

Pilot study of a parent training program for young children with autism

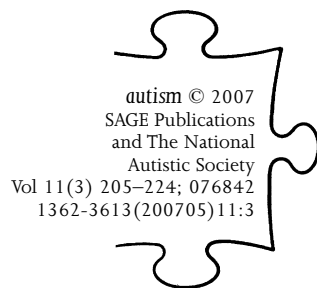
The PLAY Project Home Consultation program

RICHARD SOLOMON Ann Arbor Center for Developmental and Behavioral Pediatrics, Michigan, USA

JONATHAN NECHELES Northwestern University Feinberg School of Medicine, Chicago, USA

COURTNEY FERCH Wayne State University Medical School, Detroit, USA

DAVID BRUCKMAN Cleveland Department of Public Health, Ohio, USA



ABSTRACT The PLAY Project Home Consultation (PPHC) program trains parents of children with autistic spectrum disorders using the DIR/Floortime model of Stanley Greenspan MD. Sixty-eight children completed the 8–12 month program. Parents were encouraged to deliver 15 hours per week of 1:1 interaction. Pre/post ratings of videotapes by blind raters using the Functional Emotional Assessment Scale (FEAS) showed significant increases ($p \leq 0.0001$) in child subscale scores. Translated clinically, 45.5 percent of children made good to very good functional developmental progress. There were no significant differences between parents in the FEAS subscale scores at either pre- or post-intervention and all parents scored at levels suggesting they would be effective in working with their children. Overall satisfaction with PPHC was 90 percent. Average cost of intervention was \$2500/year. Despite important limitations, this pilot study of The PLAY Project Home Consulting model suggests that the model has potential to be a cost-effective intervention for young children with autism.

KEYWORDS
autism;
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intervention;
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ADDRESS Correspondence should be addressed to: RICHARD SOLOMON, MD, 2930 Parkridge Drive, Ann Arbor, MI 48103, USA. e-mail: dr.ricksol@comcast.net

For further information on UK workshops in September 2007, please see www.mindbuilders-consulting.com, or contact Sibylle Janert (e-mail: sibylle.janert.info).

There is a growing consensus that young children (18 months to 6 years of age) with autistic spectrum disorders (ASDs) benefit substantially from comprehensive and intensive therapies (American Academy of Pediatrics, 2001; Dawson and Osterling, 1997; Filipek et al., 2000; Howlin, 1998; Hurth et al., 1999; Lord et al., 2001; Matson et al., 1996; Rapin, 1997; Rogers, 2000). Comprehensive therapies address the multiple areas of developmental differences (i.e. language, sensory, social, educational) in children with ASDs (Campbell et al., 1996; Rogers, 2000). Intensive therapies are characterized by: 25 hours per week; high teacher to pupil ratios (1:1 or 1:2); early intervention (age 18 months to 6 years); and structured, strategic approaches that address the language, social and behavioral deficits of ASDs (Lord et al., 2001). Typically the therapies are implemented over 2–4 years until the child is 6 years old. The cost of these interventions when delivered by professionals is very expensive, ranging between \$25,000 and \$60,000 per year. When children who receive intensive intervention improve their functioning, the cost savings for society may be substantial (Jacobson and Mulick, 2000; Järbrink and Knapp, 2001). Obviously, an efficient, cost effective intervention is needed both clinically and financially. A pilot project – The PLAY Project Home Consulting program – is described which is designed to provide an intensive, cost effective, structured intervention that addresses the language, social and behavioral deficits of children with ASD. Specifically, the program evaluation of The PLAY Project's Home Consultation (PPHC) program is reported here.

Among the intensive therapeutic approaches, two broad types of interventions – behavioral and social-pragmatic – are typical (Prizant and Wetherby, 1998). Though the approaches differ deeply in their fundamental theoretical underpinnings, they share key elements: early, intensive, one-on-one intervention to start, a strategic direction (language, social skills and/or pre-academic skills) and structured programs.

The prototypical *behavioral approach* is represented by the work of Lovaas and associates (Lovaas, 1987; McEachin et al., 1993; Smith and Lovaas, 1998). Based on applied behavioral analysis (ABA), this approach shapes the child with autism's behavior through an operant learning paradigm using discrete behavioral trials to increase language and socialization and decrease repetitive behaviors. ABA methods have been carefully evaluated (Matson et al., 1996). Lovaas's original randomized controlled trial found that 47 percent of the 19 intervention children were mainstreamed in regular classrooms with only one of the control group children making equivalent gains (Lovaas, 1987). Long term follow-up of the original study group revealed that gains were maintained (McEachin et al., 1993). Careful analysis of the original study, however, has revealed several serious design flaws; and various replications of the model have fallen short of the original 'best

outcome' criteria (including especially being in typical classrooms without aide support) (Shea, 2004). Limitations of this behavioral approach include: (1) the difficulty of maintaining the 40 hours per week of intervention, (2) the high quality of supervision needed and (3) the difficulty replicating findings in non-research settings (Mudford et al., 2001). Several other studies, using ABA methods, have shown that children can make significant gains in specific targeted behavioral areas using this approach, though maintenance and generalization of skills were problematic (Matson et al., 1996). Critics often point to difficulties with generalization to natural environments, continuing difficulties with social pragmatic skills with peers, and the aversive nature of the discrete trial type of intervention. The original punishment-based program is no longer used and thus throws doubt on the generalization of outcomes to current programs.

The prototypical *social-pragmatic approach* is represented by the work of Greenspan and his developmental, individualized and relationship-oriented (DIR) model (Greenspan and Wieder, 1997a) designed to increase socialization, improve language and decrease repetitive behaviors. Joint attention and the promotion of contingent interaction are at the methodological core of the DIR model (Kasari et al., 2001; Siller and Sigman, 2002). Greenspan's case series (Greenspan and Wieder, 1997b) involved a cohort of 200 children. This sample had a highly motivated, middle- to upper-income parent population. It can only be considered as an observational study, as there were no controls and no detailed description of the specific intervention protocols used. Nonetheless, after 2 years of intervention, 58 percent of treated children showed improvements and no longer met the criteria for 'autistic disorder' on key measures (e.g. CARS). The PLAY Project uses Greenspan's theoretical DIR framework to inform its play-based intervention approach. The DIR model is one of several social-pragmatic programs in clinical use. Several other types are extant (Aldred et al., 2004; MacDonald and Carroll, 1992; Mahoney and Perales, 2005; Prizant and Wetherby, 1987; Rogers and Lewis, 1989). Despite clinical acceptance of play-based, social/pragmatic approaches, the scientific evidence for their efficacy has been limited (Dawson and Galpert, 1990; Rogers, 2000; Siller and Sigman, 2002). These approaches are more difficult to operationalize and quantify than behavioral approaches (Rogers, 2000).

Though 25 hours per week of intensive intervention is recommended by the National Research Council report (Lord et al., 2001), the approach is not feasible in most financially strapped state departments of education and is well out of financial reach for most families to obtain privately if delivered by professionals. Additionally, there is a national shortage of personnel trained in these approaches even as the number of children identified with ASDs is increasing (Croen et al., 2002; Scott et al., 2002).

Recent prevalence estimates range from 6.5 per 1000 to 4 per 1000 children (Bertrand et al., 2001; Fombonne, 1999). Until more developed, institutionalized services are available, a staged approach to intervention using parents as first interventionists has been recognized as the most practical way to deliver initial services (Anderson et al., 1987; Howlin, 1980; Rogers, 1996; Schopler and Reichler, 1971; Schreibman and Britten, 1984).

Methodologically rigorous research on parent training interventions is scant (Drew et al., 2002) but promising. Diggle et al. (2003) were able to find only two of 68 studies on parent training for young children with autism that met their strict criteria (randomized controlled studies). Jocelyn et al. (1998) evaluated a caregiver-based intervention program for children with autism in community day-care centers. Using an eclectic 12 week training approach for parents and day care personnel, this randomized controlled study showed that children with autism improved language skills significantly and parents reported greater satisfaction when compared to the control group. Smith et al. (2000) used a randomized controlled design of parent training versus intensive ABA treatment. His group found better outcomes for the intensive treatment approach though child outcomes in the parent training group, while statistically less successful on some measures, were comparable clinically. Mahoney and Perales (2005) used a controlled design and a parent training model very similar in hours and methods to The PLAY Project. Their group found highly significant improvements in the intervention group on social reciprocity and language measures. Finally, a recent randomized controlled trial of parent training, using a social communication intervention methodology, showed statistical and clinical improvement compared with controls on the ADOS (Autism Diagnostic Observation Scale) total score, particularly in reciprocal social interaction (Aldred et al., 2004).

Less rigorously designed studies of parent training also showed promising results in the areas of language, IQ, social skills and school performance. Sheinkopf and Siegel (1998), in a natural experiment, compared parent-led home-based behavioral intervention (i.e. ABA) to a matched control group receiving school-based, educational intervention. They showed significant improvements in IQ and school placement in the intervention group. Ozonoff and Cathcart (1998) used a 4 month, structured home/parent training component in addition to the children's TEACCH program. They showed highly significant improvements on psycho-educational measures. Even brief parent training interventions have shown immediate effects. Dawson and Galpert (1990) taught mothers to engage in imitative play with their 2- to 6-year-old children with autism. Increased gaze at the mothers' faces and creative toy play were found. In an interesting longitudinal study, Siller and Sigman (2002) found that certain behaviors of parents predicted subsequent development of the children's communication skills.

In particular, caregivers who synchronized their behaviors to their children's attention and activities helped children with autism develop superior joint attention and language when compared to parents who were less contingent or synchronized. In short, parents appear to be able to learn various methods of intervention to help them effectively interact with their young children with autism.

In this article we present the program evaluation results of a piloted parent training program, called The PLAY (Play and Language for Autistic Youngsters) Project Home Consulting model. Over the last seven years, the PLAY Project has established itself in southeastern Michigan as a multi-faceted, statewide, autism training and early intervention center. Fifteen agencies use the model in Michigan and, nationally, 50 agencies in 17 States are using the model. The PLAY Project's theoretical framework is based on the developmental, individualized and relationship-oriented (DIR) model of Stanley Greenspan MD (Greenspan, 1992; Greenspan and Weider, 1997a). The DIR model focuses on helping children with communication disorders improve social reciprocity and functional/pragmatic communication, an often ignored source of developmental delay (Simpson et al., 2003). The model is typically comprehensive, intensive and multidisciplinary in approach. It includes early referrals especially to speech and language and occupational therapy among other services. The project is consistent with National Research Council recommendations (Lord et al., 2001) including especially the need for intensity (up to 25 hours per week), one-on-one intervention, early start (ages 18 months to 6 years) and strategic direction (social reciprocity).

The PLAY Project has four clinical components:

- 1 *medical consultation* at the Ann Arbor Center for Developmental and Behavioral Pediatrics clinic with referrals to community resources
- 2 *training* including both *community-based workshops* for parents, pediatricians and professionals and *agency trainings* in The PLAY Project Home Consultation model
- 3 *parent support and advocacy services* called the Michigan Autism Partnership (MAP)
- 4 *The PLAY Project Home Consultation (PPHC)* program which is described in the methods section below.

To our knowledge, this is the first report of outcomes related to a programmatic, carefully operationalized approach based on the DIR model.

Methods

Subjects

All children referred to the University of Michigan Developmental and Behavioral Pediatrics Clinic from October 2000 to February 2002 were assessed clinically by the developmental/behavioral pediatrician (RS). Children were eligible if they were given a diagnosis of autistic disorder, pervasive developmental disorder not otherwise specified (PDD-NOS) or Asperger syndrome according to the *Diagnostic and Statistical Manual (DSM-IV)* criteria (American Psychiatric Association, 1994). Children were excluded if they had any of the following: an age less than 18 months or over 6 years at the time of diagnosis; residence of more than 60 miles outside the city of Ann Arbor (home consultants travel to families' homes); participation in any other intensive intervention (e.g. behavioral or social-pragmatic program delivering >10 hours per week of 1:1 or 1:2 teacher to pupil ratio); or the presence of a severe medical disability. Sixty-eight children had pre/post data available.

Consent procedure

The study design, protocol, and consent forms were reviewed and approved by the University of Michigan Institutional Review Board. Written informed consent was obtained from the child's parents or guardian before enrollment in the study.

Intervention: The PLAY Project Home Consultation program

Families with young children (1.5–6 years) who live in southeast Michigan are eligible to receive the services of The PLAY Project's three trained home consultants. The consultants, who have degrees in child development fields (one MSW, two recreational therapists), receive 1 month of structured, intensive and supervised training in the DIR theory and The PLAY Project model before beginning their work with families. Their training includes readings on the DIR theory and practice, the use of a structured training manual and regular supervision visits with the program's medical director. Home consultants then make monthly, half-day (3–4 hour) visits to families' homes to teach parents how to provide intensive, one-on-one, play-based (social pragmatic) services to their young children with autism. A key component of training involves review of videotapes obtained during these home visits and assessment of the child's progress. The program is paid for with a combination of fee for service and foundation grant funding. Average cost per family per year was between \$2500 and \$3000, depending on the number of annual visits (e.g. 10 visits/year = \$2500).

A detailed training manual is also used to train parents in The PLAY Project approach. All parents in this study learned about the play-based DIR methods through a 1 day workshop given by the project's director (RS). The aim is to help parents understand the approach needed to contingently and reciprocally engage their children a minimum of 15 hours per week even as the child makes developmental progress. Time spent can be in the form of structured sessions (e.g. 20 minutes play periods) or by taking advantage of incidental daily activities (i.e. mealtime, bathtime, bedtime). A clearly defined seven-step 'skill sequence' is used to train parents. In step 1, parents are first taught the principles of play-based intervention and how to strategically apply these principles to (a) their child's preferred way of relating, (b) their child's sensory motor preferences and deficits and (c) their child's current level of functional development. The principles are indebted in part to Greenspan's DIR theoretical framework. In step 2, they learn to assess their child's unique profile using the above principles and strategies. In step 3, a list of activities that are likely to be engaging is generated. In step 4, parents are taught methods of observing their child's cues, following their lead and 'reading' the child's intentions in order to increase reciprocal interaction. In step 5, specific techniques enhance the basic methods of following the child's lead. After parents observe the consultants modeling the skill sequence, then in step 6, video assessment offers immediate feedback to parents who can review how they are relating with their child. The consultants are taught to be supportive, non-critical and outcome oriented. In the final step, step 7, as the child makes progress up the functional developmental hierarchy, home consultants help parents refine the curriculum, methods and techniques. Thus, the skill sequence is repeated continuously so that methods are synchronized with the child's progress.

Each monthly home visit uses modeling, coaching, video assessment and written objectives to help implement and then refine the skill sequence. Modeling involves the consultants showing parents how to use the strategies, methods and techniques of the play-based approach. Coaching involves the consultant observing the parents as they play with their child and giving them positive feedback about their performance. A video assessment of parents' interactions occurs at the end of the session. Written objectives are derived from a clinical tool called The Pre-School Autism Rating Scale (PARS) (Klaw and Solomon, 1990) that profiles the young child with autism's functioning in key areas of interest (communication, reciprocal interaction, social skills, repetitive behaviors) geared to the DIR model. Home consultants review selected cases and videotaped segments with the project's medical director on a weekly basis. Observations and suggestions are recorded on a feedback form and shared with parents at the next visit. These sessions also serve as further training for the PLAY home consultants.

Assessment procedure

All children diagnosed with autistic spectrum disorders were evaluated, using a pre/post design, at the start and at the end of the first year of The PLAY Project's Home Consulting program. Baseline demographic characteristics included marital status, educational status of each parent, number of parents working outside the home, number of siblings, participation in special education preschool programs, and the number of hours and type(s) of interventions being used during the study period.

The following measures were administered before and after intervention to assess changes in children's behavior and development as well as in parents' behavior and satisfaction with home consulting services.

The Functional Emotional Assessment Scale (FEAS) ratings The FEAS (Greenspan et al., 2001) was used at baseline and the end of the study to measure changes in caregiver behaviors and in children's functional (social/pragmatic) development. The FEAS is a valid and reliable, age-normed, clinical rating scale that can be applied to videotaped interactions between children with autism and their caregivers. The FEAS is divided into two parts – caregiver and child – with six subtests in each part directly related to Greenspan's six functional developmental levels (FDLs: Greenspan and Wieder, 1997a): (1) self-regulation and interest in the world; (2) forming relationships, attachment and engagement; (3) two-way, purposeful communication; (4) behavioral organization, problem solving and internalization; (5) representational capacity; and (6) representational differentiation. According to Greenspan, typically developing children achieve early two-way communication by 7–9 months, which would correlate to an FDL 1–2. FDL 3 is achieved between 10 and 12 months, FDL 4 between 13 and 18 months, FDL 5 from 25 to 35 months, and FDL 6 between 3 and 4 years of life. On the FEAS, the higher the score, the more functional the child's behavior and the higher the child's developmental level. Children with autism are by definition delayed in their acquisition of functional development (i.e. engagement, initiation, reciprocal interaction, problem solving, etc.). Their FEAS scores will, as a result, be lower than would be expected of a typically developing, same-age peer.

The FEAS total scores were used as the primary measure of overall progress for the caregivers and children in this study. To give an estimate of clinical progress, FEAS subscale scores were used (referred to as FEAS scaled scores) based on a predetermined scoring system (see Table 1).

To establish inter-rater reliability for the FEAS, two raters, blind to the caregiver's and child's clinical status, were trained to reliability using a selection of 20 training tapes of children with autism who ranged in severity

Table 1 Assignment of scaled scores based on subscale FEAS scores*

<i>Functional developmental level</i>	<i>FEAS possible score by level</i>	<i>FEAS score to obtain 0.5 level score</i>	<i>FEAS score to obtain whole level score</i>
1	14	5–10	11–14
2	16	6–12	13–16
3	8	4–6	7–8
4	4	2	3–4
5	14	4–7	8–14
6	10	2–3	4–10

* Example: Child FEAS Level 1 score = 12 Clinical FDL assigned to child = 1
 Child FEAS Level 2 score = 8 Clinical FDL assigned to child = 0.5
 Child FEAS Level 3 score = 7 Clinical FDL assigned to child = 1

Total FDL assigned: 2.5

across FDLs. Tapes were prepared and reviewed to contain events that captured the items in the FEAS.

Clinical ratings Home consultants subjectively rated children's clinical progress using the six-point scale (with 0.5 increments) related to Greenspan's six functional developmental levels (Greenspan and Weider, 1997a).

Intensity At their first visits, families were supplied with a set of daily logs in order to help them estimate the average number of hours per week that they used PLAY Project methods as well as any other programmatic methods of intervention (e.g. speech and language therapy, occupational therapy, etc.) for their child. Home consultants recorded these estimates at the conclusion of each home visit in their clinical notes for the visit.

Client satisfaction survey Parents were asked to rate their experience with The PLAY Project's Home Consulting program at 3 months and at 1 year. Only the 12 month overall satisfaction survey results are reported, as the 3 month and 12 month survey results were nearly identical.

Statistical analysis

FEAS reliability To determine the reliability of the raters' scores across all of the testing videotapes, paired t-tests (two tailed) were used to test whether the differences between the raters' scores were equal to zero for each FEAS subscale and total score per both caregiver and child outcomes. An observer agreement analysis using a kappa statistic was applied to four measures (caregiver pre and post, child pre and post) to test the observer agreement between two raters. Data from 20 randomly chosen subjects

were selected from the pilot data and were tabulated. Finally, the training tapes were segregated from the testing tapes.

FEAS scores Total and scaled FEAS scores for the caregiver and the child were compared pre- and post-intervention using two-tailed paired t-tests. Scaled FEAS scores provide estimates of functional developmental level (FDL) using 0.5 increments from FDL 1 through 6 (i.e. 1, 1.5, 2, 2.5, etc.).

Autism severity was measured using a numeric scale based on initial medical evaluation by the developmental pediatrician. Medical evaluation scores reflect severity from severe, moderate or mild autistic disorder (5, 4, and 3, respectively,) pervasive developmental disorder not otherwise specified (2) and Asperger syndrome (1).

Intensity Intensity was rated based on the amount of intervention provided by parents of play-based intervention per week. Families consistently reporting 15 or more hours per week were rated as 1 (high intensity), 10 to 14 hours per week as 2 (moderate) and <10 hours per week as 1 (low intensity). Two-tailed paired t-tests were used to test the relationship of intensity to total FEAS scores.

Satisfaction surveys Parental satisfaction with PLAY project home consulting services was rated as very satisfied, satisfied, somewhat satisfied or not satisfied.

Clinical ratings Clinical estimates of improvement, from baseline to post-intervention, were provided by the home consultants using ratings of functional developmental level (FDL) 1 through 6 (i.e. 1, 1.5, 2, 2.5, etc.). To test clinical improvement between baseline and post-intervention, two-tailed, paired t-tests were used.

Results

Withdrawal and losses

Seventy-four children diagnosed with autistic spectrum disorders from the university's developmental behavioral pediatrics clinic were recruited to The PLAY Project within a 14 month period and enrolled in the study. Six families were unable to complete the year-long evaluation. Reasons for discontinuing participation included decisions to do other therapies ($n = 1$), moves away from the area ($n = 3$) and financial considerations ($n = 2$). Sixty-eight subjects were analyzed in this study.

Sample characteristics

Autism severity by DSM-IV diagnosis is depicted on Figure 1. Demographics and clinical characteristics of the sample are presented in Table 2. On average, children were aged 3.7 years ($SE = 0.2$) at enrollment with a range of 2 to 6 years. There were 51 boys and 17 girls. Average age at diagnosis was 35 months ($SE = 1.5$). There were three African-American children, one of whom is of mixed race. No Latino/Hispanic families were part of the pilot sample. One child had Down's syndrome and two children had seizure disorders. Approximately 70 percent of mothers and 70 percent of fathers had bachelor's degrees or above.

Other programs and interventions Twelve children less than the age of 3 were enrolled in an early intervention program which involved approximately 2 hours of school-district-based intervention per week. The remaining 56 children older than 3 years of age were enrolled in special education

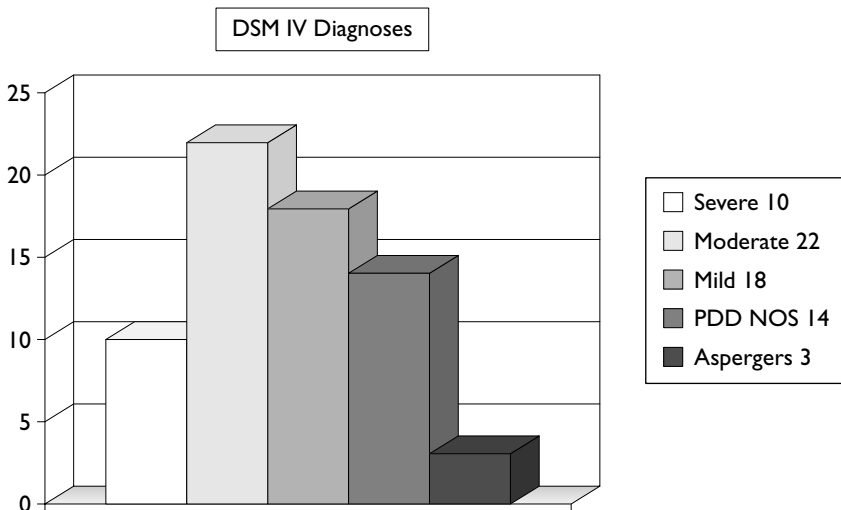


Figure 1 Sample characteristics by severity

Table 2 Parent and child characteristics

Variable	Mean	Range
Child age at entry (years)	3.7	2–7
Age, mother (years)	37	28–49
Age, father (years)	38	27–53
Married (%)	91	
Number of siblings	0.75	0–3

preschool programs which typically provided four to five half-days (approximately 2½ hours each day). Importantly, none of the Michigan intermediate school district preschool programs serving the children in this study routinely provided intensive (more than 5 hours per week), individualized behavioral interventions (e.g. ABA) to any of the children in this study.

Functional Emotional Assessment Scale

Parent and child outcomes Table 3 summarizes the primary caregiver and child FEAS outcome measures. There was no change in parents' FEAS scores before and after PLAY implementation ($p = 0.63$). However, there was an increase in the children's total and scaled FEAS scores over the 12 months of the project ($p \leq 0.0001$). Based on FEAS scaled scores, 45.5 percent of children made good to very good functional developmental progress over the study period. No statistical relationship was found between initial ASD severity and FEAS total or FEAS scaled scores.

Intensity and outcomes We compared the FEAS 'scaled scores' (Figure 2) to parents' reports of intensity in delivering the weekly hours of intervention. While not statistically significant, our data suggest an association between fewer hours per week of intervention and lower outcome scores ($p = 0.09$).

Reliability Using standard statistical methods we found there to be high reliability ($p \leq 0.05$, two-tailed t-test) between the two raters' scores in measuring both the caregiver's and child's total and scaled FEAS score at pre- and post-intervention testing. Similarly, kappa analysis (Fleiss, 1975; Fleiss and Cohen, 1975) between raters for individual items, pre to post for caregiver and child, on the FEAS revealed very good agreement: caregiver pre-test, kappa = 0.71 (95% CI, 0.66, 0.77); caregiver post-test, kappa = 0.64 (95% CI, 0.58, 0.70); child pre-test, kappa = 0.78 (95% CI, 0.73, 0.82); child post-test, kappa = 0.65 (95% CI, 0.60, 0.70).

Table 3 FEAS: caregiver and child outcomes (N = 68)

	Pre	Post
FEAS caregiver	86	86
FEAS child	38	45*
FEAS scaled child	3.6	4.5*
Clinical scores	2.5	4.2*

* $p \leq 0.0001$.

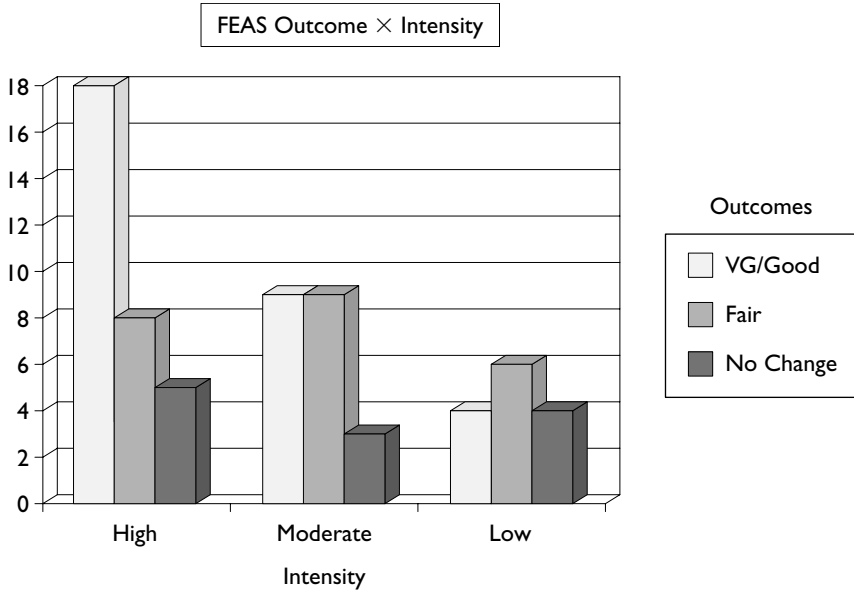


Figure 2 Comparison of scaled FEAS improvement and intensity

Clinical outcomes

Children’s progress using clinical FDL levels increased significantly ($p < 0.0001$) from baseline to the end of the first year’s intervention (Table 3). Based on clinical scores, 52 percent of children made very good (1.5 FDLs or better) clinical progress over the study period, with 14 percent making good progress (1 FDL). Clinical scores were also compared to FEAS scaled scores (Table 4). Clinicians consistently over-rated improvements when compared to the FEAS scaled scores of blinded raters. No statistical relationship was found between initial ASD severity and clinical scores.

Table 4 Clinical improvement by FEAS outcome

Clinical improvement (1L,2M,3H)	FEAS outcome			Total
	G/VG	F	NC	
Frequency				
VG (>1)	24	13	8	45
Good (=1)	4	6	3	13
Fair (≤ 0.5)	3	4	3	10
Total	31	23	14	68

Satisfaction

Of the 68 families, 74 percent ($N = 50$) of families completed satisfaction surveys. Of these, 70 percent ($N = 35$) were very satisfied with The PLAY Project, 10 percent were satisfied and 20 percent were somewhat satisfied. None were dissatisfied. Parents who were somewhat satisfied most commonly rated The PLAY Project as not providing enough services.

Discussion

This is the first report of a program evaluation based on Greenspan's DIR (developmental, individual differences, relationship-based) theory (Greenspan, 1997). Over the last 4 years, the PLAY Project has piloted a community-based, 'train-the-trainer' model with the aim of translating DIR's broad theoretical principles into a well operationalized, community-based intervention program.

Parent skills

The PLAY Project has taken the DIR theory and created a manual, training, and evaluation method. The 'PLAY skill sequence' (see 'Intervention' above), the use of videotape assessment and the regular, half-day, monthly home visits appear to be an efficient and cost effective way to teach families in a community-based setting. We find that a large majority of parents are capable of interacting with their young children with autism in a reciprocal and contingent manner. Indeed by the time of the first video evaluation 85 percent of parents were rated as appropriately interactive. Families often attended community-based workshops before beginning The PLAY Project's Home Consulting program. They may also have received one visit with the consultant before the initial FEAS was done. Despite sequential enrollment of children and families, the sample reflects a middle- to upper-middle-income group characteristic of the population served in the Ann Arbor, Michigan vicinity. Indeed, a large percentage of the parents were well educated with intact families. Many families had one parent who was not working. The number of siblings in the family was limited to less than two on average. These facts may, in part, explain the ability of most families to play in a sensitive and contingent fashion. Alternatively, this group of families may have had the innate ability to interact well with their children. In short, the families in this pilot study were self-selected and likely to benefit from a parent training model to help their young child with autism.

Intensity and outcome

On the other hand, there was a nearly statistically significant trend that suggests that parents who were not able to spend as much time in interaction

(low intensity) had children who did not make as much progress regardless of functional developmental level. This dose dependent outcome suggests that it is not enough to know what to do; the number of hours per week spent in intervention also matters (Lord et al., 2001).

Children's developmental gains

The results also suggest that, on the more conservative FEAS ratings, 45.5 percent of the children participating in the project made good to very good functional developmental gains. When rated clinically by the home consultants, 66 percent of the children rated made very good gains. Both FEAS scores (FEAS total and FEAS scaled scores) and the clinical scores (clinical FDLs) were highly statistically significant pre to post. A gain of one or more levels of functional development within an 8–12 month time frame is also clinically significant. When a child moves from an FDL 2 to an FDL 3, for instance, this represents the difference between being self-isolating and being able to consistently communicate in a two-way interactive fashion. From an age norm perspective this represents an advance of between 6 months and a year in development. Thus, nearly half of the children made clinically significant developmental gains, with most making very good (i.e. greater than 1.5 FDL of progress) clinical gains.

While the families were highly motivated and skilled at interaction, the children in the sample, however, did represent the typical range of severity along the autistic spectrum. There was approximately equal representation between mildly, moderately and severely affected individuals. Diagnosis was made using the DSM-IV criteria by an experienced pediatric clinician. Boys were overrepresented in the typical 4:1 ratio reported in the literature and most children (70%) were between 2 and 4 years of age. Statistically there were no differences in outcomes based on initial severity. The literature consistently reports poorer outcomes for more severely affected children (Harris and Handelman, 2000). Clinically, it is very hard to predict which children will do well and which will not, especially when the children are very young (18 months to 3 years). Since the groups, when divided into severity types, were relatively small, type II errors cannot be ruled out. The results of child outcomes cannot readily be explained on the basis of selecting high-functioning children with autism.

Study limitations

Several limitations of the present study need to be noted. First, without a control group, it is impossible to know whether the changes in post FEAS scores are directly attributable to the home-based training. One goal of a pilot study is to pilot the procedures. A phase II comparative study is planned. Second, the finding that the child's FEAS scores were lower

(though not quite statistically significant) for the children whose parents had the fewest hours of interaction suggests that parents' time of involvement may be more important than the specific effects of the training program. It is a tenet of the DIR model, however, that in order to help the child increase functional development they need the guidance of knowing what to do at each functional developmental level. It is this guidance that is offered by the home consultants and incorporated into the iterative PLAY skill sequence. Nonetheless, theoretically, simply instructing a parent, who is already skilled in interaction, to play 15 hours per week without further guidance may be enough to induce changes in the child's functional development over time. Future studies should include an 'education only' control group that addresses this issue.

Nearly all children in this study were simultaneously enrolled in standard special education early intervention or preschool programs. While it could be argued that these programs confound the outcomes, the total number of hours of other one-on-one, intensive interventions was very limited. In Michigan, intensive interventions in the school system (i.e. ABA, DIR, etc.) are not typically provided. The literature suggests that even when children are given up to 10 other hours of intensive intervention it does not substantially affect the course of their development (Lovaas, 1987). Recent evidence, however, from more 'social pragmatic' intervention studies suggests that 15 hours per week may be sufficient to achieve substantial developmental gains (Aldred et al., 2004; Mahoney and Perales, 2005). The development of children with autism who do not receive substantial intervention is poor. In the longest prospective follow-up study with a sound methodological design (Rutter, 1970) fewer than 2 percent could be considered free of clinically significant problems by adulthood. Others have found similar long term courses for children receiving traditional school-based programming alone (Freeman et al., 1991; Nordin and Gilberg, 1998). Thus our results cannot be explained easily on the basis of a natural course of improvement.

Methodological weaknesses

There were a number of other methodological weaknesses in this pilot project. More in-depth, repeated and objective measures of development (i.e. language, IQ and/or developmental outcomes) will need to be added to improve the measurement of the outcomes. Parent measures of stress and the impact of this demanding method of intervention should be added to the evaluation protocol (Bristol, 1985; Shorten, 1996). Intensity was a poorly operationalized concept. Parents were poor at keeping daily logs and their rough estimates of interaction are likely to be inaccurate especially given the social desirability of appearing to spend more time with your child. Though children improved substantially on the FEAS, they did so

usually with one primary caretaker. Whether or not the gains they made generalized to other environments should be measured in future studies of this kind.

Conclusion

The DIR model supports parents as their child's primary play partners and offers naturalistic play-based interactions that engage the child's affect. Greenspan's 'affect diathesis hypothesis' asserts that it is affect that drives meaningful development. While children with autism clearly can benefit from a 'drill for skills' approach, it is important to recognize that parents also play with their children as a primary activity. It is a tenet of The PLAY Project that a child with autism's love of other people will depend on other people doing what he loves. Given the increasing prevalence of these disorders and the extraordinary costs of providing therapist delivered intensive intervention, more rigorous studies are urgently needed to establish the clinical and cost effectiveness of this type of low cost, play-based approach.

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