Inclusive Programming for Toddlers with Autism Spectrum Disorders:

Outcomes From the Children's Toddler School

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Abstract: The passage of the Individuals with Disabilities Education Act of 1990 mandated the provision of interventions for young children with autism spectrum disorders (ASD) under the age of 3 years. Although Strain, McGee, and Kohler (2001) suggested that children with autism benefit from inclusive programming, inclusive early intervention programs are rare. In the current study, the authors used a quasi-experimental design to analyze the outcomes for 20 young children with ASD in an inclusive program for children under age 3. Both outcomes on standardized assessments and functional outcomes were compared at program entry and exit. Significant increases in standard scores were found for the standardized assessments from intake to exit, with 37% of the children functioning in the typical range at exit, compared to 11% at entry. Significant improvements in performance on functional measures were also seen. At intake, 50% of the study participants had no functional communication skills, whereas at exit, 90% used a functional communication system. Social and play behaviors also increased substantially. Use of augmentative communication systems and a combination of research-based programming are discussed.

Researchers and educators typically agree that children with autism spectrum disorders (ASD) benefit from early identification and intervention services (National Research Council, 2001; Rapin, 1997; Rogers, 1996; Strain, Wolery, & Izeman, 1998). Beyond that, disagreement arises on a variety of levels, with one of the most important being the appropriate setting for early intervention (e.g., in-home or inclusion programming). Although most intervention researchers recognize the importance of social integration for children with disabilities, and more specifically, children with autism, there is little consensus as to at what point in the intervention it should occur. Some researchers would argue that in cases of autism, inclusion is appropriate for older children or children who are higher functioning but not for preschoolers who may not be "behaviorally ready" to benefit from an inclusion environment (Strain, McGee, & Kohler, 2001). Other researchers have suggested that preschoolers with autism will not be given appropriate services in inclusion settings or may be socially rejected by their peers (e.g., Lowenthal, 1999). Programs supporting this philosophy typically advocate a period of individualized and small-group instruction prior to placement in an inclusive setting (S. R. Anderson & Romanczyk, 1999; Harris & Handleman, 1994) in order to work on these prerequisite skills.

Strain and colleagues (2001) emphasized the fact that although the commonly held assumption of behavioral readiness greatly influences early intervention programming for young children with autism, there are no data to support this claim. For two inclusive preschool programs—the Walden Preschool (McGee, Daly, & Jacobs, 1994; McGee, Morrier, & Daly, 2000) and the LEAP program (Strain & Cordisco, 1994)—excellent child progress has been documented, and the majority of children (ages 3 years–5 years) who exit these programs have functional verbal communication skills and are mainstreamed into typical school environments.

As the debate over best practices regarding inclusion for preschoolers with autism has continued, the issue of inclusive programming has arisen. Until recently, services for toddlers with autism have been limited; however, an increase in the number being identified early has reinforced

the need for appropriate toddler services in the area of autism. It may be assumed that if children with autism benefit from inclusion in the preschool years, inclusion during the toddler years may also increase social and language behaviors. One inclusive program for toddlers with autism, the Toddler Center of the Walden Early Childhood Program, has demonstrated excellent child outcomes in both language and social behaviors, with 82% of children with autism using spoken words at program exit and 71% exhibiting an increase in proximity to other children from entry to exit (McGee, Morrier, & Daly, 1999). These preliminary outcomes are very impressive, which makes replication of such results very important.

Unfortunately, data on changes in children's standardized assessment scores after program participation have not been provided, thus complicating comparisons across early intervention studies using both inclusion and one-to-one treatments (S. R. Anderson, Avery, DiPietro, Edwards, & Christian, 1987; McEachin, Smith, & Lovaas, 1993). Changes in the quality of language, social, and play behaviors and developmental level also were not addressed. More information on child outcomes is needed before we can definitely assert that inclusion is an effective method for improving basic cognitive, communication, and social skills in toddlers with autism. Such research will bring researchers one step closer to comparing outcomes across programs.

The Children's Toddler School (CTS) Program began as a partial replication of the Walden Toddler Program (for complete descriptions of the program, see McGee et al., 2000; McGee et al., 1999). The partial replication was funded through the federal Office of Special Education Programming and included extensive training in incidental teaching, assistance in program start-up, and adoption of numerous curriculum and program features. The CTS program continues to use many of the Walden Toddler Program features, for example, the activity schedule and goals, home visitation program, teacher training in incidental teaching, and educational curriculum. During the first year, however, significant changes were made to meet the needs of families in the community served by the program.

The CTS program differs from the original Walden Toddler Program format in four main ways. One key difference is the use of "zones" and teacher rotation. The Walden Toddler classroom is divided into multiple zones. One teacher is in charge of a zone, each of which has a different focus, such as free play, diapering, snack, and special activity. The teacher stays in each zone for 15 minutes and then rotates to a new zone. The purpose is to maximize opportunities for incidental teaching (as children move around, initiating for desired toys and activities) and to prevent problem behaviors that often occur when children are required to wait to participate in large-group transitions and to go to activities not of their choosing (LeLaurin & Risley, 1972). The CTS classroom is not divided into zones, and the teachers do not rotate. This deviation was made to facilitate replication of the program by typical area preschools. One of the CTS program goals is to transition children from CTS to typical preschools in the community and to use the toddler program as a teacher training ground for inclusion. The program therefore operates as much like a typical preschool as possible. The use of zones, although effective, makes it difficult for typical preschool teachers to envision using any part of the model in their own program.

A second difference between the two programs is the provision of one-to-one sessions in a separate room at CTS. The Walden program does provide one-to-one instruction to the children with ASD, but it is conducted in the classroom. CTS instructors posit that conducting one-to-one sessions in a separate room while typically developing children nap (a) provides more attention to the one-to-one programming; (b) offers a quieter, more structured environment; and (c) addresses some practical issues concerning the provision of this service. Parents have reported greater satisfaction with this type of one-to-one programming than with one-to-one in the classroom because they are better able to observe the specific skills upon which their child is working. In addition, teachers are able to incorporate structured teaching techniques with the former.

Another important difference is in the use of multiple treatment strategies. The Walden model uses incidental teaching as its sole intervention method. McGee et al. (1999) advocated the use of one treatment strategy because of the possibility that multiple treatments may confuse the children. These authors take the position that "the 'more is better' tenet applies to hours of intervention and not to various methods of intervention" (McGee et al., 1999, p. 144). Some researchers have suggested that an individual child may respond better to one treatment than to another. Current research has lent support to this claim (Anderson, 2002; A. E. Anderson & Schreibman, 1999; Ingersoll, Schreibman, & Stahmer, 2001; Rogers, 1996; Sherer, 2002; Sherer & Schreibman, 1999). As a result, the philosophy of CTS is that the use of several evidence-based teaching techniques that are varied in level of structure can enhance the outcomes for an individual child. For example, one child who has particular difficulties engaging in activities or with toys may respond best to a more structured technique, such as discrete trial training or pivotal response training. Another child (or the same child later in treatment) who already possesses these skills may respond better to a more child-directed intervention, such as incidental teaching. Also, some techniques may be better suited to different target behaviors or environments. By matching the approach to the child's level, the current task, and child's style of learning, we help the child progress more quickly, a view that has been supported by other re-

searchers (S. R. Anderson & Romanczyk, 1999). This theory has not been assessed in an inclusion program with toddlers, however.

The final difference between CTS and Walden is in the use of augmentative communication systems with nonverbal children. The Walden philosophy considers verbal language the preferred system of communication. The use of alternative communication systems thus is viewed as a possible detriment to the acquisition of spoken language and is discouraged. The Walden program staff members have reported a high response rate to this verbal-language-only approach, with 82% of children who exit the program having acquired verbal language skills. Despite these impressive results, 18% of children who entered the program as nonverbal were unable to acquire spoken language by the time of exit. In addition, some nonverbal children acquire language quickly, but other children take a considerable amount of time to master only a few words.

In recent research on augmentative communication systems, it has been suggested that nonverbal children can acquire functional communication through the *Picture Exchange Communication System* (PECS; Schwartz, Garfinkle, & Bauer, 1998) or sign language when they have not been successful at learning verbal language. In addition, the authors of several studies have indicated that the use of the PECS does not interfere with verbal language acquisition when paired with spoken words (Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002; Frost & Bondy, 1994). A recent study examining PECS and sign language demonstrated that individual children often indicate a preference for one system over the other by using one system more readily (A. E. Anderson, 2002). Many treatment programs train nonverbal children to use only one type of augmentative communication system. This decision is often based on the particular program's philosophy or the teachers' training.

The philosophy in CTS is that the sooner a child develops a communication system, the better able he or she is to participate in social and emotional interactions with others; thus, CTS uses both sign and PECS with children who are entering the program without consistent vocalizations. As children exhibit a preference for one system over the other, the use of that system is intensified and the other is abandoned. Although these systems may be more systematically trained during one-to-one training, they are used naturalistically throughout the classroom and combined with the same instructional techniques as verbal language. Both augmentative systems are paired with verbal language, and as the child develops spoken words, verbal language is targeted.

Despite these differences, the similarities of a philosophy of early inclusion, strong teacher training, parent training and involvement, and data-driven interventions based on theories of applied behavior analysis remain. The CTS is run in cooperation with California Early Start (managed through the San Diego Regional Center) and the HOPE Infant Family Support Program (San Diego County Office of Education). Offering this program in cooperation with local early intervention agencies has allowed us to assess the feasibility of providing evidence-based practices within a current service system. In this article, we present outcome data from the CTS program for toddlers with autism. CTS is one of the few inclusive toddler programs serving children with autism in the country. These data also differ from those for other programs because the CTS program combines several evidence-based practices for use with children with autism. This combining of techniques is often done in public school settings; however, there is little research to indicate whether it is appropriate for toddlers.

Method

PARTICIPANTS

Participants consisted of 20 children with ASD (16 boys, 4 girls) who had participated in the CTS program for a minimum of 6 months, the criteria set for inclusion in the program evaluation. Average age at program entry was 28 months; average age at program exit was 35 months. The average amount of time enrolled was 9.5 months. The majority of the children attended regularly, with the average rate of attendance being 86% of available days. In the majority of families, there were two parents, and all of the children resided with their biological parents. In order to obtain an estimate of socioeconomic status, we used the *Four Factor Index of Social Status* (Hollingshead, 1975). All of the children enrolled in the program were funded through California Early Start (see Table 1 for a description of the demographics of the participants).

Children were eligible for this program if they had received from a clinician not associated with this research project an independent diagnosis of ASD based upon the criteria for Autistic Disorder and Pervasive Developmental Disorder–Not Otherwise Specified in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 1994). Diagnoses were confirmed by the first author through observation and use of standardized assessments, including the *Childhood Autism Rating Scale* (CARS; Schopler, Reichler, & Renner, 1988) and the *Gilliam Autism Rating Scale* (GARS; Gilliam, 1995). Eligible children were required to have a minimum nonverbal mental age of 12 months on the *Bayley Scales of Infant Development–Second Edition* (BSID-II; Bayley, 1993) to be accepted into the program. No minimum verbal age or mental development index (MDI) was required. Program enrollment was based on age (less than 2 years 6 months), nonverbal ability requirements, and parental consent. Children whose parents did not wish to participate in the program or were not eligible for other reasons

Table 1. Participant Demographic Information

Characteristic	%[a]
Time enrolled in program	
M (range)	9.68 mos (6–17 mos)
Diagnosis	
Autistic disorder	55
Pervasive developmental disorder–Not otherwise specified	45
Percentage attendance[b]	
M (range)	86 (75–97)
Age at program entry	
M (range)	27.6 mos (22–31 mos)
Birth order	
Only child	20
Oldest child of 2	15
Youngest child of 2	30
Youngest child of 3	5
Middle child of 3	10
Twin (three families)	20
Marital status of parents	
Married	90
Separated	10
Divorced	0
Race/ethnicity of children	
Asian	10
Hispanic	20
Filipino	10
White	60
Socioeconomic status of family	
Major business/professional	25
Med. business/minor professional	50
Skilled workers	10
Semiskilled workers	15
Unskilled laborers	0

[a]Unless otherwise specified. [b]Percentage of available school days the child came to school.

were referred to other area infant programs funded through California Early Start.

MEASURES AND PROCEDURE

Child outcomes were determined in two ways: standardized assessment and an observation checklist. After a child had been referred to CTS for services and before he or she began the program, pretreatment measures were completed. The children in the study then participated in the CTS program for a minimum of 6 months (M = 9.68 months). Measures were repeated approximately 1 week before each child completed treatment. The program psychologist administered the BSID-II, a standardized test of developmental functioning, to each child at entry and exit. A mental development quotient on the BSID-II was used to determine change in child intellectual functioning. Because many children obtained a BSID-II MDI below the lowest score provided in the manual (i.e., less than 50), a developmental quotient was obtained for all participants by dividing each child's mental age equivalent by his or her chronological age and multiplying by 100 (Stone, Ousley, & Littleford, 1997). To assess child adaptive functioning, the program director administered the *Vineland Adaptive Behavior Scales* (Sparrow, Balla, & Cicchetti, 1984) to the child's primary care provider (typically the mother) at entry and exit. This measure is a structured interview in which parents assess daily living, communication, socialization, and motor skills in a standardized fashion. Standard scores on each subdomain on the *Vineland* were used to compare changes from entry to exit. In addition, each child's parents completed the GARS, an assessment of severity of autistic symptoms based on a national sample of individuals with autism. We should note that norms are not currently available for children under the age of 3 years. The autism quotient on the GARS was used to determine changes in severity of autism from entry to exit. For all assessments, standard scores were chosen over age equivalents because they factor in developmental maturation and thus are a more stringent measurement of child progress. Age equivalents were used for the developmental trajectory analyses, as is required by this type of analysis.

One criticism of treatment studies in which only standardized test scores are used is that statistical significance does not always equal clinical significance for individual children (e.g., Green, 1996). Although small but consistent increases in IQ across children may result in statistically significant changes in scores, they do not necessarily indicate clinically significant changes in functioning level. Therefore, in addition to examining changes in group standard scores, we examined changes in functioning range on the standardized assessments. We also used behavioral measures to examine functioning level.

For the purposes of ongoing child evaluation, it is important to know the functional skills each child has mastered and the skills with which the child continues to struggle. We therefore constructed a checklist of functional skills to assess each child's skill level for communication, social, and play behaviors in an ongoing fashion. We based this checklist on the general progression of development from the revised edition of the *Brigance Diagnostic Inventory of Early Development* (Brigance, 1991). This method of behavioral evaluation provides a descriptive account of qualitative improvements in functional skills; however, it does not assess increases in quantity of behavior. Functional skill level was determined by observing at a particular time period during treatment the highest skill level of each behavioral category in which a child engaged. The child needed to engage in the behavior on at least 10 occasions per week in multiple (at least three) settings (e.g., snack, free play, outside), with multiple people, and with

multiple items to receive the level rating. Complete definitions are provided in Table 2.

The program psychologist completed the checklist for all participating children at entry and exit. The checklist was based on the goals and objectives in the child's Individualized Family Service Plan, written anecdotal notes of the child's progress, and in vivo and videotaped observations. In addition, one rater unfamiliar with the children also completed the checklist for 35% of the children to obtain reliability. Reliability averaged 80% for Functional Communication Skills, 86% for the Functional Social Interaction Skills, and 82% for Functional Play Skills. The range for each was 50% to 100%.

DATA ANALYSIS

Two-tailed, paired-sample *t* tests were used to determine significant changes in performance on standardized and norm-referenced tests. Paired Wilcoxon *T* tests for ranked data were used to determine significant changes in functional skills for each behavioral category.

Developmental trajectory comparisons were also conducted to compare expected developmental rate with and without intervention. This type of data analysis has been used by behavior analysts to assess the magnitude of change in one-group designs (see Romanczyk, 2000). The analyses require the use of age-equivalent data rather than standard scores.

PROGRAM OVERVIEW

Located at the Children's Hospital and Health Center in San Diego, CTS is a state-of-the-art inclusive program jointly sponsored by Children's Hospital and the HOPE Infant Family Support Program. Funding for children with ASD is provided by California Early Start. This program opened in January of 1998 and serves children with autism spectrum disorders and typically developing children between the ages of 18 months and 3 years. The CTS program consists of three intervention components: an inclusive classroom, individualized instruction, and parent training (see Table 3 for a sample daily schedule).

Inclusive Classroom Program

The inclusive classroom serves eight children with ASD and eight typically developing children under 3 years of age. Four children with ASD attend the morning session, and the other four children with ASD attend the afternoon session. Both inclusion sessions are 3 hours a day, 5 days a week. Each child with ASD thus receives 15 hours of inclusive programming per week. The eight typical children

Table 2. Behavioral Definitions for Functional Skills Checklist

Skill type	Description
	Functional communication skills
No functional communication	Child is not using any consistent system to communicate needs. Child may reach for items, place an adult's hand on items, or cry to have needs meet or to express self.
Single signs or PECS	Child uses single signs or PECS cards with discrimination to request.
Combinations with augmentative system	Child uses two-sign combinations or sentence strip with PECS to request.
Single words	Child uses single words to request.
Phrases	Child uses one- to three-word phrases to request or label only.
Commenting/sharing	Child uses phrases of at least three words for the purposes of sharing information or ideas.
	Functional social interaction skills
Avoidant	Child avoids interaction or prefers to play alone.
Facilitated	Child prefers to play alone but will play in proximity to peers if facilitated by an adult.
Parallel play	Child plays near peers and teachers but does not initiate or respond to initiations by peers.
Responsive to peers	Child responds to initiations by peers independently or with minimal adult facilitation.
Reciprocal play	Child initiates interaction with peers or engages in some back-and-forth play (at least three exchanges).
	Functional play skills
No functional play	Child wanders; throws toys; and/or uses toys inappropriately, repetitively, or in an exploratory manner only (looking, pulling, poking, tearing).
Cause/effect	Child combines objects (uses busy box, puts objects in container).
Relational play	Child uses toys more functionally (throws a ball, pushes car).
Simple pretend play	Child engages in familiar play actions with self, others, or doll (phone to ear, feeds adult, puts doll to bed) or substitutes objects in play (pretends banana is telephone).
Complex pretend play	Child links actions (doll in car, car to store) or tells extended stories with toys.

Note. PECS = *Picture Exchange Communication System* (Schwartz et al., 1998).

Table 3. Sample Toddler School Daily Schedule

Time[a]	Activity	Target behaviors & intervention strategies
7:30 a.m.–8:30 a.m. 5:00 p.m.–5:30 p.m.	Day care for typically developing children	Indoor free-play and table-top activities available.
8:30 a.m.–9:30 a.m. 2:00 p.m.–2:30 p.m.	Children with ASD arrive, health check, diaper check, and free play	Teachers target greeting peers during arrival and identification of body parts and self-help skills during diapering. Teachers use various intervention strategies to encourage appropriate play and interaction during free play.
9:30 a.m.–9:45 a.m. 2:30 p.m.–2:45 p.m.	Circle time	Use of routine and music to help children participate. Picture and object prompts used to encourage participation in a short circle time. Picture schedule may be used to help children transition between activities.
9:45 a.m.–10:00 a.m. 2:45 p.m.–3:00 p.m.	Snack	Communication is encouraged by providing small amounts of food and drink, allowing children to be "helpers" and ask each other for more items, and by placing items in a such a way that children must ask each other to pass the items.
10:00 a.m.–11:00 a.m. 3:00 p.m.–4:00 p.m.	Free play outside	Teachers focus on gross-motor play, organization of free time (e.g., appropriate play instead of wandering), encouraging movement and play in a variety of textures, and facilitating group games and activities.
11:00 a.m.–11:30 a.m. 4:00 p.m.–5:00 p.m.	Special activity, diaper checks, & free play.	Special activity includes a process-based art project or sensory play. Materials are placed to encourage children to communicate to obtain desired items. Desired items are incorporated into new activities, or activities are adapted for children who have difficulty participating.
11:30 a.m. 5:00 p.m.	Children with ASD leave for special skills training/home	Teachers target self-help skills and saying "good-bye" to peers.
11:30 a.m.–12:00 p.m. 1:00 p.m.–2:00 p.m.	Children with ASD have special skills training while day care children lunch and nap.	Teachers target specialized skills using more structured intervention techniques (i.e., PRT, PECS, DTT). Routine songs are used at each transition.

Note. PRT = pivotal response training (Koegel et al., 1999); PECS = *Picture Exchange Communication System* (Schwartz et al., 1998); DTT = discrete trial training (Lovaas, 1987).

[a]The first time listed is for activities during the morning session, the second time is for activities during the afternoon session. Extended-care children stay throughout the day.

each attend a full-day program, which allows for a majority of typical children (one child with ASD for every two typically developing children). The classroom has a high teacher-to-child ratio (1:3).

The room is arranged like a typical toddler classroom, with toys appropriate for different levels of play. There is an art table, a loft, a quiet area with books and pillows, a dramatic play area, a circle time area, manipulative toys, and a toileting and diapering area. The outdoor area has a play structure conducive to gross-motor play, a playhouse, grass, and a tricycle path. A one-way observation window allows researchers to observe the classroom and collect data without disrupting classroom activities.

At CTS, special education and early education teachers work together to plan a curriculum appropriate for all children. Teachers do not follow a specific packaged curriculum, instead using developmentally appropriate practices. Teaching occurs during classroom activities such as free play, snack, outside play, special activity (e.g., art), circle time, and self-help activities (e.g., diapering, hand washing). In order to facilitate appropriate programming, the most naturalistic teaching strategies are used to meet curriculum goals. The classroom utilizes a blend of state-of-the-art intervention techniques, including incidental teaching (Hart & Risley, 1982; McGee et al., 1999), pivotal response training (Koegel et al., 1989; Schreibman & Koegel, 1996), discrete trial training (Lovaas, 1987), structured teaching (Lord, Bristol, & Schopler, 1993), and floor time (Greenspan & Wieder, 1998). Two augmentative communication systems, the PECS and modified sign language (e.g., Carr, Binkoff, Kologinsky, & Eddy, 1978), are also used with nonverbal children or children who appear to need visual support to use language appropriately. Favorable results have been found for each technique when it

has been used with young children with ASD (Carr et al., 1978; Charlop-Christy et al., 2002; Greenspan & Weider, 1998; Lovaas, 1987; McEachin et al., 1993; McGee et al., 2000; Ozonoff & Cathcart, 1998; Schreibman & Koegel, 1996).

A variety of interesting toys and activities are used to peak children's interest. Once a child has become interested in a toy or activity, the teacher can use that opportunity to provide the child with a learning activity based on the child's particular goals. The following is an example of strategy use in the classroom: If a child is engaged with a toy during free play, the teachers typically begin an interaction using an incidental teaching model by approaching the child, waiting for a response, and increasing the level of structure as necessary. For example, the teacher might comment on the child's actions, model an appropriate action, or provide direct instruction, depending upon the child's level of need. If the child does not respond to incidental teaching techniques, the teachers move to a more structured technique, such as pivotal response training or PECS, depending upon the child's goals. If a child is not engaged with a toy, teachers will first implement some structured pivotal response training to engage the child and provide opportunities to respond. If the child is very difficult to engage, floor-time strategies to open circles of communication and encourage interaction at the child's developmental level are employed. All techniques may be used in a single free-play session with a child, depending upon the child's needs that day.

Children with ASD are encouraged to observe and interact with typically developing peers, based upon the former's social interaction goals. For some children, tolerating proximity to peers is an initial goal, whereas for other children, the focus may be on initiating interactions and imitating actions at circle time. Teachers facilitate interactions among the children throughout the day. For example, children are encouraged to ask each other for additional snack items or to trade materials at special activity. Teachers are trained to be very "fun" and to act as a "magnet" for the children to encourage proximity of children with ASD to typically developing children. All children are involved in each activity during the day.

Special Skills Training

In addition to inclusive programming, each child with ASD receives special skills training. This training is conducted in a smaller room that has a one-way window and contains a variety of toys and materials. During special skills training, one teacher provides individualized instruction to two children for 1 hour, 4 days a week. Each child with ASD thus receives 2 hours per week (30 minutes × 4 days per week) of one-to-one teaching during special skills training. The children attending the morning session receive this training during the hour following the morning session, and the afternoon children receive it for the hour preceding the afternoon session. This arrangement prevents the children with ASD from having to be removed from ongoing classroom activities to receive individualized instruction. During special skills training, the teacher works with the child on goals that are more easily addressed in a more structured setting. Intervention strategies include direct teaching of augmentative communication systems and other skills, including verbal and nonverbal imitation; discrete trial training (Lovaas, 1987); and strategies used in the classroom.

Family Education and Support

The family education component consists of a weekly 2-hour home visit with one of the classroom teachers. The same teacher works with the family throughout the child's tenure at CTS. Parents are taught the techniques used in the classroom. As in the Walden Toddler Program, parents agree to provide an additional 10 hours of services with their children each week. Naturalistic techniques focused on increasing communication, play, and interaction are emphasized in the home program because they are the most effective for parent training (Schreibman & Koegel, 1996). In addition, the parent trainer helps the parents choose appropriate goals for the child, increase the child's self-help skills in the home, and identify and target problem behaviors using behavioral strategies. Goals may include community settings as well. Often the home teacher will accompany the family on community outings to meet specific goals. Parents are invited to observe the children in the classroom at any time. Additional education and training is provided to any of the child's interested caregivers and family members.

In order to facilitate parent support, the lead teacher conducts a parent group meeting each week to discuss classroom issues, educate parents about topics relevant to autism and special education, and provide support to families. A resource center with information about autism, school information, and community resources is available at the school. Parents may check out books, videotapes, and resource materials about different methodologies used in the classroom and in other programs, alternative treatments, research articles, policy information, and school district information.

Parent participation is an integral part of the CTS program. Parents are involved in setting goals and development strategies for their children, reviewing goals, choosing appropriate intervention strategies, developing positive behavioral supports, and facilitating the transition process to the preschool program. Parents work with the team at each stage, including the final assessment, and report information that is used to transition the child to the school district program. The home teacher or the psychologist accompany the family to the transition and Individualized

Education Program (IEP) meetings in order to facilitate a smooth transition to the new program when the child reaches age 3 years.

GOAL SETTING

Intervention priorities are determined individually for each child by the entire team. Upon entry into the program, children are assessed by the psychologist, speech therapist, occupational therapist, and special education teacher. The home teacher interviews the parents and completes an assessment of parental goals for the child, as well as support needs, needs of the child in the home setting, and skill level of the family in terms of the strategies used at CTS. Once the child has had a chance to acclimate to the program, initial goals are developed in the areas of communication skills, social skills (including play and interaction), self-help skills, sensory and motor skills, behavioral issues, and any additional areas any team member believes is appropriate. A progression of goals is developed so that teachers have a long-term goal, as well as specific short-term goals, upon which to work each week. A weekly staff meeting allows team members to discuss each child's specific progress and the next steps for that week. Daily notes are taken on progress and program changes and are shared each morning with the entire staff. Every 5 weeks, the entire team, including the family, reviews the child's progress. At this time, goals may be modified or added, or strategies can be changed if current strategies have not allowed the child to meet his or her goals in a timely manner. At transition, these goals are shared with school district personnel and are often used to develop the child's IEP, allowing for a smoother transition to the new environment.

STAFFING AND TRAINING

In the classroom, one lead teacher is in charge of planning daily activities and supervising the additional classroom teachers. All teachers must possess a minimum of a bachelor of arts degree from a 4-year institution and have prior experience working with young typically developing children and children with autism or a degree and experience in early childhood education. All teachers must also meet infant/toddler classroom licensing standards for the state of California. The lead teacher also has an early childhood special education degree. Each teacher receives extensive training in each intervention technique through didactic instruction with the technique training manuals as well as hands-on experience in the appropriate program setting. Verifying fidelity of program implementation is completed on a quarterly basis through direct observation and videotaped recordings of teacher performance. Developmental feedback is provided to each teacher on a daily basis during the course of instruction.

SPEECH AND OCCUPATIONAL THERAPIES

CTS utilizes a consultative model for speech therapy and occupational therapy. A speech therapist and an occupational therapist are involved in each child's intake assessment and goal development. Each consultant works with teachers and children in the classroom for 4 hours each week. This time may include facilitating group activities, providing specific consultation about a particular child, educating parents, training teachers, reviewing goals, and developing procedures.

OUTSIDE/ALTERNATIVE THERAPIES

Although CTS is considered an all-inclusive early intervention program by California Early Start, at times some children may qualify for additional individual treatment based on need. Some families in the program also may choose to purchase additional treatment for their child during his or her enrollment at CTS. Each month, the home teacher asks families about additional treatments, therapies, and medications the children might have received. Supplemental treatments provided through California Early Start are also documented in each child's record. The majority of children (75%) in this study were not receiving any additional treatment outside of the CTS program. Four of the children (20%) were on specialized gluten/casein-free diets, and their parents supplied the school with food that complied with the dietary program. Two of the children (10%) qualified for 1 hour per week of individual occupational therapy in addition to what they were receiving at CTS. One child (5%) received 12 weeks of weekly individual speech therapy. Two families (10%) chose to purchase in-home therapy in addition to CTS: One child received 10 hours per week of discrete trial training from a private vendor, and the other child received 3 hours per week of naturalistic intervention from a trained student hired by the family.

Results

STANDARDIZED ASSESSMENTS AND DEVELOPMENTAL FUNCTIONING

Results for standardized and norm-referenced assessments are summarized in Table 4. BSID-II scores were unavailable at intake for one child, as he was uncooperative during the testing session. This child was excluded, leaving 19 children for this analysis. This assessment has a mean standard score of 100 and a standard deviation of 15. The children exhibited a significant increase, $t(19) = -3.45$, $p < .01$, in IQ from intake ($M = 67.2$, $SD = 14.7$) to exit ($M = 74.6$, $SD = 17.5$), as measured by the BSID-II. Overall, in 47% of the children, the developmental quotient increased on this assessment. At intake, 11 (58%) of the 19 children were in

the significantly delayed range at intake (IQ below 70). Six (32%) of the children were in the mildly delayed range (IQ between 70 and 84), whereas only 2 (11%) children were in the normally developing range (IQ between 85 and 115). At exit, 7 (37%) children were functioning in the normal range, another 4 (21%) children were functioning in the mildly delayed range, and 8 (42%) children remained in the significantly delayed range. The percentage of children who functioned in the typical range of development thus grew from 10% to 37%. In addition, 4 of 11 children moved out of the severe range of functioning. Not surprisingly, although 67% of the children functioning in the mildly delayed range at intake increased their functioning to the normal range after treatment, only 1 child (5%) functioning in the significantly delayed range at intake was functioning in the normal range at exit.

Trajectory changes in mental age based on verbal and nonverbal mental age scores on the BSID-II are illustrated in Figures 1 and 2. The expected trajectory was estimated based on developmental level at intake, with the assumption that without intervention, the same rate of development would continue. Clearly, typical child development does not always take a linear path; however, this comparison allows us to illustrate how changes in development might be altered due to intervention (see Romanczyk, 2000). If the rate of change is greater than the expected rate of development, the intervention is said to have a positive effect on the child's development. The typical children's developmental trajectory is illustrated as well. As a group, children with autism had the most change in the area of nonverbal mental age, increasing on average from 18 months at intake to 26 months at exit. This analysis indicates that the rate of development for these children was 64% of the rate of development of the typical children at intake and 74% of the rate of development of the typical children at exit, indicating a 10% increase in developmental progress. Similar results were found in the area of language age. The children with ASD were developing at 53% of the rate of typical children at entry and 67% of their rate at exit, indicating a 14% increase in developmental progress. Because the use of pictures and sign language could not be scored on this assessment, augmentative communication skills are not reflected.

ADAPTIVE FUNCTIONING

Because subscores for entry and exit on the Interview Edition of the *Vineland* were unavailable for four children, these children were excluded from the adaptive functioning analysis. Significant increases in adaptive behavior, as determined by standard scores on the communication, $t(16) = -3.61$, $p < .005$, and social subdomains, $t(16) = -2.66$, $p < .05$, of the *Vineland*, were evident from intake (communication $M = 71.1$, $SD = 13.9$; social $M = 70.4$, $SD = 8.9$) to exit (communication $M = 79.3$, $SD = 17.1$; social $M = 75$, $SD = 10.9$). No change was indicated in the daily living, $t(16) = -.74$, *ns*, or motor skills, $t(16) = .65$, *ns*, domain standard scores, however. Overall, 44% of children showed increases in their levels of functioning on the *Vineland* communication domain and 4 of 15 (27%) moved into the normal range. Before entry into the program, one child (6%) was scoring in the severely delayed range, seven (44%) children in the mildly delayed range, seven (44%) children in the borderline range, and one (6%) child in the average range of functioning for the communication domain. This apparently high-functioning level at intake (with only one child in the severely delayed range) was likely due to the age of the children at intake and the limited number of verbal communication items on the *Vineland* for this age group. At exit from the program, no children were functioning in the severely delayed range, six (38%) children remained mildly delayed, five (31%) children were functioning in the borderline range, and five (31%) children had moved to the typically functioning range. Similar changes were seen in the socialization domain, with only one (6%) child functioning in the typical range at entry and five (31%) children in the typical range at exit.

A trajectory graph of changes in the children's overall adaptive behavior age-equivalents is illustrated in Figure 3. Overall, on the *Vineland* the children increased from an age-equivalent of 14 months to an average age-equivalent of 21 months. This represents a 10% increase in developmental rate attributable to the intervention.

Table 4. Children's Mean Scores on Standardized Assessments at Program Entry and Exit

Assessment	At Entry		At Exit	
	M	(*SD*)	*M*	(*SD*)
Chronological age (16 boys, 4 girls)	28 mos		35 mos	
Developmental quotient[a]	67.2	(14.7)	74.6	(17.9)**
Adaptive functioning[b]				
Communication	71.1	(13.9)	79.3	(17.1)**
Daily Living Skills	71.2	(8.9)	72.8	(9.4)
Socialization	70.4	(8.9)	75.0	(10.9)*
Motor Skills	88.9	(12.5)	87.4	(16.1)
Autism quotient[c]	87.2	(11.2)	76.5	(23.0)*

[a]*Bayley Scales of Infant Development–Second Edition* (Bayley, 1993); $n = 19$. [b]*Vineland Adaptive Behavior Scales* (Sparrow et al., 1984); $n = 16$. [c]*Gilliam Autism Rating Scale* (Gilliam, 1995); $n = 19$.
*$p < .05$. **$p < .01$.

SYMPTOMS OF AUTISM

Because GARS scores were unavailable for one child at program exit, this boy was excluded from the analysis. The

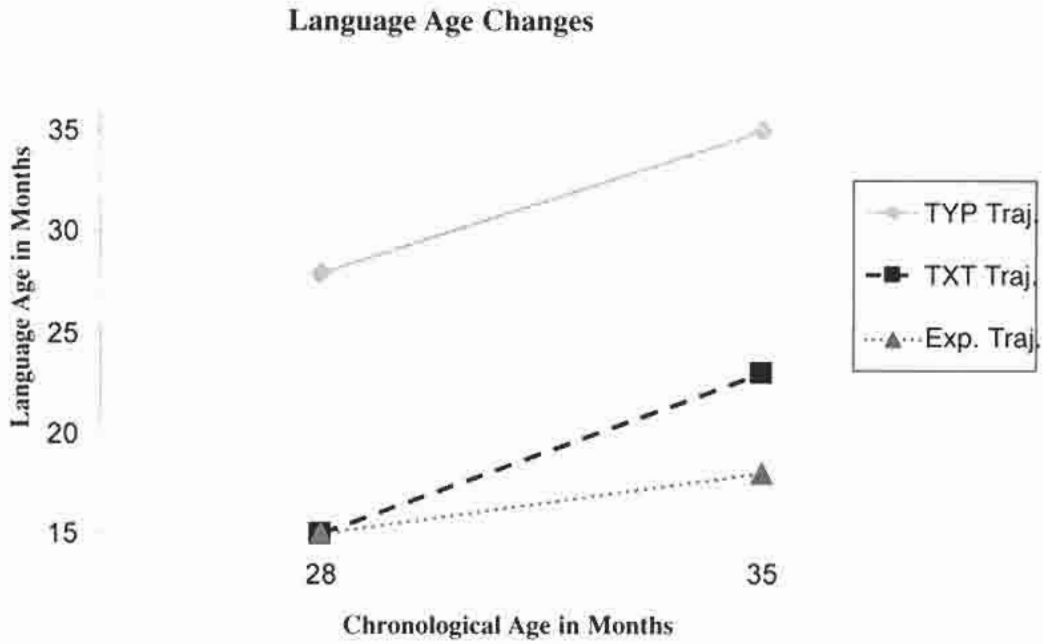

Figure 1. Changes in developmental trajectory for verbal mental age on the *Bayley Scales of Infant Development–Second Edition* (Bayley, 1993) from entry to exit. The expected trajectory for participants with autism was estimated from their developmental level at intake, and the expected trajectory for typical children was estimated from progress expected for typical children during the same time period. *Note.* TYP Traj. = developmental trajectory for typically developing children, on average; TXT Traj. = actual developmental trajectory for children in the program with autism spectrum disorders; Exp. Traj. = expected developmental trajectory for children with autism spectrum disorders if no treatment had been provided (based on intake scores and continuing to level at the same rate).

GARS assessment was normed on individuals with a diagnosis of autism. A score of 100 indicates a high probability that the child has autism. Lower scores indicate a reduced probability that the diagnosis is autism and a reduction in the number and severity of symptoms that are indicative of the disorder. Although this assessment has not been normed for children under the age of 3 years, it can provide an estimate of change in behaviors associated with autism.

In this study, autism quotients on the GARS indicated a significant decrease in severity of autism from intake to exit, $t(19) = 2.20$, $p < .05$. At entry, the average autism quotient fell within the below-average probability of autism range ($M = 87.2$, $SD = 11.2$; Gilliam, 1995). A recent validity study of the GARS found the average score of children with known diagnoses of autism to be 90.1, rather than 100, as reported in the GARS manual (South et al., 2002). As a result, we believe the children in this study were in the average range of autism at intake. At exit, the average autism quotient fell within the low probability of autism range ($M = 76.5$, $SD = 23.0$; Gilliam, 1995), with five (26%) of the children in the very low probability of autism range. Once again, the range of probability of autism should be interpreted cautiously because of the likelihood that the cutoff criterion should be lower for this measure than that reported in the manual. Changes in the autism quotient scores from intake to exit did indicate a significant decrease in autistic symptomology (more than a 10-point change). Overall, these results showed a significant improvement in performance on standardized assessments of intellectual and adaptive functioning and a decrease in the number of autistic symptoms after at least 6 months' participation in the CTS.

FUNCTIONAL COMMUNICATION SKILLS

Functional skills results for all three areas are summarized in Table 5. At program entry, 10 (50%) children had no functional communication system. By program exit, 18 (90%) children used a functional communication system independently, and 16 (80%) children exited the program with spoken language. Functional systems included PECS, sign language, and spoken language. The children who entered CTS without functional communication and were not yet consistently vocalizing were started on both PECS and sign language until a preferred augmentative commu-

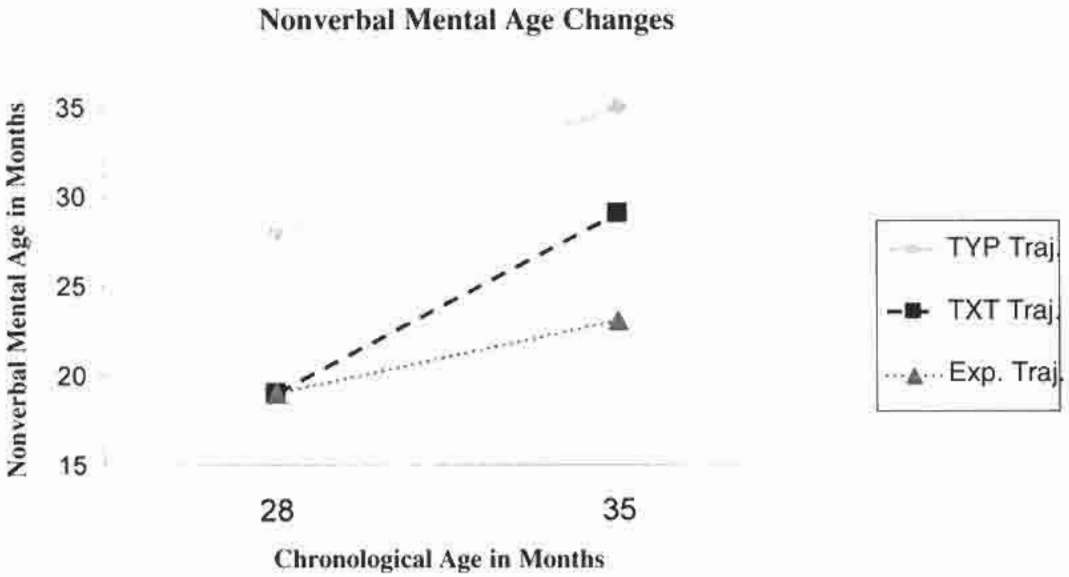

Figure 2. Changes in developmental trajectory for nonverbal mental age on the *Bayley Scales of Infant Development–Second Edition* (Bayley, 1993) from entry to exit. The expected trajectory for participants with autism was estimated from their developmental level at intake, and the expected trajectory for typical children was estimated from progress expected for typical children during the same time period. *Note.* TYP Traj. = developmental trajectory for typically developing children, on average; TXT Traj. = actual developmental trajectory for children in the program with autism spectrum disorders; Exp. Traj. = expected developmental trajectory for children with autism spectrum disorders if no treatment had been provided (based on intake scores and continuing to level at the same rate).

nication system was identified. Of these 8 children, upon exit, 4 children were able to use word combinations with their preferred system (2 developed multiword phrases in sign language, 2 used sentence strips with PECS), 2 children could use individual PECS with discrimination, and 2 children never acquired any functional communication. All of the children who used PECS or sign combinations also acquired single spoken words. Two of the children on the PECS system began to use spoken language consistently, and they discontinued use of the PECS system. The use of an augmentative system thus did not appear to impair the acquisition of spoken language for these children, as has been previously suggested (McGee et al., 1999). Two children entered the program without verbal language but were able to consistently vocalize. These children were able to acquire spoken language without an augmentative system.

Ten (50%) children entered the program with some verbal communication. Of those 10, 7 children used only single words, 2 used two-word combinations, and 1 child employed phrases. The majority of the children's language use was in the form of requests or labels. By program exit, 7 of these children, as well as the 2 children who were not using words at program entry, were using language to comment on things in the environment, using past tense, or engaging in extended conversation. Overall, 9 (45%) children exited the program with pragmatic language, 3 (15%) used phrases, and 4 (20%) used single words to communicate (2 of these children continued to use augmentative communication as well). A paired Wilcoxon T test for ranked data indicated a significant increase, in communication behaviors from program entry to exit, $T(18) = 0, p < .01$.

FUNCTIONAL SOCIAL INTERACTION SKILLS

At entry into CTS, none of the children engaged in social interaction with peers. Eight (40%) children actively avoided their peers. These children would move to isolated areas when left to play on their own and would remove themselves from the area when placed in proximity to peers. Eight (40%) children would remain in proximity to peers with adult facilitation. These children did not actively seek out peers, but when they were placed in proximity to a peer, they would remain there. The final 4 (20%) children engaged in parallel play at entry (e.g., sat near a peer and played on their own). At exit, no children actively avoided peers, 12 (60%) who were engaged in social interactions with peers (5 [25%] could respond to initiations, and 7 [35%] could engage in reciprocal interactions). A

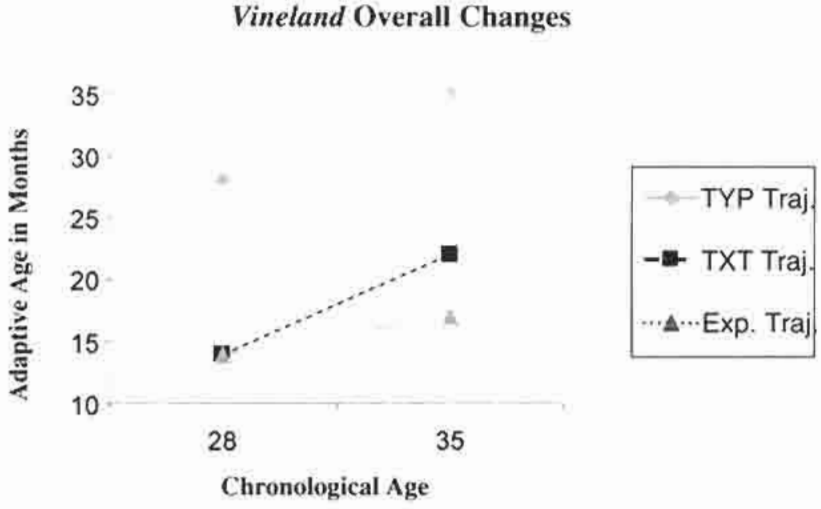

Figure 3. Changes in developmental trajectory for overall adaptive behavior age-equivalents on the *Vineland Adaptive Behavior Scales* (Sparrow et al., 1984) from entry to exit. The expected trajectory for participants with autism was estimated from their developmental level at intake, and the expected trajectory for typical children was estimated from progress expected for typical children during the same time period. *Note.* TYP Traj. = developmental trajectory for typically developing children, on average; TXT Traj. = actual developmental trajectory for children in the program with autism spectrum disorders; Exp. Traj. = expected developmental trajectory for children with autism spectrum disorders if no treatment had been provided (based on intake scores and continuing to level at the same rate).

Wilcoxon T test indicated a significant increase in social behaviors during participation in the program, $T(20) = 0$, $p < .01$.

FUNCTIONAL PLAY SKILLS

At entry, none of the children exhibited age-appropriate play. Seven (35%) children had no functional play, and only three (15%) were able to engage in basic "pretend actions" (e.g., feeding a doll or placing a phone to their ear). By exit, all children independently exhibited at least relational play, and eight (40%) children were able to engage in independent, age-appropriate extended play sequences (e.g., pretending to cook dinner, feed a doll, and put the doll to bed). A Wilcoxon T test indicated that improvements in play behaviors from program entry to exit were significant, $T(20) = 0, p < .01$.

Discussion

The results of the current study of the CTS inclusion program suggest that inclusion may be an effective treatment model for children with ASD who are under the age of 3 years and have a nonverbal mental age of at least 12 months. The majority of children enrolled in the program learned to use spoken language to request or label, and many of these children also used language to comment and respond to questions. All of the children increased their play skills, with almost half of the children exhibiting age-appropriate play. This play included complex, independent, symbolic play, which is often absent in children with ASD. The lack of an appropriate control group compromises any strong interpretation of these data, and the following issues are presented within the acknowledged limits of the design.

Changes in social and language skills for the children in this study were commensurate with those reported for other inclusion programs (McGee et al., 1994; McGee et al., 2000; Strain & Cordisco, 1994) that typically measure outcome in terms of functional skills. For example, improvements in language skills were similar to those reported in the Walden Toddler Program. Eighty-two percent of children exited the Walden Toddler Program at 42 months with spoken language (McGee et al., 1999), compared to 80% of CTS graduates. In addition, another 10% of the CTS children had a functional augmentative communication system in place when leaving the program. Finally, the majority of children leaving CTS had ac-

Table 5. Changes in Functional Skills at Program Entry and Exit (n = 20)

Functional skill	At intake (%)	At exit (%)
Communication skills		
No functional communication	50	10
Single signs or PECS	0	10
Combinations with augmentative system	0	20[a]
Single spoken words	35	20[a]
Phrases	15	15
Commenting/sharing	0	45
Social interaction skills		
Avoidant	40	0
Facilitated	40	15
Parallel play	20	25
Responsive to peers	0	25
Reciprocal play	0	35
Play skills		
No functional play	35	0
Cause/effect play	15	0
Relational play	35	35
Simple pretend play	15	25
Complex pretend play	0	40

Note. PECS = *Picture Exchange Communication System* (Schwartz et al., 1998).
[a]All four children who engaged in combinations with their augmentative system also used single spoken language for communication; as a result, these four children are represented in both categories.

quired the ability to use phrases or commenting skills. At least 88% of the children exited the Walden Early Childhood Program after preschool with meaningful verbal language (McGee et al., 2000); however, further differentiation of the levels of language skills for these children and for children in the Walden Toddler Program was not reported. Direct comparison of the programs was difficult in several other areas:

1. entry communication skill differences, in that fewer children in the Walden program (36%) began with spoken language than in the CTS program (50%);
2. possible entry IQ or developmental level differences, in that the Walden program does not have minimum entry requirements; therefore, some of their children may have had more severe cognitive deficits;
3. duration of enrollment, as many children participate in the Walden program for extended periods; and
4. entry/exit ages, as many of the children in the Walden program did not exit until 42 months, whereas the majority of the children in the CTS program exited at 36 months.

Clearly, however, both inclusion programs are beneficial for children with ASD in the area of communication development, with the majority of children becoming verbal before the age of 5 years.

The changes in performance on standardized measures by the CTS children were also similar to progress reported in one-to-one treatment programs. For example, McEachin et al. (1993) reported that 47% of children in their one-to-one home-based program were in the typical range at follow-up in elementary school. In comparison, upon exiting CTS at age 3 years, 37% of children were functioning in the average range on standardized assessments of cognitive development. We are not claiming that these children did not have other issues related to autism, such as deficits in pragmatic use of language, social skills, and stereotyped behaviors, as measured by functional scales, the *Vineland*, and the GARS; however, McEachin et al. did not report these other areas, nor did they separate verbal and nonverbal IQ scores; therefore, child performance on the standardized cognitive assessment is the only comparison that can be made at this time. These data provide preliminary evidence that intensive inclusion programming using naturalistic techniques may improve cognitive functioning in young children with ASD at rates similar to those reported for in-home programs; however, direct comparison studies need to be conducted. These data will provide additional evidence that "behavioral readiness" is not a necessary criterion for inclusion programming for toddlers with ASD.

Another preliminary finding of this project was that augmentative communication systems used in the toddler years do not seem to inhibit the use of spoken language. Four of the children who participated in this program used PECS or sign combinations. Two of these children also began to use spoken words soon after beginning to combine symbols with the augmentative system. The children used the augmentative systems for communication until their spoken language was consistent. Two of the children abandoned the augmentative system altogether before exiting the program. In anecdotes, teachers and clinicians in the program indicated that they believed that the addition of the augmentative system reduced behavior problems and encouraged spontaneous communication. These early data suggest that the use of an augmentative system may be positively related to the acquisition of spoken language rather than a hindrance to it. Clearly, additional controlled research is necessary to determine the rate at which these children would have learned spoken language (or if they would have learned it at all) without an augmentative system.

These outcome data suggest that integration of intervention techniques does not impede child progress. The majority of early intervention outcome projects have focused on the use of a single technique, such as discrete trial training (e.g., Lovaas, 1987), incidental teaching (McGee et al., 1999; McGee et al., 2000), or floor time (Greenspan & Weider, 1998), whereas the majority of publicly funded early intervention programs use a combination of methods in their treatment models. In fact, the best practice committees in both New York (New York State Department of Health Early Intervention Program, 1999) and California (Collaborative Work Group on Autistic Spectrum Disorders, 1997) recommended the use of a combination of treatments based on the needs of the child. Very few studies have examined the efficacy of integrating best-practice treatment methods (e.g., Jacobson & Mulick, 2000). This research provides some preliminary evidence that a combination of treatments designed with the best fit for the child and family in mind leads to excellent outcomes for toddlers with ASD.

Given that this program contains several elements (i.e., inclusive classroom, special skills training, parent training and support), it is not possible to determine which components were responsible or necessary for the children's behavior change. In all probability, the combination of these three elements contributed to the children's progress. Although the inclusion of multiple intervention components limits the conclusions that can be drawn regarding inclusion alone, the CTS program is representative of state-of-the-art inclusion programs for children with autism, as well as best practices for intervention with toddlers with autism. For example, researchers and educators recognize the importance of parent education in any service delivery model for young children with autism (National Research Council, 2001). Although this program does not isolate the effects of inclusion, it does provide information on the effect of early intervention delivered within an inclusion model.

In order to fully determine the effects of inclusion for children with autism in the toddler years, direct comparisons of in-home programs, small-group programs, and programs in which the main intervention is delivered in an inclusion format must be conducted. In addition, follow up of children exiting inclusion programs will be necessary to determine the long-term effects of such programs. Further research to determine, a priori, which children will benefit most from structured versus naturalistic programming and from individual versus group instruction is also needed. Researchers are currently looking for child characteristics that may determine response to treatments such as pivotal response training and discrete trial training (Schreibman, Stahmer, & Cestone, 2001; Sherer, 2002; Sherer & Schreibman, 1999). The development of behavioral profiles for children who respond well and children who do not respond well to these treatments will assist early intervention providers in choosing the appropriate methods for each child. We have begun to examine these possibilities for children entering CTS as well. Early information has indicated that children who are extremely avoidant of their peers may not perform as well in an inclusion environment as children who do not avoid their peers (Ingersoll et al., 2001). Whether these children will respond more favorably to an alternative treatment has yet to be determined, however.

Another area of great importance addressed by these data is the translation of evidence-based practices into community environments. The need to span the gap between treatments developed in highly controlled research settings and services delivered in community settings has been identified as a critical area by the National Institute of Mental Health (Report of the National Advisory Mental Health Council's Behavioral, 2000; Report of the National Advisory Mental Health Council's Clinical, 1999). CTS is an example in which evidence-based techniques have been successfully translated into use in a community-funded early intervention setting. This school is more controlled than many early intervention settings due to the specific development of the program as an inclusion program using behaviorally based techniques. In addition, the families studied were, in general, well-educated, middle-income, two-parent households. This limits the generalizability of these data to other areas; however, the program does operate under all of the funding and policy regulations utilized by California Early Start and represents a model program for merging research and practice. Additional research in a wider variety of community settings is needed to assess quality and quantity of programming, staff training needs, and implementation in less optimal environments.

Much work needs to be done in the area of early intervention in autism. We hope that these data contribute to the literature by indicating that inclusion programming is appropriate for toddlers with autism and can be implemented in a community early intervention program. These children clearly can learn in an intensive, structured, inclusion environment with highly trained staff members and consultants.

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AUTHORS' NOTES

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