Journal of Autism and Developmental Disorders, Vol. 30, No. 2, 2000

Age and IQ at Intake as Predictors of Placement for Young Children with Autism: A Four- to Six-Year Follow-Up

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The predictive power of age and IQ at time of admission to an intensive treatment program using applied behavior analysis were examined in a 4- to 6-year follow-up of educational placement. Twenty-seven children with autistic disorder who were between the ages of 31 and 65 months and had IQs on the Stanford Binet between 35 and 109 at time of admission to the Douglass Developmental Disabilities Center were followed up 4 to 6 years after they left the preschool. The results showed that having a higher IQ at intake (M = 78) and being of younger age (M = 42 months) were both predictive of being in a regular education class after discharge, whereas having a lower IQ (M = 46) and being older at intake (M = 54 months) were closely related to placement in a special education classroom. The results are interpreted as pointing to the need for very early intervention for children with Autistic Disorder. It is also emphasized that older children and those with lower IQs in the present study showed measurable gains in IQ from treatment. The data should not be taken to suggest that children older than 4 years of age do not merit high quality treatment.

KEY WORDS: Autistic disorder; age; IQ; placement in special education; applied behavior analysis.

INTRODUCTION

Intensive use of applied behavior analysis for the education of very young children with autism has been reported to have beneficial effects on the development of these youngsters (e.g., Fenske, Zalenski, Krantz, & McClannahan, 1985; Harris, Handleman, Gordon, Kristoff, & Fuentes, 1991; Lovaas, 1987). Controversies do remain about the extent of the benefits from these techniques (e.g., Gresham & MacMillan, 1998; Schopler, 1998) and there is a dearth of data comparing applied behavior analysis technology to other established methods such as the structured teaching used in the TEACCH program (Lord & Schopler, 1994). Nonetheless, at least for some very young children applied behavior analysis teaching methods appear to have a substantial developmental impact. Although there are methodological limitations to his research, Lovaas's (1987) study provides the best data thus far documenting changes in the developmental trajectory of his young participants.

Several authors have reported that roughly half of the children who receive early intensive behavioral intervention make major developmental gains; the gains for the other half are more modest (Anderson, Campbell, & Cannon, 1994; Lovaas, 1987; McClannahan & Krantz, 1994). The purpose of the present study was to explore two potential predictors of outcome, the age and the cognitive functioning of the child at time of intake and at time of discharge from an intensive treatment program using applied behavior analysis.

In an early study of age as a predictor of treatment outcome, Fenske *et al.* (1985) found a better outcome for children who began applied behavior analysis treatment before 60 months as compared to those who started after 60 months. These data were collected for children treated

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0162-3257/00/0400-0137$18.00/0

between 1975 and 1983 when intervention often began at an older age and when treatment procedures were less sophisticated than they have become in the late 1990s.

The present study evaluated educational placement for children who had participated in an intensive applied behavior analysis center-based treatment program for children with autism. These children as a group were much younger than the children studied by Fenske *et al.* (1985) and had the benefits of more recent treatment methods.

METHOD

Participants

The participants were 27 children who had entered the Douglass Developmental Disabilities Center (DDDC) between 1990 and 1992. All of these children were diagnosed as having Autistic Disorder according to the criteria of DSM-III-R (American Psychiatric Association, 1987). That diagnosis was initially made by an outside source and then confirmed by an experienced clinical psychologist during the child's intake at the DDDC. Every child for whom there were data on age at admission and discharge, pre and post IQ data, and CARS scores at admission was included in the study.

Table I summarizes several important descriptors about each child including gender, pre and post IQ, age at admission, the class in which child was placed at admission and the class from which he or she graduated from the DDDC, the CARS score at admission, and the child's educational placement at the time of follow-up.

The children's mean age at time of admission was 49 months (range 31–65 months). At the time of follow-up the mean age was 142 months (range 122–170). The mean score on the Childhood Autism Rating Scale (Schopler, Reicheler, & Renner, 1986) was 34.17 (range 30–40). The children's mean IQ on the 4th edition of

Table I. Basic Information About Each Participant

Child	Gender	Pre IQ	Post IQ	Pre age	Class[a]		Cars	Placement[b]
					Entry*	Exit[a]		
1	F	73	76	54	2	3	32	S
2	M	90	112	46	2	3	30	I
3	M	47	74	52	2	3	30	S
4	F	51	72	48	2	2	32	S
5	M	90	92	62	1	3	32	S
6	M	63	90	57	1	3	31.5	S
7	M	60	106	38	1	3	34.5	I+
8	M	37	57	52	1	2	40	S
9	M	35	35	55	1	1	35.5	S
10	M	84	116	31	1	3	30	I
11	M	35	55	50	1	1	32.5	S
12	F	35	49	48	1	2	32	S
13	M	69	83	45	1	3	34	I
14	M	70	98	39	2	3	36.5	I+
15	M	84	106	43	2	3	38.5	I+
16	F	105	101	41	2	3	38.5	I+
17	M	36	35	62	1	1	37.5	S
18	M	35	36	37	1	1	40	S
19	M	36	51	57	1	1	30	S
20	M	36	80	38	1	1	32.5	I+
21	M	36	36	65	2	3	38.5	S
22	M	93	123	43	2	3	30.5	I+
23	M	36	55	52	2	3	34	S
24	M	52	88	58	2	2	37	S
25	M	59	92	42	2	2	34	I+
26	M	109	127	58	3	3	33.5	I+
27	M	46	50	50	1	1	35.5	S
Mean		59.33	77.59	49	—	—	34.17	—

[a] I = entry level class, 2 = intermediate, 3 = integrated.

[b] S = special education, I = regular education, I+ = regular education with support services.

the Stanford Binet (Thorndike, Hagen, & Sattler, 1986) at intake was 59 (range 35–109). These IQ scores were not available at the time children were admitted to the DDDC and were not used in determining classroom placement. Neither were the posttreatment scores available when decisions were made about placement upon graduation from the DDDC.

Setting

The DDDC is a Rutgers University center-based program for the education and treatment of children, adolescents, and adults with autism. The educational instruction at the center is developmentally sequenced and uses applied behavior analysis teaching methods including discrete trial and naturalistic instruction. The center's programs include a preschool with three classrooms. One preschool class is devoted to 1:1, very intensive instruction for six children, there is a class of intermediate intensity where six children with autism receive a combination of individual and small group instruction, and the least intensive class where six children with autism are blended with seven typically developing peers. The professional staffing ratio in these classes ranges from 1:1 in the entry level class, to 4:6 in the intermediate class, and 4:13 in the integrated preschool. In addition to the full-time staff, each class has a half-time speech therapist and one undergraduate assistant.

In the entry level class much of the instruction focused on teaching compliance, cognitive and communication skills, and the rudiments of social skills. Serious behavior problems were addressed in this class as well as fundamental self-help skills like toilet training and independent eating and dressing. In the intermediate intensity class children learned how to be part of a small group, to engage in some interactive play, and continue their work on communication, cognitive skills, and self-help. The integrated preschool class had a curriculum in many respects like that of a very good preschool with an emphasis on communication and socialization and those preacademic skills needed for kindergarten. Discrete trial teaching methods were rarely, if ever, used in this class which relies upon more naturalistic teaching methods.

All children received between 35 and 45 hours of instruction each week. The school day was 5 ½ hours long, 5 days a week, for a 12-month school year. Each family was expected to provide an additional 10 to 15 hours a week of home-based instruction. Some families elected to do this home-based work themselves and we provided a consultant to help them create their teaching programs which typically focused on either the generalization of material learned in school and/or self-help and life independence skills best taught in the home setting. The specific skills taught at home were determined by the needs of the child and family and ranged from toilet training and dressing to playing with siblings and participating in play groups. Other families hired outside staff to help them run their home programs and we ensured that these consultants worked in a coordinated fashion with our own efforts. The school offers neither occupational therapy nor physical therapy and a few families elected to receive these services outside of school hours.

A speech and language specialist worked half-time in each of the three classrooms. Every child in the present study received two half-hour individual speech therapy sessions a week. These sessions were used primarily for assessment and the information gathered was used to design the group speech and language sessions led by the speech therapist in the classroom as well as to design speech and language programs to be applied by the teaching staff.

A child may remain in the preschool through the year in which he or she turns 6 years of age. Typically children begin in the one-to-one setting and ultimately progress to the integrated classroom, although placements are individualized and children may enter and remain in any classroom that is appropriate. In the present sample, 14 children began in the entry class, 12 in the intermediate class, and 1 started in the integrated preschool (see Table I). Among the 11 children who were ultimately placed in regular education classes, 4 started in the entry class, 6 in the intermediate class, and 1 in the integrated class. All spent at least 1 year in the integrated class before graduating. Among the 16 children who remained in special education settings, 10 started in the entry level class and 6 in the intermediate class; 6 of these children spent at least 1 year in the integrated class while 6 graduated from the entry class and 4 from the intermediate class.

Procedures

In 1999, follow-up questionnaires were sent to the school districts and the parents of all children who had entered preschool classroom of the DDDC between 1990 and 1992. This questionnaire asked about the child's current educational placement including whether it were a regular education class or a special education class. The response rate for the follow-up was 100%. This was achieved by active follow-up with DDDC staff to determine placements for those children for whom there was no initial response.

RESULTS

Pearson product-moment correlations were used to examine the relationship between of age at admission, severity of autism as measured by the CARS at intake, IQ at time of admission, and IQ at discharge as predictors of educational placement at follow up. For purpose of these analyses, educational placement was defined as either a regular education setting or a special education setting.

There was a significant relationship between the child's age in months at time of admission and ultimate educational placement, $r(25) = .658$, $p < .005$, such that children who were younger at admission were more likely to be in regular education settings at follow-up than were children who were older. A similar relationship was found for IQ at admission, $r(25) = .655$, $p < .005$, with children who had higher IQs at admission more likely to be in regular education classes at follow-up.

There was no significant correlation between age at intake and IQ at intake, $r(25) = -.211$, ns. There was however a significant correlation between age at intake and IQ when the child left the program, $r(25) = -.401$, $p < .025$, such that younger children had higher IQs at discharge than those who entered at an older age. The child's IQ at time of discharge was also significantly correlated with placement at follow up, $r(25) = .779$, $p < .005$. The relationship between IQ at intake and discharge was also highly correlated, $r(25) = .871$, $p < .005$.

The range of IQ at intake for the children who started before 48 months was 39–101 and for the children 50 months and older it was 35–109. A two-sample *t* test comparing the IQ at admission of these younger ($M = 67.00$) and older ($M = 52.21$) found no significant difference between the two groups, $t(25) = 1.636$, ns.

The CARS scores at intake were not significantly correlated with IQ at intake, $r(25) = -.290$, ns. Nor was severity of autism as measured by the CARS significantly related to placement, $r(25) = .079$, ns. A two-sample *t* test comparing the CARS scores of those children who entered regular educational settings ($M = 33.57$) and those who remained in special education settings ($M = 34.71$) regardless of age of admission to the DDDC showed no difference in severity of autism on admission, $t(25) = 0.925$, ns.

Median splits on the variables of age, IQ at admission and IQ at discharge were used to look more closely at the status of the children at follow-up. Among the 13 children who began treatment at 48 months or less, all but 3 were in inclusive, regular education settings while among the 14 who started at 50 months or older, 1 was included in a regular class (Fisher exact test $p < .005$). Only 1 child who started at 45 months of age or younger was in a special education class. Among the 14 children with IQs of 52 or less at intake, 13 ultimately went to special education settings and 1 to a regular education class, while for the 13 children with initial IQs of 59 or higher 10 went to inclusive settings and 3 to special education programs (Fisher exact test $p < .005$).

Although the children's IQs had increased considerably at the time of discharge, the predicative pattern of IQ at intake pattern held true. Among children with a discharge IQ of 80 or more, 11 were included in regular classes and 3 were in special education classes and by contrast for the 13 children with IQs of 76 or less, all went to special education classes (Fisher exact test, $p < .005$).

DISCUSSION

The results of the present study support the benefits of intensive early intervention for young children with autism. Those children who were enrolled at the Douglass Developmental Disabilities Center before 48 months of age were far more likely to achieve an inclusive educational placement in a regular education class than were those children who began after that age. With the exception of one child who was admitted at 37 months and ultimately went to a special education class, and one child admitted at 58 months who went to a regular education class, the distribution does not overlap. Interestingly, child 26 (see Table I), who was 58 months at intake, and who was in a regular education class with some support at follow-up, was the one child in the present sample who entered the integrated preschool at the point of admission to the DDDC. He also scored 109 on the Stanford-Binet at the time of intake and 127 at discharge. With that one exception, all of the children 48 months and older at intake were in special education classes 4 to 6 years after leaving the preschool.

Many of the published studies reporting major educational or cognitive gains through the use of applied behavior analysis have involved children younger than 48 months of age (e.g., Anderson *et al.*, 1987; Birnbauer & Leach, 1993; Lovaas, 1987; Sheinkopf & Siegel, 1998). The participation of these younger children has not allowed a close look at the impact of a broader age range on the benefits from treatment. The children in the present study had a mean age of 49 months (range-31 to 65 months) thus allowing a more nuanced look at age as a predictor than previous studies.

If we look at those children from our center who entered before 48 months of age our outcome data are consistent with those of others who report favorable outcome (Anderson, Avery, DiPietro, Edwards, & Christian, 1987; Birnbauer & Leach, 1993; Lovaas, 1987; Sheinkopf & Siegel, 1998). By contrast, if we inspect the data for the older children alone, one would receive the misleading impression that our treatment methods were not as effective as those our colleagues. At least for our program, age at time of admission is a crucial factor in outcome.

The IQ of children shortly after their admission to the Center was also highly predictive of their later placement as well as of their IQ at discharge. We have previously reported on the mean 19-point increase in IQ that we saw in a group of children after treatment including some of those in the present sample (Harris *et al.*, 1991). What we did not know at the time of that earlier study was the predictive power of the initial test data to predict the child's status several years later.

The correlation between pre and post IQ is not surprising, but it does testify to the expertise with which the pretest was administered (Harris, Handleman, & Burton, 1990). Children were given several weeks to adapt to being at the center and then were tested by a highly experienced examiner with another familiar adult in the room to help maintain the child's attention. Testing was done in short chunks to maximize the likelihood that the child was attending to the examiner during testing. These efforts appear to have enhanced the reliability of the test results.

These outcome data based on age at intake and IQ are intriguing, but they are drawn from too small a sample to reach a definitive conclusion about the impact of these variables on the ability of children to benefit from intensive applied behavior analysis treatment. It should be noted that those children who went into special education settings showed measurable gains in IQ from pre- to posttreatment. That group had a mean IQ of 46 at entry and of 59 at discharge. That 13-point increase is not a trivial one. Their progress was not however sufficient to allow them to function effectively in a regular education class. By contrast, the group of children who went on to regular classes had a mean IQ of 78 at entry and 104 at discharge, showing a 26-point gain.

Although 8 of the 11 children in regular education classes continued to receive some special services such as going to resource room for some subjects, speech therapy, or having an additional staff member in the class during some activities, none of them were receiving 1:1 care in the class. Most of these children are currently in the upper elementary school years and have reached the point where the educational expectations are considerable. The next crucial transition for many of them will be their entry into middle school with a marked increase in social demands.

The present sample is too small to draw definite conclusions about the impact of a specific cutoff age where the probability of major benefit begins to decline. Neither do we have information about all of the educational experiences that the children enjoyed after leaving the Douglass Center. Nonetheless, it is important to note that those children who started treatment before the age of 4 years had, as a group, a better placement outcome than those who started later. The results of the present study highlight the importance of data from other centers to examine the impact of age and IQ in predicting benefit from intervention at a young age. These data should not however be taken to suggest that children 4 years of age and older should be denied intensive treatment. Their 13-point increase in IQ speaks to their capacity to benefit from their education.

The present study, like much research, raises more questions than it answers. We do not know to what extent applied behavior analytic teaching methods were crucial to the outcome as compared to other kinds of treatment. Neither do we know the impact of the intensity in terms of number of hours of instruction the children received. Such research is important if we are to provide the most effective learning experience for children with autism and gain optimal use from our educational dollars.

ACKNOWLEDGMENTS

Our thanks to the many parents and school district professionals who provided follow-up information about the children. The changes that occurred in these children were the products of countless hours of devoted work by teaching staff and parents. Special thanks to Maria Arnold, Alena Carter, David Celiberti, Lara Delmolino, Sylvia Krieger, Barbara Kristoff, and Mary Jane Weiss.

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