

## The Murdoch Early Intervention Program After 2 Years

Jay S. Birnbrauer and David J. Leach

*Murdoch University*

The goal of the Murdoch Early Intervention Program (MEIP) was to replicate the intensive early intervention program designed by Lovaas for children with severe developmental disability and autism. This paper describes the objectives, methods, and the results as of 24 months. Although MEIP differs from Lovaas's model in several respects, and the children have been generally less capable at the outset, results are interpreted tentatively as being as predicted. Four of 9 experimental children have shown signs of approaching normal levels of functioning whereas 1 of 5 control children has made significant progress. Improvements in the remainder of the children are rated as moderate to minimal. These preliminary results are presented to encourage others working with children with autism and other difficult-to-teach children to publish their methods and results. The small number of children in any one locality, and the high cost of controlled studies indicates the necessity for accumulating findings across service providers.

Lovaas (1987) reported that approximately half the children who had participated in an intensive early intervention program achieved levels of performance that fell within the normal range on a variety of measures by the time they reached primary school. None of the children in his control group made comparable gains. McEachin, Smith, and Lovaas (1993) followed up these children as adolescents and found that 8 of the 9 "good outcome" children were indistinguishable from a sample of randomly selected peers. That is, they displayed no significant autistic symptomatology.

Given the poor prognosis associated with autism, these results are extraordinary and have been the subject of considerable discussion (Baer, 1993; Foxx, 1993; Kazdin, 1993; Mesibov, 1993; Mundy, 1993; Prior, 1992; Schopler, Short, & Mesibov, 1989; Smith, McEachin, & Lovaas, 1993). The one point that authors agree upon is that these results need replicating by independent investigators.

In general terms, the Lovaas program is quite

consistent with the points which Clunjes-Ross (1988) suggested are agreed upon by workers in the field of autism: (a) Intervention should commence early — as soon as needs are assessed, (b) objectives should be specified clearly, (c) teaching methods should be applied precisely, (d) teaching and learning opportunities should be maximised, (e) an interdisciplinary approach should be taken, (f) parents should be actively involved, and (g) provision for follow-up should be made.

The program differs from other behavioural programs for children with autism in two major ways. First, the goal is distinctive. That is, the objective is to completely eliminate autistic characteristics. While other early intervention programs have reported significant gains, none of the children was said to have "recovered" from autism (Anderson, Avery, DiPietro, Edwards, & Christian, 1987; Harris, Handleman, Gordon, Kristoff, & Fuentes, 1991). Second, and according to Lovaas related to the first, the program is very intensive. Lovaas advocates treatment for

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Requests for reprints should be sent to either author, Department of Psychology, Murdoch University, Perth WA 6150, Australia.

an average of 40 hr of 1:1 structured training per week with parents also conducting training in the normal course of daily activities for up to 2 years. Intensity also refers to presenting repeated trials rapidly and with precision so that no training time is wasted.

In addition to positive empirical results, Lovaas's procedures have been described in sufficient detail to enable replication (Lovaas, Ackerman, Alexander, Firestone, Perkins, & Young, 1981) and the behavioural principles on which the program is based have been applied successfully to a wide range of problems and populations. However, it is true that since the children's needs and competencies vary considerably, it is necessary to design individualised curricula and specially trained staff are required (McEachin et al., 1993).

Arguments against the Lovaas model include its high labour intensity and the intrusiveness and aversiveness of the methods. A number of highly trained therapists are required to conduct the program properly. This problem has been solved by using volunteers. Intrusiveness follows from its being a home-based program requiring that a portion of the child's home be dedicated to training for many hours per week. Since we shared concern about possible adverse effects upon parents and siblings, our replication protocol included monitoring familial stress and we worked collaboratively with the parents. Our aims were to attend to their personal and other family needs and to include them in every aspect of the program so as to empower them.

The aversive features that cause concern include controlling access to primary reinforcers, for example, food, drink and comforting; and the use of ignoring, time-out, overcorrection procedures and stern reprimands. Withholding reinforcers is essential because a fundamental aspect of behavioural training is differential reinforcement, that is applying positive consequences to instances of appropriate behaviour and withholding these consequences when behaviour is inappropriate. Since a salient characteristic of children with autism is their inattentiveness to social positive consequences, food and favoured objects and activities must be controlled at first. Theoretically, if social and other more acceptable and natural events are paired with primary reinforcers, social events will become effective reinforcers. The program includes many trials of such pairing to attain this goal.

Another aversive characteristic is that instruc-

tions and consequences are presented emphatically to gain the child's attention and interrupt stereotyped behaviour so that alternative behaviour can be prompted and reinforced. Although the Lovaas program includes contingent physical aversives (i.e., usually an open-handed slap on the thigh to stop self-stimulatory and aversive behaviour that does not respond to other methods), we have not employed physical punishment programs with any of the MEIP children. This decision was taken despite Lovaas's conclusion that "contingent aversives were isolated as one significant variable. It is therefore unlikely that treatment effects could be replicated without this component" (Lovaas, 1987, p. 8).

Our purpose is to describe the design, distinguishing features and results of the Murdoch Early Intervention Program within the first 2 years. It will be seen that we have departed from the Lovaas program in several respects.

## METHOD

### *Participants*

We sought children who (a) were 24 to 48 months of age, (b) met the DSM III-R criteria for Pervasive Developmental Disorder (PDD) Autistic Disorder and PDD Not Otherwise Specified, (c) had attained intellectual and adaptive behaviour functioning levels of less than borderline, and (d) were free of sensory or physical impairments that would require special materials. Fifty referrals were received from agencies concerned with autism and developmental disabilities, child health centres and medical practitioners in the Perth Metropolitan area.

Following referral, a detailed history was obtained and the Vineland Adaptive Behavior Scale (ABS) was administered by a staff member, child personality and stress inventories were completed by the parents, and the child's cognitive functioning and language level were assessed by an independent clinical psychologist. The child's behaviour was also video-recorded in a structured play and instructional situation. The assessment protocol is shown in Table 1.

Thirty-three children were excluded: 22 because they were not diagnosed as autistic; 8 were older than 48 months; and 3 lived too far away. A place in MEIP was offered if the child met the criteria, a Program Coordinator was available and the distance from Murdoch University was not prohibitive. The decision to participate was finally the family's. Families

TABLE 1 Assessment Battery

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Intellectual Functioning (Administered Annually)
Bayley Scales of Infant Development
Stanford-Binet Intelligence Scale for Children
Leiter International Performance Scale
Peabody Picture Vocabulary Test; WIPPSI; WISC
Vineland Adaptive Behavior Scale (Administered Annually)
Language (Administered Annually)
Reynell Developmental Language Scale
Receptive-Expressive Emergent Language Scale (Bzoch & League, 1971)
Parenting Stress Index (Abidin, 1986) (Bi-annual)
Personality Inventory for Children (Wirt, et al. 1984) (Bi-annual)
Behavioural Observations (Year 1 – Quarterly; Years 2 & 3 – 6 monthly) observation of play, self-stimulatory behaviour, withdrawal, compliance and imitation under controlled conditions

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who lived too far away and who wished to join after our complement of experimental children was chosen were invited to provide control data.

Places in MEIP were offered to 11 children. Ten families accepted, but one family discontinued within the first 6 months for reasons that were not clear. Eight families agreed to participate in the control group. However, complete sets of data have been collected on only five of those families. Characteristics of MEIP and the control group at referral are described in Table 2. (We could find no evidence that attrition introduced any bias in the control group — that is, the summary data for the 8 control children were virtually identical to the data shown in Table 2.)

Table 2 indicates that the control and MEIP groups were closely matched. They were similar also in other variables: Eight of the 9 MEIP children and 3 of the 5 control children were from two-parent families. Although MEIP included 4 girls and 5 boys and the control children were all boys, the results were not affected by this difference. The results of the Personality Inventory for children lend support to a diagnosis of autism, as high scores on Adjustment, Depression, Withdrawal, Psychosis and Social Skills suggest childhood psychosis according to Wirt, Lachar, Klinedinst, and Seat, (1984).

From direct observation and parental reports, we calculated an estimate of pathology as used in Lovaas (1987). The proportion of children to whom each item applied is shown in Table 3. On

all items except severe tantrums, the control group exceeded MEIP. Four children, 2 in each group, were credited with some meaningful words. Their words were predominantly echolalic with only infrequent, appropriate usage. Although tantrums sometimes included hitting and biting others and self-injurious behaviour, none of the children referred displayed self-injurious behaviour of a degree that demanded immediate attention. Play consisted largely of mouthing and carrying objects about and repetitive use and lining up objects with no child engaging in social play. Self-stimulatory behaviour included twirling hair, slapping self, licking objects, toe walking, aimless pacing about and hand flapping. Typically, the children displayed across-the-board deficits in self-help and daily living skills as reflected in ABS scores of 11 to 25 months. The highest ABS score for each child was almost invariably in the motor skills domain.

#### *Standardised Measures*

As set out in Table 1, assessment of intellectual functioning, language development and adaptive behaviour were conducted annually by experienced clinical psychologists who did not know the group placement of the children or how long they had been in the program. (The initial Vineland ABS, however, was administered by our staff.) The tests were chosen to closely match those used in Lovaas (1987). The independent assessors were asked to use the tests in

TABLE 2 Summary of Participant Characteristics

	MEIP (N = 9)		CONTROL (N = 5)	
	Mean	Range	Mean	Range
Age (Mos)	39	32-47	33	22-47
Adaptive Behaviour Composite (Mos)	18	15-22	17	11-25
Language Age (Mos)	11	5-20	13**	6-24
Bayley MA (Mos)	20*	10-25	18**	10-23
Bayley Motor (Mos)	22*	16-31	21**	11->30
<b>Personality Inventory (T-scores)</b>				
Adjustment	91	67-109	88	76-95
Depression	80	23-89	72	51-94
Family Relations	61	44-80	58	45-77
Delinquency	67	54-93	68	49-87
Withdrawal	76	65-92	59	46-86
Anxiety	55	39-59	50	36-63
Psychosis	120	120-120+	107	102-115
Hyperactivity	51	32-65	49	47-52
Social Skills	84	57-103	69	59-78
<b>Parenting Stress Index</b>				
Mother (Percentile)	95	85-99+	95	90-99+
*	N = 7			
**	N = 4			

TABLE 3 Severity of Disorder at Referral (0 Mos) and 24 Months Later

CHARACTERISTIC	MEIP		CONTROL	
	0 Mos	24 Mos	0 Mos	24 Mos
No Meaningful Words	7/9	2/9	3/5	2/5
Not Affectionate	7/9	0/9	1/5	1/5
No Toy Play	6/9	0/9	2/5	1/5
No Peer Play	9/9	3/9	4/5	2/5
Self-stimulation	9/9	9/9	4/5	3/5
Severe Tantrums	5/9	2/9	4/5	4/5
Not Toilet Trained	7/9	1/9	4/5	2/5

the list that would yield the best estimates and to administer the tests as set out in the test manuals. As a rule, testing was conducted in the child's home with the mother present; if necessary, the examiners returned to complete testing on another day. In addition, parents completed the Parenting Stress Index and Personality Inventory for children biannually.

#### *Behavioural Observations*

Videotape recorded behavioural observations were conducted in the Murdoch University Applied Psychology Clinic on referral, quarterly during the 1st year in the program and biannually during the child's 2nd year. A staff member, who was present with the child and mother in the testing room throughout, followed a standard set

of instructions and played the role of "stranger". Each session consisted of four parts: Play with Parent, Play Alone, Instruction Following and Imitation with Parent and Instruction Following and Imitation with Stranger.

*Play.* Two 5-min samples of play were obtained using one of 2 sets of 12 toys and two of the child's favourite toys. In the first sample, the child and his or her mother (in most cases) played together; in the second, the child played alone with parents and a staff member observing, intervening only when the child was off camera. These results will not be reported because they were highly variable and showed no discernible changes across time.

*Instruction following and imitation.* Immediately following play, the mother was instructed to present a series of eight nonverbal imitation items, (for example, "Do this" and demonstrated clapping hands); and seven simple instructions (such as "Give me the ball") with a ball, car, teddy bear, and block present on the table. Then, 19 verbal items (ranging from "Say 'BOO'" to "What's your name?") were presented. The mother was encouraged to obtain the best performance she could without prompting. These procedures were repeated with the staff person and mother reversing roles. The staff person was permitted to use only social and verbal reinforcers. Each session required 30 to 45 min.

*Scoring.* The videotapes were coded by independent raters who did not know the group placement of the child and tapes were presented in a random order so that no child was rated sequentially. Instruction-following items were scored as correct or incorrect. Correct responses were defined as "responding appropriately, in full, within 3 s of the adult's instruction prior to the use of any prompt". The average and range of interobserver agreement was 96.75% (87.5–100%) and 92.98% (75–100%) for the nonverbal and verbal portions respectively. Self-stimulatory (stereotyped) behaviour, echolalia, withdrawal (verbal complaining and/or attempting to escape) and aggressive and destructive behaviour were counted throughout the assessment. The average interobserver agreement was 92.67% (63.60–100%). (A detailed description of the behavioural assessments is available from the authors.)

#### *Program Organisation*

Each treatment team consisted of one of the authors, a Program Coordinator, the parents and

up to 24 volunteer trainers at any one time. The principal criteria for selection as a program coordinator were experience in using behavioural techniques with children with developmental disabilities and in curriculum planning. Program Coordinators were employed on the basis of the equivalent of 1 day per week per family.

When a place in MEIP was offered, parents were given a contract which informed them about the operation of the program and detailed mutual commitment and rights. (Copies of the contracts are available on request.) Parents' responsibilities were to recruit one-half of the volunteers, to purchase and have accessible the materials and reinforcers required by the program, to conduct at least one training session per week and to supervise the volunteers as needed. Parents were involved in welcoming and orienting new volunteers, hosting team meetings every 3 weeks and conveying changes in instruction by word and demonstration.

Volunteers were obtained through announcements at the universities in Perth and media releases. Prospective volunteers received information about autism and the program and a statement of their ethical responsibilities. They then observed training, and if still interested, began on-the-job training. Volunteers were asked to commit themselves to a minimum of one 2.5-hr session per week for 4 months. Although the modal time for participation was 4 months, many volunteers served throughout the 2 years since the program began. Volunteer contributions were acknowledged with a certificate of thanks and some students were able to combine the practical work with assignments in their course-work. Leach, Birnbrauer, Chapman, Pailthorpe and Strong (1991) discuss the volunteers in more detail.

#### *Program Procedures*

Details of each child's program were designed by the Program Coordinator and mother in sessions in the home during which the child's skills were assessed. Since all the children were non-compliant, engaged in high rates of self-stimulatory behaviour and were nonverbal, compliance with simple commands, imitation ("Do this") training, object discrimination ("Give me doll") and communication formed the bulk of the 1:1 work. This training was interspersed with large motor activities in which response demands were less, but contingencies remained in effect. Thus,

each session consisted of cycles of several tasks interspersed with play periods. Later sessions included excursions to a local park or shop.

Each lesson (task or drill) was conducted for 10 to 20 trials depending upon the child's performance. If the child made three consecutive correct responses, the task was terminated for that cycle. On the other hand, to prevent the child from learning to escape through misbehaviour or making mistakes, tasks were not terminated until the child had made a successful response. Training on a particular item continued until the child made three of four correct, unprompted trials in succession at the *beginning* of the drill. When this was achieved by three pairs of volunteers, the item was placed on "maintenance" and a new item replaced it in the drill. Maintenance drills were tests or probes. If the child did not respond correctly at least 80% of the time on a previously taught item, it was added to the drills for intensive retraining.

Describing the programs adequately here is impossible, especially since they were tailored to each child's behaviour and changed as criteria were met. The best single source for program design and rules is Lovaas, Ackerman, Alexander, Firestone, Perkins, and Young (1981). However, we did not hesitate to draw from other curricular materials and special programs were designed to address particular problems in, for example, dressing, social play, toilet training and self-stimulatory behaviour.

*Volunteer records.* Specific items, whether responses were correct, prompted or an approximation, and achievements were recorded each session. Positive responses and inappropriate behaviour between drills were also counted. Volunteers wrote a brief summary of the session in which they noted spontaneous and new behaviour, queries, suggestions, and problems. The parents maintained an attendance record and, at the end of their participation, volunteers completed a questionnaire about their experience, why they joined and why they were leaving.

## RESULTS

All data are based on tests given approximately 24 months from assessments which took place immediately after referral. Mean duration from commencement of MEIP was 21.56 months with a range of 17 to 24 months.

### *Program Intensity*

The average number of hours per week of pro-

grammed training for MEIP children was 18.72 (range 8.7 to 24.6 hr). There was considerable variation across the calendar year; hours were lowest during the summer, during university examination periods and between semesters. Records during a period in which children had full complements of volunteers yielded an average of 28.7 hr per week (range 19.5 to 35 hr).

### *Independent Assessments*

Individual results are ordered within groups in decreasing magnitude of gains in Table 4. This method of presenting the results was chosen because of large within-group variances and what appeared to be the emergence of bimodal distributions in both groups. Results on the Vineland Adaptive Behavior Scale and Reynell and REEL Language assessments have been converted into change per month over the 24-month period. A score of 1.00 thus represents normal developmental rate. Rates in excess of 1.00 were necessary, however, for children to catch up with their CA. Given the variety of intelligence tests attempted and a high rate of no interpretable results (NS) at referral, we present only the IQ test results at 24 months.

The first subgroup are judged as showing high improvement on the basis of their achieving IQs exceeding 80 on at least one scale and substantial gains in language and adaptive behaviour. It needs to be noted, however, that adaptive behaviour and language continued to be well below chronological age in all cases. Four MEIP children were classed as showing high improvement and 5 moderate to low. In the control group, Child L achieved substantial gains on every domain of the ABS and in expressive language but not on the cognitive tests. The other 4 children were classified as showing moderate or minimal gains.

The initial and 24-month data on severity in Table 3 illustrate some of the qualitative differences between the subgroups. The high achieving group had begun to communicate, engage in appropriate play with toys and peers, display few tantrums, were toilet trained and were learning other self-help skills. At the other extreme, 2 children within the MEIP sample and 3 control children had not acquired meaningful spoken words, signs or pictures, toy play and peer play and showed little interest in their physical and social environments. The groups did not differ in displaying affection and self-stimulatory behaviour as all but 1 control subject was rated

TABLE 4 Results of Independent Assessments of Adaptive Behaviour (ABS Composite), Receptive and Expressive Language and Intelligence (Stanford-Binet and Leiter Tests)

Group/ Child	ABS Comp <sup>a</sup>	Language		IQ	
		Rec <sup>a</sup>	Exp <sup>a</sup>	SB	Leiter
MEIP — High Achieving					
A	.71	1.21	1.17	73	103
F	.79	1.17	.92	75	89
H	.58	.54	.71	56	89
B <sup>b</sup>	.25	.25	.17	79	97
MEIP — Moderate — Low Achieving					
C	.25	.46	.25	NS	NS
D	.17	.13	.08	72	NS
J	.13	0	.29	52	NS
E	0	.46	.46	51	NS
G	.08	0	0	NS	NS
Control — High Achieving					
L	1.38	.38	.79	66	67
Control — Moderate — Low Achieving					
K	.38	.54	.29	60	NS
M	.25	0	0	NS	48
N	0	0	0	NS	NS
O	-.04	.25	0	NS	NS

<sup>a</sup> Change/24; 1.00 = normal rate of development

<sup>b</sup> Child does not speak; communication by writing not reflected in these assessments.

as showing affection and all MEIP children and 3 of 4 control children continued to exhibit self-stimulatory behaviour. It should be noted that Child L in the control group was the most advanced at referral in both samples and displayed the least number of the features listed in Table 3.

#### *Behavioural Assessments*

*Instruction following and imitation.* Figures 1 and 2 display the average performance of the MEIP and control groups in the behavioural observations requiring nonverbal and verbal responses respectively. At initial testing, as Figure 1 shows, the groups were closely matched in correct nonverbal performance with average scores of 30% with the parent and 15% with the stranger. In Figure 2, it can be seen that verbal scores were 0% for MEIP and 15% for controls, the modes in both groups being zero. Incidence of self-stimulation and withdrawal was high and comparable across groups; scores ranged from 50% to 90% of the intervals observed.

At the 3-month test, MEIP children showed

increases in nonverbal correct responding and reductions in withdrawal on both the nonverbal and verbal parts of the test. The criterion for correct nonverbal responses was attained by the 24-month assessment and criterion for withdrawal at 6 to 12 months. In contrast, correct responding by control children changed very little and withdrawal remained high.

The results were different with self-stimulatory behaviour. Average scores of 35% and 50% in the MEIP and control groups respectively at 24 months were unacceptably high.

The curves for verbal responding in Figure 2 show little between-group differences but inspection of individual data permit different conclusions. The control group included 2 children who began with higher scores that were maintained and 3 children who obtained nil correct responses throughout. In MEIP, 8 of the 9 children were continuing to show some improvement. The higher score at 24 months with parent, for example, was attributable to 1 child who began to speak about that time and a second who achieved correct responses on those items which could be answered with signs.

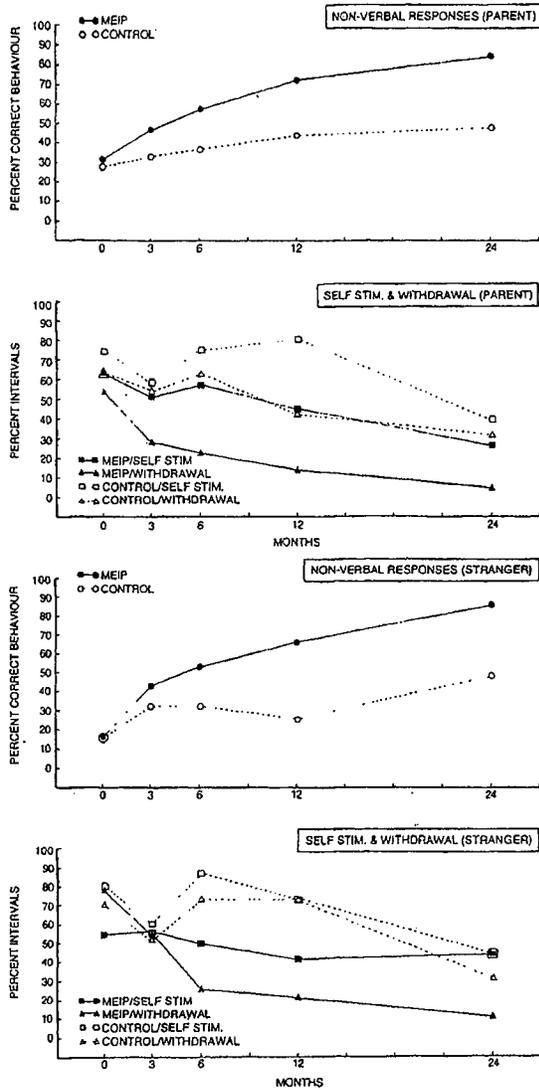


FIGURE 1 Average Performance of the Experimental (MEIP) and Control Groups on the Nonverbal Instruction Following and Imitation Subtest of Behavioural Assessments Conducted under Controlled Conditions With the Child's Parent and an Unfamiliar Adult ("stranger") as Instructors.

As in the nonverbal portion of the assessment, withdrawal behaviour by MEIP children diminished rapidly. The decrease in withdrawal may be particularly significant as the children were in a situation in which rates of success were very low and probably, therefore, stressful for them. Although self-stimulatory behaviour declined, it did not reach an acceptable level.

#### Personality

Table 5 shows the initial and 24-month results

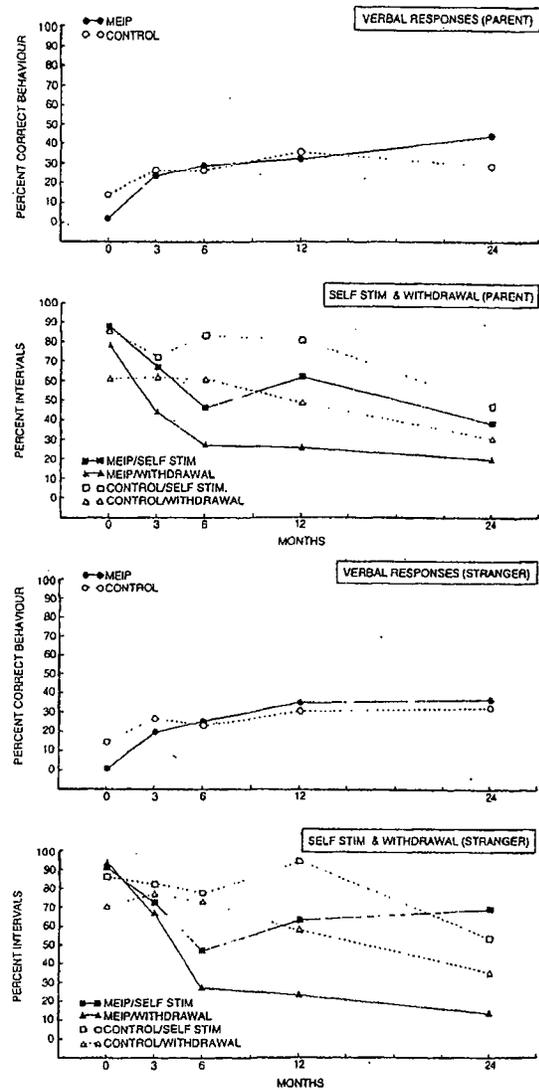


FIGURE 2 Average Performance of the Experimental (MEIP) and Control Groups on the Verbal Subtest of Behavioural Assessments.

of the Personality Inventory for Children (PIC). None of the 7 MEIP children who displayed the psychotic pattern (Adjustment, Depression, Withdrawal, Psychosis, and Social Skills) did so at 24 months, although all remained in the clinically significant range on the psychotic subscale itself. One control child achieved all normal scores at retesting whereas the other 4 continued to exhibit the "psychotic pattern". The high Psychosis scores are consistent with the high incidence of self-stimulatory behaviour and low

independent play noted above. However, the changes suggest that the MEIP children, on the whole, were becoming more sociable and socially competent children.

#### *Parental Stress*

Initial composite scores on the Parenting Stress Index (Abidin, 1986) are listed in Table 2. With the exception of a few fathers, all had stress levels which exceeded the top of the normal range in the standardisation sample (80th percentile). At 24 months, the PSI was repeated by the children's mothers. MEIP mothers decreased on average 8.5 points in the Child Domain, 13.8 points in the Parent Domain and 12.8 points in composite score. Thus, the mean for mothers at 24 months was 82, a quite considerable improvement. In contrast, the composite scores of control mothers decreased 1.8 percentile points. They reported the same levels of stress in the Child Domain and two reported quite substantial increases in the Parent Domain. Thus, MEIP did not increase stress. Instead, it was associated with reductions in stress that were not evident in the control group.

### DISCUSSION

#### *Integrity of the Replication*

*Sample.* The MEIP sample met criteria for autism as judged by independent professionals and verified by PIC scores. Although the MEIP children were slightly older on average than the sample in Lovaas (1987), that is 39 months versus 35 months, and MEIP children had lower scores in adaptive behaviour and intelligence

assessments, differences were not great. We favour the conclusion that the MEIP sample is a close approximation. Perhaps the most important point to note is that overall, the MEIP sample could not be said to include higher functioning children, a criticism that Schopler, Short, and Mesibov (1989) made of Lovaas's sample. (See also the reply by Lovaas, Smith, & McEachin, 1989.)

*Intensity.* Training hours fell short of our goal of 30 hr per week and far short of the 40 hr per week that Lovaas regards as necessary. On this indicator, our replication departed significantly. Lovaas, however, has not documented hours of training and we are not certain of the basis of his calculations. Our figures exclude time in school and any training that parents may have conducted in the course of daily routines; it is not clear that his estimates do. Certainly our intent was that "treatment could take place for almost all of the subjects' waking hours, 365 days a year" (Lovaas, 1987, p. 5). We regarded 30 hr of programmed training, that is two sessions per 6-day week, as a realistically attainable figure; but even then, illnesses, holidays, untoward weather and the numerous other daily crises that affect families and volunteers resulted in a lower yearly average.

McEachin et al. (1993) report an average of 2.5 years of intensive training *before* the children entered first grade; that is approximately 2 years of home-based instruction followed by 1 year of combined home-based training and kindergarten. This pattern will have been followed with only 1 MEIP child. The remaining

TABLE 5 Proportion of Children whose Personality Scores Exceeded Normal Range at Referral (0 Mos) and 24 Months Later

Personality Inventory for Children Subscale	MEIP (N = 9)		CONTROL (N = 5)	
	0 Mos	24 Mos	0 Mos	24 Mos
Adjustment	7/9	4/9	5/5	4/5
Depression	9/9	0/9	4/5	4/5
Family Relations	2/9	0/9	1/5	1/5
Delinquency	3/9	1/9	2/5	0/5
Withdrawal	7/9	1/9	3/5	3/5
Anxiety	0/9	0/9	0/5	0/5
Psychosis	9/9	9/9	5/5	4/5
Hyperactivity	0/9	0/9	0/5	0/5
Social Skills	8/9	4/9	2/5	4/5

children were enrolled in preschool during their 2nd year; 2 of the 4 high-performing children entered primary school prior to their 3rd year in the program. Although, in some instances, a MEIP staff member was appointed as a teacher's aide and continued some aspects of the program in the preschool, in others this desirable arrangement was not possible.

Thus, MEIP differed significantly on amount of training. At the same time, we do not expect to find a direct relationship between progress and number of hours of training provided that allocation of time is reduced because gains in a child's performance permit more integrated instruction and conforms with the individual's program plan. On the other hand, unplanned decreases in training would appear to be serious departures with possibly significant negative effects on child gains. The length and intensity of the program described by Anderson et al. (1987) approximate ours with comparable results.

*Quality of training and program.* The number of hours of training is not only a coarse measure of intensity but also tells little of correct implementation of procedures. One aspect of Lovaas's approach is that his student-therapists attend a sequence of courses in which working in the UCLA Young Autism Project is the practical laboratory. We have had to rely almost entirely upon on-the-job training, parental supervision and team meetings. It is impossible to say how the difference in preparation and maintenance of volunteers affected the quality of training the children received in the absence of objective measurement of trainer proficiency. A measure of quality is needed to facilitate quality control and research into program variables related to success. We are developing such a tool.

In addition, different models of organisation and volunteer training need exploration. Anderson et al., for example, have the bulk of 1:1 home training conducted by a trained teacher and the parent.

We cannot quantify departures and similarities between MEIP and Lovaas's model except with regard to the use of physical punishment procedures. We programmed none. A firm "No" and sharp commands to regain the child's attention, overcorrection and contingent exercise were used most commonly. This variation may account for the lack of success in reducing self-stimulatory behaviour to acceptable levels. At

the same time, the use of aversive physical consequences is a major obstacle to acceptance of the approach and may not be done ethically until a method of maintaining correct training procedures is in place.

### *Global Results*

The distribution of potential success (achievement of normal functioning levels) parallels that reported in Lovaas (1987). Nine of his sample of 19 experimental subjects achieved normal functioning levels while the other children were described as making more modest and minimal gains. In the present study, 4 of 9 MEIP children and 1 control child made substantial improvements within 24 months. Scores were less than average and, as the personality test and behavioural observations indicated, the children were displaying "autistic" self-stimulatory behaviour and deficits in social and play behaviour. Whether or not trends towards higher functioning continue is uncertain and await future assessments.

### *Predictors of Success*

No characteristics at referral appear to correlate highly with good response to this program. The presence of some speech, a generally acknowledged positive prognostic sign, was not essential. Two of the high improvement subgroup had some speech whereas 2 did not and 1 does not yet. The 2 control children who showed the most progress also had some speech at referral. The high performing subgroup included 1 girl and 3 boys. Two were not testable on the cognitive tests at referral while 2 had Stanford-Binet IQs of 85 and 35. Another variable, initial rates of improvement, held for 3 of the children. For them, gains were most pronounced between 0 and 12 months. The 4th child, however, did not begin to make gains until well into his 2nd year. At present, it is probably best to conclude that all autistic children require an intensive preschool program and that the program be continued for at least 2 years.

### *Nature of Gains*

Across the sample, gains were most pronounced in the domains of compliance, manageability, or cooperativeness and least in the domains of independent and social play and diminution of self-stimulatory behaviour. Our finding that adaptive behaviour scores of the high subgroup were generally lower than intelli-

gence estimates was consistent with the results in McEachin et al. (1993) who also reported lower scores in household tasks, community independence and play with other children. They attributed the discrepancy to their focus on cognition and language in training.

It does appear that the pattern of changes was consistent with program content in MEIP as well. Independent play, for example, was left largely to incidental learning and less structured teaching. Thus, little improvement in play was disappointing but not unexpected. As noted above, continuation of self-stimulatory behaviour probably was due to greater tolerance of this behaviour during training and the fact that most children ceased when prompted to stop. The results indicate that specific interventions to eliminate self-stimulation are required. Since such behaviour is a social and educational handicap, its diminution must be a program objective. It also needs to be borne in mind that our coding system counted all self-stimulatory behaviour in a novel, generalisation probe and the system made no allowance for type and duration. Thus, the estimates are likely to be high. Secondly, the scoring may obscure any changes in quality or duration that might reflect the increased sophistication in self-stimulatory behaviour that Epstein, Taubman, and Lovaas (1985) argue accompanies developmental gains.

#### *Parental Stress*

The program was associated with decreases in parental stress levels. There is no doubt that living with a child with autism can be extremely stressful as all mothers (and most fathers) in our samples reported at the outset. Furthermore, there is no basis for expecting it to diminish with time alone. The control group results verified that.

Invasion of privacy ("numerous strangers tramping through the house every day"), lack of control over what is happening to their child, ignoring the needs of parents and other family members and giving parents unrealistic expectations are examples of objections that have been raised about this program. We shared these sentiments and, in addition to measuring stress, took steps to inform the parents fully about previous results, to maximise their sense of control and to meet their needs. Parents were regarded as full partners and were involved in planning, training and so on. Lack of control was, thus, not an issue. Privacy was respected by (for

example) setting portions of the house off-limits and instructing the volunteers in their ethical obligations regarding confidentiality and client rights. Several volunteers have remained friends of the family and add to their support network. All but 1 child had siblings. If parents and child were agreeable, siblings participated in the training sessions; but for the most part, they did not. Some families arranged special times for siblings as a precaution. It is significant, and somewhat surprising, that only one family declined the program after learning of its nature and requirements and only one family dropped out before the end of their 3-year contract.

#### *Costs*

Finally, the cost of MEIP is comparatively very low. Our calculations indicate that the program can be run for under \$10,000 per family per year, the major expense being the salary of a skilled program coordinator. Assuming 2 years of full-time home-based instruction and 50% time in a 3rd year while the child is integrated into regular community programs, total cost per child would be about \$A25,000. Given the enormous savings with every successful intervention, the cost-benefit ratio is one that any investor would find exceedingly attractive.

#### *Conclusion*

The study shows that substantial gains are realisable in less than the ideal circumstances Lovaas describes. The minimum requirements we think necessary to achieve and maintain the highest rates of correct delivery possible are (a) a team that is unified with respect to the behavioural, data based training model; (b) program coordinators who are highly skilled in the application of behavioural training techniques and program (curriculum) development; (c) parents who will enter an alliance; and (d) a structure for recruiting volunteers. Since the number of children in any locality is too small to implement large-scale research projects, we recommend that service providers and investigators accumulate and share similar longitudinal data so as to permit comparisons across several sites. This paper is our first contribution to such an enterprise. We are continuing to follow the MEIP and control children; others are being recruited.

#### REFERENCES

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