observation, fidelity of implementation was collected for each parent during the last baseline session, midway through treatment, and at the final treatment session, as well as during all of the structured observations with the parent. Jack's mother received an average fidelity rating of 3.0 (range = 2.4–3.8). David's father received an average fidelity rating of 3.3 (range = 2.6–3.6). Paul's father received an average fidelity rating of 3.1 (range = 2.8–3.6). The parents did not meet fidelity at any point in treatment and did not improve in their implementation of the intervention over the course of treatment.

## Dependent Measures

Child outcome was determined by changes in rate of spontaneous language use during daily sessions. The first 10 min of all baseline, treatment, and generalization sessions were videotaped and scored for spontaneous language in 30-s intervals (see Table 2).

In addition, structured observations were administered at pretreatment, posttreatment, and follow-up to determine skill generalization and maintenance. The structured observation was adapted from the *Functional Emotional Assessment Scale* protocol (Greenspan, DeGangi, & Wieder, 2001) and was videotaped and scored for total appropriate language in 30-s intervals. In this assessment, the child was observed for 15 min with the therapist or parent with three different sets of toys: symbolic, sensory, and gross motor. Each set of toys was presented for 5 min in the same order. The symbolic toys included plates and utensils, pretend food, cash register, phone, baby, and stroller. The sensory toys included toys that provided sensory stimulation, such as stretchy snakes and frogs, koosh balls, balls that made sounds, a furry blanket, and music toys. The gross motor toys included a large therapy ball and a scooter. Toys used in structured observation were not used during treatment.

## Observer Training and Interobserver Agreement

Videotapes were scored by naive observers (undergraduate research assistants who were unaware of participants' point in treatment) trained to 80% accuracy across three practice tapes. Interobserver reliability was obtained for 25% of the videotaped observations using kappa. Reliability was determined using overall agreements/disagreements for each 30-s interval summed across observations, and yielded a kappa coefficient of .61 for spontaneous language and .60 for appropriate language. These kappa values indicate good agreement.

## Results

### Session Data

During baseline, all children exhibited relatively low rates of spontaneous language with the therapist. Jack exhibited the most language ( $M = 25$ , range = 0–40), Paul exhibited intermediate rates ( $M = 14.3$ , range = 0–40), and David exhibited no language ( $M = 0$ ). These rates remained stable throughout baseline for David and Paul, suggesting that maturation and exposure to the treatment setting, therapist, and toys did not affect their rates of spontaneous language. Jack's rate of spontaneous language increased over the course of baseline, suggesting that he had improvements in his use of language with the therapist before treatment was implemented, which limits the conclusions that can be drawn from his data. During treatment, Jack ( $M = 60.6$ , range = 11–90), David ( $M = 8.1$ , range = 0–20), and Paul ( $M = 53.6$ , range = 0–90) all exhib-

**TABLE 2**  
Behavioral Definitions for Dependent Measures

Measure	Definition
Spontaneous language	The child uses appropriate language that is not evoked by a prompt or cue. The child may spontaneously label his or her play with a verbal marker or request an activity or item as long as the adult does not cue the child by holding up the item, blocking the child's play, or asking the child a direct question. Delayed echolalia used in context and pronominal reversals are included as long as the language is directed at a communicative partner.
Total appropriate language	The child uses any form of appropriate language. Includes verbal imitation, cued language, and spontaneous language. All language must be used in context.

ited increases in their use of spontaneous language with the therapist.

Generalization sessions with the participants' parents also show evidence of increased rates of language for two children consistent with the onset of treatment, although the improvements were less dramatic than with the therapist. During baseline, both Jack ( $M = 12$ , range = 8–16) and David ( $M = 0$ ) exhibited limited language with their parent. For David, this performance was similar to his performance with the therapist during baseline, whereas Jack used less language with his mother than he did with the therapist. After treatment was begun, both Jack ( $M = 25$ , range = 0–66) and David ( $M = 10.4$ , range = 0–27) showed increases in their spontaneous language with their parent. Paul exhibited an ascending trend in his rate of language with his parent during baseline ( $M =$

25.3, range = 10–35) that continued into treatment ( $M = 38.3$ , range = 16–56), thus limiting any strong interpretation of these data (see Figure 1).

### Performance on the Structured Observation

The structured observation indicates that the participants exhibited an increase in their rate of appropriate language with the therapist and parent from pretreatment to posttreatment (see Table 3). Follow-up data on the structured observation were available for two of the children 1 month after the end of treatment. Both children continued to exhibit higher rates of appropriate language on the structured observation with the therapist, and their language use was higher than at post-treatment.

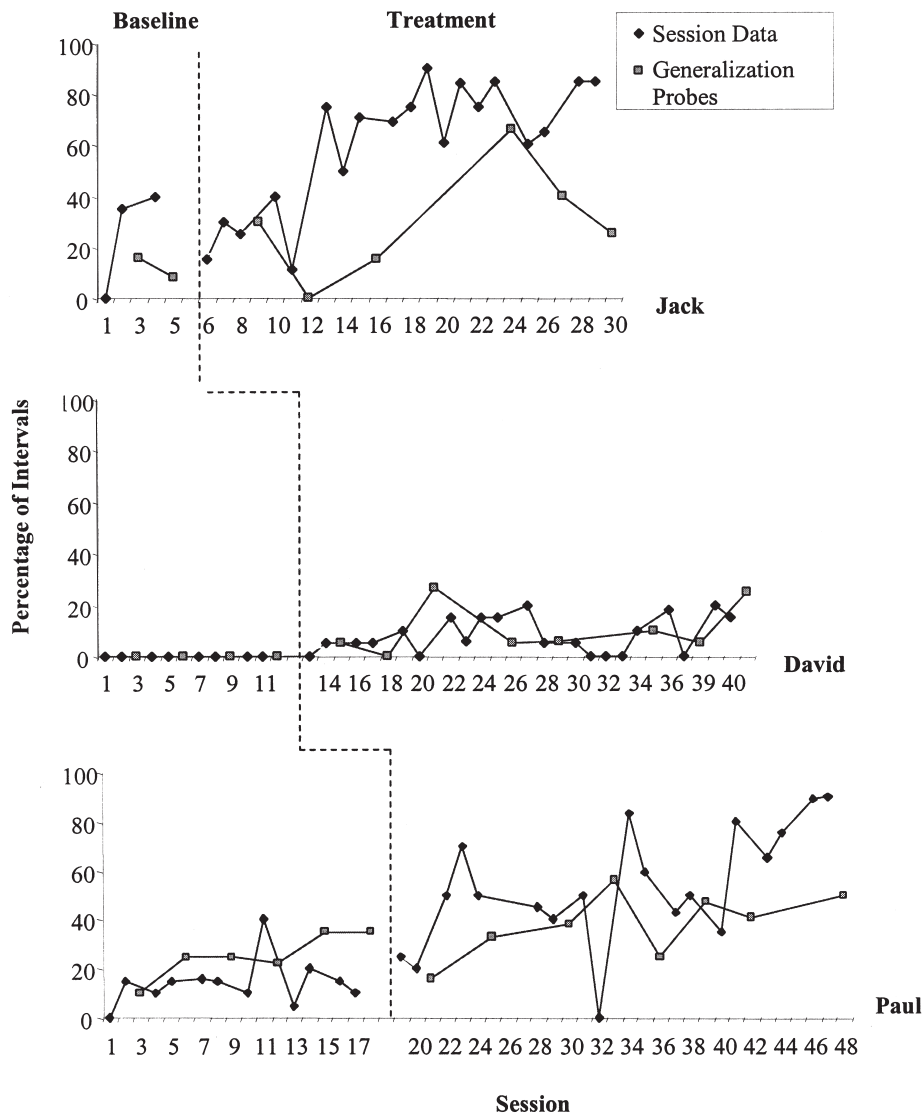


FIGURE 1. Percentage of spontaneous expressive language used with the therapist during sessions and with the caregiver during generalization probes.

One child participated in a follow-up structured observation with his parent. On this measure, David exhibited less language than during posttreatment; however, his rate of appropriate language use was greater than it was with his parent during pretreatment.

## Discussion

These results provide support for the effectiveness of a DSP language intervention for young children with ASD. In this study, two of the children had gains in their use of spontaneous language with the therapist that began at the onset of treatment. These gains generalized to a novel treatment setting and toys, as measured by the structured observation and maintained over a 1-month delay. The third child, Jack, also exhibited gains in his rate of spontaneous language during treatment as well as improvement on the structured observation from pre- to posttreatment. However, due to his ascending baseline, it is unknown whether gains in his language skills were a result of the intervention, maturation, or some other factor.

It is especially exciting that David, the nonverbal child, made gains in his use of language using this approach. Several researchers have suggested that children with autism who are nonverbal may require a more structured approach to learn prerequisite skills such as verbal imitation prior to receiving a less structured approach (e.g., Greenspan & Wieder, 1998). The nonverbal child in this study made gains in spontaneous language, which suggests that DSP interventions may be appropriate for nonverbal children with ASD.

Two of the children also exhibited increases in their rate of language with their parents during the generalization sessions at the onset of treatment. This finding is especially important given the extreme deficits in generalization that children with ASD often exhibit (e.g., National Research Council, 2001). Interestingly, although we were unable to demonstrate experimental control for Jack with the therapist, the generalization data suggest that his rate of language with his parent did not increase until the onset of the intervention. In contrast, Paul did not show an increased rate of language use with his parent during treatment beyond the rate of his already ascending baseline. This finding is surprising given that Paul exhibited more language with his parent during baseline than the other children. Our fidelity measure indicated that Paul's father was not using the DSP strategies any more proficiently than the other parents at any point during treatment; however, it is possible that the interaction style he was using with his son was facilitative. The gradual change over baseline into treatment may have been a result of the father's use of other, non-DSP strategies, such as direct elicitation, which masked the effect of the DSP intervention. It is likely that the children would have generalized their use of language skills with their parents more if their parents had also been trained to implement the intervention, a position supported by research on other language

**TABLE 3**  
Percentage of Intervals of Total Appropriate Expressive Language Used During the Structured Observation With the Therapist and Caregiver During Pretreatment, Posttreatment, and Follow-up

Child	Therapist			Caregiver		
	Pre	Post	Follow-up	Pre	Post	Follow-up
Jack	19	77	— <sup>a</sup>	20	30	— <sup>a</sup>
David	8	20	44	6	17	10
Paul	30	70	75	26	55	— <sup>b</sup>

<sup>a</sup>Child did not return for follow-up. <sup>b</sup>Parent did not return for follow-up.

interventions (e.g., Koegel, Schreibman, Britten, Burke, & O'Neill, 1982).

One potential limitation of the generalization data in this study is the fact that two of the children's parents, David's and Paul's fathers, chose to observe the sessions. It is possible that these two parents learned the treatment strategies through observation of the intervention sessions, thus limiting the generalization findings. However, we find this possibility unlikely for two reasons. First, Jack's mother did not observe the intervention, yet Jack demonstrated a substantial increase in his rate of spontaneous language with her. Second, we conducted fidelity of implementation on the parents during the structured observations and the generalization sessions that occurred during baseline and intervention and found that the parents did not meet fidelity for the intervention at any point during the study. These findings are not surprising given that research on milieu teaching, a related approach, has shown that parents did not meet fidelity of implementation until after they had received extensive practice and feedback (Kaiser, Hemmeter, Ostrosky, Alpert, & Hancock, 1995).

A second limitation is that we were unable to obtain 1-month follow-up data for Jack. We were also unable to obtain follow-up data with the parent for Paul because his father started a new job. This difficulty limits the conclusions that can be drawn on the maintenance of the acquired skills using this approach. However, the follow-up data we do have suggest that two of the children continued to use language at higher-than-baseline (and posttreatment) rates after 1 month posttreatment with the therapist. David showed rates higher than baseline but lower than posttreatment with his father, suggesting that language increases maintained over 1 month but were more robust with the therapist than with the parent. Again, parent training may have improved the maintenance of the children's communication behavior.

A third limitation is that we did not measure generalization of skills to the child's natural environment (i.e., home); thus, it is unknown whether the changes in the children's language were robust or limited to the treatment environment. Future studies will need to examine the generalization of lan-

guage skills to the natural environment to determine the effect of the intervention on children's functional use of language.

A strength of this study is that it examines meaningful outcomes by assessing the use of spontaneous functional communication, as recommended by the National Research Council (2001). On the other hand, our data do not provide evidence for changes in the children's overall language development in terms of complexity, function, or uniqueness of meaning. Given the heavy focus of DSP approaches on communicative functions, future studies that examine changes in communicative functions (i.e., requesting, protesting, commenting, and sharing) and the use of a broader range of language and social-communicative measures would provide a richer understanding of the intervention's effects.

A valid criticism of much early intervention research is the lack of procedural fidelity. DSP approaches are particularly vulnerable to this criticism, as their individual intervention components have traditionally been less well defined than those of behavioral interventions. Therefore, a strength of this research is the use of a clearly defined measure of fidelity of implementation. Our fidelity measure ensures that our intervention was implemented as designed and provides a model for ways in which the implementation of other DSP interventions can be measured.

Several differences are noted between the DSP intervention provided in this study and how other DSP approaches are often described. First, our intervention was implemented for a small number of hours (90 min per week) over 10 weeks. Other DSP approaches advocate that the intervention be implemented much more intensively over a longer period of time. For example, Greenspan and Wieder (1998) recommended providing up to eight 20-min sessions of floor time per day for several years. Our results suggest that language changes can be observed in young children with ASD with as little as 15 hr of treatment using a DSP approach, a much smaller amount of intervention than traditionally thought necessary (e.g., Greenspan & Wieder, 1998). We anticipate that greater gains in language would be made with more hours of intervention.

Second, the intervention was provided by a speech-language pathologist in a clinic setting rather than by the children's parents in the natural environment. We chose to evaluate the effectiveness of this technique with a speech-language pathologist because the increased interest in the use of DSP strategies by interventionists necessitates documenting the efficacy of this approach as used by professionals. This difference may have inadvertently increased the effectiveness of the intervention over the parent-implemented models reviewed by Tannock and Girolametto (1992), as the therapist's previous experiences may have influenced her use of intervention strategies. Our fidelity of implementation attempted to control for this possibility, but small yet significant differences in the implementation of the intervention cannot be ruled out.

As is the case with many comprehensive interventions, it is unknown which specific components were necessary to pro-

duce the observed changes. In addition, it is unknown how these DSP strategies compare with naturalistic behavioral interventions in terms of child outcomes. Perhaps the most significant difference between DSP and naturalistic behavioral approaches is the lack of direct elicitation of child communication in the former. Our data suggest that direct elicitation is unnecessary for changes in rates of language production to occur. It is possible that direct elicitation may actually inhibit the development of spontaneous, functional language. Conversely, it is possible that with direct elicitation, changes in the children's rate of spontaneous communication would have been far greater.

It is also possible that one intervention may be more effective than the other, depending on the pretreatment language age of the child. For example, Yoder et al. (1995) found that children at lower language levels responded better to milieu teaching, a naturalistic behavioral intervention, whereas children at higher language levels responded better to responsive interaction, a DSP intervention. Our data indicate that the two children who achieved the highest rates of expressive language by the end of treatment also had higher expressive language ages at pretreatment, lending some support to this possibility. Research that can address the effectiveness of individual strategies as well as directly compare DSP with naturalistic behavioral approaches for children of varying language levels will provide a better understanding of which techniques produce the best outcomes for which children.

In conclusion, this study offers preliminary support for a DSP approach as a therapist-implemented language intervention for young children with autistic spectrum disorders. Clearly, additional studies involving more participants that represent a wider range of ages and abilities are needed to further validate the efficacy of this approach.

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#### AUTHORS' NOTES

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## APPENDIX

### Fidelity of Implementation Measure

#### 1. Does the adult follow the child's lead? 1 2 3 4 5

- 1 = Adult does not imitate the child, assist the child with his play, or follow the child's lead with activities. Adult directs activities or does not respond to child's interests.
- 3 = Adult follows the child's lead but often misses opportunities or tries to direct the child's activities.
- 5 = Adult engages in whatever activity the child expresses interest in and attempts to make all activities interesting for the child by imitating the child or assisting the child with play.

#### 2. Does the adult appropriately evoke communication? 1 2 3 4 5

- 1 = Adult does not attempt to get the child to communicate.
- 3 = Adult attempts to get the child to communicate but does not often create opportunities by manipulating the environment.
- 5 = Adult attempts to evoke communication throughout the session by using playful obstruction, sabotage, undoing approach, in sight-out of reach, and other environmental arrangements.

#### 3. Does the adult treat the child's actions as purposeful? 1 2 3 4 5

- 1 = Adult does not respond to the child's actions or treat the child's actions as intentional. Adult does not map appropriate language onto child's actions.
- 3 = Adult responds to some initiations but misses several opportunities. Adult maps appropriate language onto some of the child's actions but misses several opportunities.
- 5 = Adult responds to all initiations, including unconventional and preintentional (such as reaching or grabbing), as if they are intentional. The adult maps appropriate language onto all of the child's actions.

#### 4. Does the adult emphasize the appropriate affect? 1 2 3 4 5

- 1 = Adult does not modulate his or her own affect in accordance with the affect displayed by the child.
- 3 = Adult modulates his or her affect in accordance with the child about half the time but at other times seems unresponsive to or misinterprets the child's affect.
- 5 = Adult modulates his or her own affect in accordance with the affect displayed by the child. Positive affect is shown in parallel and negative affect is responded to with empathy, sympathy, etc.

#### 5. Does the adult use indirect language stimulation? 1 2 3 4 5

- 1 = Adult does not simplify language around the child's attentional focus. Language is either not used by the adult or is not related to the child's actions or attention.
- 3 = Adult uses simplified language around the child's attentional focus during some activities (50% or less) but not during others and misses several opportunities.
- 5 = Adult uses simplified language around the child's attentional focus, including vocal imitation, descriptive modeling, self-talk, parallel talk, and expansion. This accounts for more than 50% of the adult's language during the session.

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