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Age at Intervention and Treatment Outcome for Autistic Children in a Comprehensive Intervention Program

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This study compared the treatment outcomes of nine autistic children who began receiving intensive behavioral intervention prior to 60 months of age with outcomes for nine other children who entered the same intervention program after 60 months of age. The 18 children in the sample included all of the children served by the Princeton Child Development Institute's day school and treatment program during the period 1975–83 who were diagnosed autistic and who had either (a) achieved positive discharge or (b) been enrolled in the program for 24 months or longer and continued to receive program services. Age at program entry was found to be strongly related to positive treatment outcome (i.e., to children's continued residence with their natural parents and attendance at public school classes). This investigation underlines the importance of early behavioral intervention for autistic children.

The paucity of published data on the impact of early intervention for autistic children is clearly documented by a review of the relevant literature. A computer literature search, using PsychINFO database, identified 1,308 studies that used the words "early infantile autism," "autism," "autistic children," or

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"developmental disabilities." The same database contained 10,344 studies that employed the terms "outcome," "prognosis," or "early intervention" as descriptors. Only 28 articles were located which combined descriptors about autism with the terms "outcome," "prognosis," or "early intervention." Some reports on early intervention did not deal with outcome or prognosis. Other reports examined the prognostic value of such variables as hand lateralization by age 5 (Tsai, 1983); pubertal deterioration (Gillberg & Schaumann, 1981); "natal" and "acquired" autism (Harper & Williams, 1975); speech (Lotter, 1974a); and the presence of positive neurological findings (Harper, 1974). Chess (1978) reported a longitudinal study of autism associated with congenital rubella, and Lotter (1974b) provided follow-up information on the social adjustment, placement histories and employment of 32 autistic children identified in an epidemiological survey. Several investigators (Bartak & Rutter, 1976; DeMyer, Barton, Alpern, Kimberline, Allen, Yang, & Steele, 1974; Freeman, 1976) examined IQ as a predictor of outcome, and Davids (1975) noted an association between scores on Rimland's Diagnostic Check List and improvement following discharge.

Mazuryk, Barker, and Harasym (1978) reported on outcome for the first 15 autistic children discharged from an inpatient program that employed a behavior modification approach; 53% were still living at home at the time of follow-up. Ward (1978) examined the effect of structural therapy, "spontaneous physical and verbal stimulation applied . . . in a playful and gamelike fashion" (p. 586), on 21 inpatient cases of early infantile autism. Treatment resulted in the discharge of 12 patients (57%).

Lovaas (1982) presented preliminary data on autistic children who entered treatment prior to 42 months of age. Within this age group, outcome was compared for 19 children who received intensive intervention (at least 40 hours per week) and 17 children who received less intensive intervention (not more than 10 hours per week). Fifty-three percent of children in the "more intensive" group successfully completed first grade in a regular classroom, while none of the children in the "less intensive" group achieved this goal.

Groden, Dominque, Chesnick, Groden, and Baron (1983) reported follow-up data for an autistic child who began receiving services at age 2. Behavioral intervention over a 3-year period resulted in the child's placement in a school for normal children at age 5.

In general, only a handful of studies reported treatment outcomes for autistic children; in those studies, success rates ranged from 53% to 57%. No investigations were located which compared treatment outcomes for autistic children who received early intervention with those who did not. The absence of data on the effectiveness of early intervention is significant, since education for handicapped children ages 3 to 5 is mandated in many states. Eisenberg (1956) and Rutter (1978) maintain that the acquisition of functional speech by 5 years of age is one of the most reliable predictors of positive out-

come for autistic children, and Fay (1980) asserts that intervention must begin before 5 years of age if children's opportunities for positive discharge are to be realized. The present study therefore compared treatment outcomes for autistic children who began receiving comprehensive behavioral treatment services prior to 60 months of age with outcomes for children who entered the same treatment program after 60 months of age.

METHOD

Participants

The 18 children in this study included all children enrolled in the Princeton Child Development Institute's day school and treatment program during the period 1975–1983 who had been diagnosed as autistic by an outside agency, and who had either (a) achieved positive discharge, or (b) been enrolled in the program 24 months or longer and were continuing to receive program services at the time of this report. Since the mean time in program for children achieving positive discharge was 30 months (median 34 months, range 13 to 39 months), 24 months was selected as a conservative cut-off, permitting a control for time in treatment. Without this control, recently-admitted children with brief time in the program would introduce a confounding variable that would affect outcome data.

Of the 18 participants, 9 children (8 boys and 1 girl) entered the program prior to 60 months of age (Group 1) and 9 children (8 boys and 1 girl) were enrolled after 60 months of age (Group 2). Mean age at program entry was 48.9 months for Group 1 and 101.2 months for Group 2 (see Table 1). Mean time enrolled in the comprehensive behavioral intervention program was 45.9 months for Group 1 and 72.4 months for Group 2.

Age when autism was first diagnosed (according to the date of the earliest diagnostic report in each child's records) did not differ significantly for the two groups. The mean age at diagnosis was 40.8 months for Group 1 children and 41.8 months for Group 2 children. However, latency (i.e., age at program entry minus age at diagnosis) in enrolling in the comprehensive intervention program differed substantially. The mean time from diagnosis to program entry was 7.8 months for Group 1 and 58.8 months for Group 2. During the interim period from diagnosis to enrollment in the comprehensive behavioral treatment program, 15 children (6 children in Group 1 and 9 children in Group 2) attended one or more other programs for handicapped youngsters. Theoretical orientation, program content, hours of service, and similar variables descriptive of these prior treatment experiences could not, unfortunately, be established. All 18 children were, however, defined by their referring agencies as in need of intervention.

TABLE 1.
Characteristics of Children in Groups 1 and 2

Group	Measure*	Age at Entry	Time in Program	Age at Diagnosis	Latency in Entering Program
Group 1—Program entry at 60 months or earlier	N	9	9	9	9
	Mean	48.9	45.9	40.8	7.8
	SD	5.6	28.9	3.9	7.8
	Median	48.5	34.5	40	4.8
	Range	42-58	13-101	35-46	0-19
Group 2—Program entry after 60 months	N	9	9	9	9
	Mean	101.2	72.4	41.8	58.8
	SD	28.7	27.7	12.2	25.6
	Median	97.0	73.0	41.8	48.0
	Range	61-156	28-101	18-61	36-107

*All ages and time measurements are expressed in months.

The Peabody Picture Vocabulary Test (PPVT) was administered to all 18 children at program entry. Eight children in Group 1 did not achieve basal scores, and one child achieved a mental age score of 2.2 years. Three children in Group 2 did not achieve basal scores; for the remaining 6 children, mental age scores ranged from 2.6 years to 8.8 years, with a mean of 4.9 years.

All of the children in the sample exhibited behavioral repertoires that were representative of the definition of the syndrome of autism adopted by the National Society for Autistic Children (Ritvo & Freeman, 1978), including disturbances of developmental rates and sequences; disturbances of reponses to sensory stimuli; disturbances of speech, language and nonverbal communication; and disturbances in appropriately relating to people, objects, and events.

Since all of the youngsters had been diagnosed as autistic by at least one other agency not associated with the Princeton Child Development Institute, the earliest diagnostic report from an outside agency was used to provide an informal comparison of the pretreatment behavioral characteristics of children who entered the program before and after 60 months of age. The behavioral excesses and deficits mentioned in these early reports are displayed in Table 2, and are approximately equally distributed across the two groups.

At intake, 17 of the children lived at home with their own parents; one child left a mental hospital to enroll in the Institute's day school and to enter Family Focus, one of the Institute's community-based group homes.

Setting

All of the children in the sample were enrolled in one or more programs of the Princeton Child Development Institute. The Institute is a private, nonprofit agency, offering a broad array of services to autistic persons from early

childhood to adulthood. Comprehensive behavioral intervention services include a day school and treatment program (in which all 18 participants were enrolled); Teaching-Family Model group homes for children in need of residential intervention (which served 1 child in Group 1 and 4 children in Group 2); parent-training services; individualized transition programs for children approaching readiness for positive discharge; and post-discharge follow-up services. All of these programs emphasize professional and consumer evaluation and data-based accountability for service delivery (McClannahan & Krantz, 1981). The Institute does not espouse any specific behavior

TABLE 2.
Pre-Treatment Behavioral Characteristics of Children in Group 1 and Group 2, as Cited in Earliest Diagnostic Reports from Outside Agencies

Behavioral Characteristic	Number of Reports Citing this Characteristic	
	Group 1	Group 2
Audible laughter	3	4
Avoids physical contact	6	6
Bedtime disruptions	1	0
Crying	7	4
Echolalia	4	3
Finger play	2	2
Food refusal	5	4
Handwaving	5	2
Hyperactive	4	4
Hyperlexic	2	2
Inappropriate use of toys/lines up objects	3	2
Inaudible laughing/giggling	2	3
Lack of eye contact/gaze aversion	9	6
Mouthes objects	1	2
Mutism	2	1
No fear of dangerous situations	3	0
Noncompliance	9	9
No use of pronouns	9	9
Perseverative	6	4
Phobic for water on face	3	1
Physical aggression	3	6
Poor attention span	1	0
Resistance to change	4	4
Rocks	2	2
Screams	1	4
Self-injurious behavior	3	3
Sensitive to sounds	2	1
Stares	3	1
Tantrums	6	4
Twirls (body)	0	1
Uses jargon	2	0
Visual self-stimulation	2	1
Vocal noise	5	2
Withdrawn	6	2

modification procedures, but systematically employs an applied behavior analysis approach to intervention.

Children enrolled in the day education and treatment program attend school 5.5 hours per day, 5 days per week, and 11 months per year. During each school day, children have eleven 30-minute classes and at the end of each class, they change activities, classrooms, and teachers. This strategy is employed to assist children in generalizing newly acquired skills across persons and settings. This arrangement of the school day, however, also serves as an informal means of counterbalancing the skills of different teachers and therapists, since the majority of children see most school personnel each day.

Clients who require residential intervention live with professional teaching parents (a married couple) in family-style, community-based Teaching-Family Model group homes (McClannahan, Krantz, McGee, & MacDuff, 1984). Intervention programs at school and in group homes are closely and systematically coordinated.

Individualized parent training services are delivered in children's own homes approximately once a month. During these visits, the home programmer models instruction and treatment strategies, teaches observation and behavioral measurement, and provides hands-on training, enabling parents to serve as home tutors and therapists for their own children and youth. Parents participate in the selection of treatment goals and collect home performance data that they submit to the home programmer at specified intervals (McClannahan, Krantz, & McGee, 1982).

Children are provided with individualized transition programs when observational data indicate (a) consistent display of language, social, self-care and leisure skills; (b) consistent control of behavior problems; and (c) generalization of these performances across day-school and home. Transition programs feature gradually increasing attendance at local preschools, after-school recreation activities, and public school classrooms, where child performance continues to be systematically observed and measured by Institute personnel, and the data are used to design additional instructional programs.

Positive discharge is achieved when children's performance data indicate that they have generalized their new skills and their control of behavior problems to the new public school setting. After discharge, follow-up services are initially delivered at least monthly, but are faded to an annual follow-up schedule after the first year out of the program. Follow-up services continue to be available thereafter (e.g., at parent request).

Definitions of Variables

The independent variable, age at program entry, was expressed in months of chronological age. Children were assigned to Group 1 if they had been 60 months of age or younger at program entry, or to Group 2 if they were more than 60 months of age at program entry.

The dependent variable, treatment outcome, was defined as (a) positive outcome (i.e., the participant lived at home with his/her family members and was enrolled full time in a public school), or (b) no positive outcome (i.e., the subject remained in treatment at the Institute).

Research Design

A two-sample, static-group design (Campbell & Stanley, 1966) was used to assess the relationship between age at program entry and treatment outcome. Both chi-square and correlational tests were employed to determine the effects of age at program entry.

Reliability

Interobserver agreement on treatment outcome was not obtained for children who remained in treatment since the status of these children was evident (i.e., all continued to attend the Institute's day program and to receive ongoing home programming services). For discharged children, interobserver agreement on treatment outcome was obtained through telephone calls to each child's natural parent and to a member of each youngster's public school staff (i.e., teacher, special services staff member, or principal). Each of these individuals was asked two questions: (a) "Is the child still living at home?" and (b) "Is the child still enrolled full time in the public school?" These telephone interviews yielded 100% agreement between each parent/school official pair on each of the two questions asked.

RESULTS

As shown in Table 3, 7 of the 18 children included in the sample (39%) achieved positive treatment outcomes. Of the 9 children in Group 1 who entered the Institute's programs prior to 60 months of age, 6 children (67%) achieved positive outcomes; of the 9 children in Group 2 who enrolled in the program after 60 months of age, only 1 child (11%) attained a positive outcome. Alternatively, these findings may be stated as follows: of 7 children in the sample who achieved positive treatment outcomes, 6 children (86%) began treatment at the Institute prior to 60 months of age. A chi-square analysis indicated a greater probability of positive treatment outcomes for children who entered the comprehensive intervention program prior to 60 months of age vs. after 60 months of age, $\chi^2\,(1) = 5.86$, $p < .02$. A Spearman rank-order correlation indicated a significant relationship between age at program entry and length of time in treatment at the Institute; $r_s = .631$, $p < .01$, two tailed test.

Of the six children in Group 1 who had positive outcomes, four attended regular public school classrooms and two attended special education classes

TABLE 3.
Treatment Outcomes for Children in Groups 1 and 2 and for the Total Sample

Group	Total	Percent (and number) of children who	
		Achieved Positive Treatment Outcome	Remained in Comprehensive Intervention Program
Group 1—Program entry at 60 months or earlier	100% (9)	67% (6)	33% (3)
Group 2—Program entry after 60 months	100% (9)	11% (1)	89% (8)
Total	100% (18)	39% (7)	61% (11)

in public schools, but were mainstreamed for some activities. Two of the three children in Group 1 who remained in treatment lived at home with their own families, while one child resided in a Teaching-Family Model group home.

The only child in Group 2 who achieved a positive outcome attended regular classes in his public school. Of the other eight children in Group 2 who continued in treatment, four lived with their natural parents, and four were residents of a Teaching-Family group home.

DISCUSSION

The data presented here document the importance of early behavioral intervention for autistic children. Broad interpretation of these results, however, is limited by small sample size and by less than optimal research design. These limitations were unavoidable, since the agency's goals include (a) provision of services to a limited number of autistic persons, so that enrolled individuals may enjoy an excellent client-staff ratio and intensive and comprehensive treatment; and (b) provision of intervention services for as long as these are needed, regardless of the implications for acceptance of new referrals. These program parameters support the progress of individual subjects in treatment, but discourage large sample sizes and random assignment of participants. On the other hand, a small number of participants and a rigorous applied behavior analysis model have fostered ongoing, reliable tracking of individual subjects, and detailed information on treatment outcome.

Of course, major differences in the severity of developmental disabilities displayed by pre-60-month-old and post-60-month-old children would affect the validity of the findings. Detailed examination of the behavioral characteristics mentioned in children's earliest diagnostic reports (Table 2), however, does not support the assumption that Group 2 children were more severely handicapped. Indeed, of the 34 characteristics listed in Table 2, only 6 (audible

laughing, inaudible laughing, mouthing of objects, physical aggression, screaming and body twirling) were mentioned more often for Group 2 children. Nine behavioral characteristics were mentioned an equal number of times for children in Groups 1 and 2, and 19 characteristics were mentioned more often for Group 1 children.

Since mean age at diagnosis is comparable for the two groups of youngsters, this does not appear to be a plausible explanation for such differences. It could be hypothesized, however, that the same clusters of variables that produced more thorough or complete behavioral descriptions of Group 1 children also resulted in their earlier entry into comprehensive behavioral treatment. Examples of such variables might be health care and referral agency representatives' familiarity with the signs and symptoms of autism, and parents' skillfulness in locating professional helpers and helping agencies.

Mental age scores on the Peabody Picture Vocabulary Test (PPVT) were the only standardized scores available for all 18 participants and, as mentioned earlier, 8 children in Group 1 and 3 children in Group 2 did not achieve basal scores. For this reason, PPVT scores are minimally useful in equating the two groups. It does appear evident, however, that the participants' PPVT mental age scores were correlated with chronological age; thus, children in Group 1, who were younger at program entry, had fewer skills in almost every area, including language.

Anecdotally, the authors, who have tracked these youngsters for most of their intervention/post-intervention experiences, retrospectively entertain the notion that children who entered treatment at comparatively older chronological ages might have achieved different treatment outcomes if comprehensive behavioral intervention services had been available earlier in their lives. The presence of hyperlexia and echolalia, noted in some Group 2 children's earliest diagnostic reports, should have been indicators of favorable prognosis, as they were for children in Group 1; unfortunately, the Group 2 children thus identified have remained in treatment. Furthermore, clinical experience suggests that if aggressive, self-injurious, or noncompliant responses become the targets of less than skillful intervention attempts, later behavioral treatment, however skillful, may require more time and may yield less than substantial results.

A final word of caution about these outcome data relates to the types of comprehensive intervention services the children received. There are no data on the effects of deleting any one of the services provided (e.g., day treatment, parent training, individualized transition programming, or follow-up services).

Given these provisos, this investigation supports early behavioral intervention for autistic children. The marked relationship between age at intervention and treatment outcome has not, to our knowledge, been previously documented for autistic children.

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