

## **EIBI Saves Up to \$2,500,000**

### **SUMMARY: Cost-benefit Estimates for Early Intensive Behavioral Intervention for Young Children with Autism**

John W. Jacobson,  
James A. Mulick,  
and Gina Green

In *Behavioral Interventions*, 1998, Volume 13, 201-226

Public and private spending for specialized human services has increased dramatically over the past two decades. So have concerns about the investment of public resources in these services. For example, research has shown that without effective intervention, most people with autism and other pervasive developmental disorders (PDD) require lifelong specialized educational, family, and adult services, at a total cost that is estimated at upwards of \$4 million in some states. Every year, millions of dollars are spent on interventions for autism/PDD that have little or no proven efficacy. It is prudent, therefore, to ask how investments in services are likely to pay off in the long run, and how to make the best use of the limited resources available for educating and treating people with autism/PDD.

Research with children who have, or are at risk for, various disabilities has shown that effective early intervention can substantially reduce their need for specialized services later on. To be effective, however, Guralnick (1998) and Ramey and Ramey (1998) found that early intervention must be (1) comprehensive, (2) intensive, (3) extended over time, (4) individualized, and (5) delivered directly to children. Of course, such intervention is neither cheap nor easy, so it is important to determine how this kind of intervention is likely to pay off not only in benefits to particular children and families but also in financial savings.

### **Early Intensive Behavioral Intervention (EIBI)**

Studies have demonstrated that intensive early intervention using the principles and methods of applied behavior analysis (ABA) can produce substantial benefits for many children with autism/PDD (Anderson et al., 1987; Birnbrauer & Leach, 1993; Fenske et al., 1985; Lovaas, 1987; McEachin, Smith, & Lovaas, 1993). Although there were some variations in procedures across studies, the interventions generally met the five criteria listed as essential by Guralnick (1998) and Ramey and Ramey (1998).

The interventions:

1. emphasized skill development through positive reinforcement;
2. started with an assessment of each child's current skills and deficits; instructional objectives, teaching methods, pacing, skill sequences, and reinforcers were all customized to the characteristics and needs of each child;
3. addressed all skill domains;
4. used frequent direct observation and measurement of individual performance to determine if progress was occurring, and adjust instructional methods accordingly;
5. included parents as co-therapists; and
6. were directed and supervised by individuals with postgraduate training in behavior analysis plus extensive hands-on experience in providing ABA intervention to young children with autism.

Among the studies published to date, the best outcomes – achievement of normal or near-normal functioning in all skill domains – were documented for children who received this kind of intervention for at least 30 hours per week year around for 2-3 years, starting before they reached the age of 6. In the longest and best documented study, Lovaas and colleagues (Lovaas, 1987; McEachin, Smith, & Lovaas 1993) found that 47% of the children receiving EIBI were able to function independently and successfully in regular classrooms. Another 40% or so made substantial improvements but continued to need some specialized intervention; and about 10% made minimal gains and continued to need intensive intervention. For a review, see Green (1996).

### **Cost-Benefit Analysis of EIBI**

Given the emerging evidence on the effectiveness of EIBI, and the availability of detailed information about the costs of childhood and adult services for people with autism and related disorders, it is now possible to estimate the financial costs and benefits of EIBI. We conducted such an analysis using information from the state of Pennsylvania available to us at the end of 1996.

The major assumptions underlying the analysis were:

1. There is insufficient scientific evidence on which to base predictions about the likely outcome for any individual child.
2. In any group of children receiving EIBI, between 20% and 50% will achieve normal functioning and require no specialized services after entering elementary school. About 10% will make small gains and require intensive special education and adult services (minimal effect group). The remainder will make moderate gains and need nonintensive special education and adult services (partial effect group).
3. Without EIBI, most people with autism need lifelong special services.
4. The average annual cost of EIBI is estimated at \$33,000 per child. The average duration is estimated to be three years.
5. Children who realize partial or minimal effects will use family support services to age 22, i.e. for 18 years.
6. During adulthood, those who achieve partial effects will use 18 years of Medicaid waiver (or equivalent) services and 15 years of supported work services.
7. During adulthood, of those adults for whom minimal effects are obtained, 80% will use waiver services for 20 years, 20% will use intensive community services for 23 years, and 40% will use supported work services for 15 years.

### **Calculating Projected Costs and Benefits**

We summed the costs of all public entitlements to early intervention, education, family support, adult services, and Social Security benefits for people with autism. Then, we factored in earnings in adulthood using the 1996 median household annual income to estimate earnings by individuals who are diagnosed with autism or PDD as young children but achieve normal functioning by adulthood, and supported employment wages for those who do not.

Costs and savings were estimated for individuals who achieve normal range effects, partial effects, and minimal effects from EIBI and for differing proportions of groups of children with autism/PDD who achieve normal functioning (i.e., 20%, 30%, 40%, 50%). In the article we show projected present value,

current cost, and cost with inflation. A great deal of additional information is provided regarding the exact methods used to project costs.

### Summary of Results

Table 1 Estimated Net Costs and Savings of EIBI, Ages 3-55 years.

NET SAVINGS for typically developing person	\$1,597,049
NET SAVINGS for child with autism/PDD who achieves normal functioning	\$1,475,791
NET COST for child who realizes partial effects	\$3,368,469
NET COST for child who makes minimal gains	\$4,404,482
NET SAVINGS for child who realizes partial effects (\$4,404,482. - \$3,368,469)	\$1,036,013

The net savings for a typically developing person shows the cost benefit of providing public education K-12 to a typically developing person through adulthood, i.e., career income minus costs of education. The net savings for a child with autism/PDD who achieves normal functioning has a similar basis, except that costs for early intervention and preschool age support services are included. The net cost for a child with autism/PDD who makes minimal gains is the cost of services for 52 years, less income from supported work. Net savings to age 55 for a child who achieves partial effects are the difference between “minimal gains” costs and “partial effects” costs. Below we show the range of average weighted cost benefits (savings) per child, based on differing levels of effectiveness of programs, per hundred children. For this reason, the savings we show below cannot be calculated directly from the costs shown in Table 1. The steps used to estimate these ranges are shown in the full article.

**Estimated Savings Per Child, 3-22 Years.** Average savings to the educational system range from \$298,651 to \$274,709 depending upon the proportion of children - 20, 30, 40 or 50% - who achieve normal functioning levels. Surprisingly, because children who achieve normal functioning continue to incur costs throughout the school years, i.e. the costs of regular education services, the largest savings actually come from the children who achieve partial or moderate gains from EIBI. This aspect of savings is not shown in Table 1 but is shown in the full article. The average cost savings are roughly equal to total regular education costs in Pennsylvania for a child from K-12.

**Estimated Savings per Child, Ages 3-55 Years.** The average savings per child to age 55, again depending on the proportions of effectiveness of EIBI, range from \$1,686,061 to \$2,816,535. There are a number of factors that cause the savings to be greater through adulthood. The most important considerations are that a person may use adult human services for a longer period of time than they attend school during their life span, and that some adult human services have annual costs higher than the annual costs of special or intensive special education.

### Discussion

Investing in high-quality EIBI for children with autism is likely to pay handsome dividends for the various systems that are charged with providing services to these individuals. For the purpose of the present analysis, the initial investment was estimated at just under \$100,000 per child (\$33,000 per year for 3 years). This was the average cost in Pennsylvania in 1996. This figure probably is lower than present costs. Using \$150,000, or \$50,000 a year for 3 years, the estimated savings are still substantial. In either

case, the overall average savings are estimated to range from well over \$1 million to over \$2 million per individual across the life span.

There are a number of potentially problematic features in the assumptions we made in conducting this analysis. These are discussed in detail in the published article, and involve assumptions about future costs, future service use, and levels of inflation, among other features. As indicated, a major qualifier is the rate of attainment of normal functioning, but it is important to note that moderate gains from EIBI result in substantial savings.

Another question is: "How do these costs and benefits of EIBI compare with other forms of early intervention for children with autism/PDD?" The question, unfortunately, cannot be answered, because, to date, comprehensive outcomes using nonABA interventions have not been documented. We simply do not know how many, if any, children who have received other forms of early intervention have achieved normal functioning, moderate (partial) gains, or minimal benefits.

Like effective treatments for other severe childhood disorders, such as cancer, early intensive behavioral intervention can be described as aggressive, intrusive, expensive, and necessitating a high level of specialized expertise for effective delivery. The decision to invest in intrusive, expensive treatment for childhood cancer is usually based on several factors, including the scientifically demonstrated efficacy of other treatments, and the probable consequences of pursuing other treatments or no treatment at all. If a child with a major disorder needs treatment, cost is usually not a major factor; various public and private resources are typically made available to cover the costs. Many parents and professionals are beginning to insist that the same considerations apply to the treatment of children with autism/PD. We should all recognize that the most expensive interventions are those that fail to produce meaningful, measurable, lasting benefits, regardless of cost.

## References

[This is a partial listing of relevant references, some of which are cited above. A complete listing may be found in the original article.]

Anderson, S. R., Avery, D. L., DiPietro, E. K., Edwards, G. L., & Christian, W. P. (1987). Intensive home-based early intervention with autistic children. *Education and Treatment of Children, 10*, 352-366.

Birnbrauer, J. S., & Leach, D. J. (1993). The Murdoch Early Intervention Program after 2 years. *Behaviour Change, 10*, 63-74.

Fenske, E.C., Zalenski, S., Krantz, P..J., & McClannahan, L.E. (1985). Age at intervention and treatment outcome for autistic children in a comprehensive intervention program. *Analysis and Intervention in Developmental Disabilities, 5*, 49-58.

Graff, R. B., Green, G., & Libby, M. E. (1998). Effects of two levels of treatment intensity on a young child with severe disabilities. *Behavioral Interventions, 13*, 21-42.

Green, G. (1996a). Early behavioral intervention for autism. What does research tell us? In C. Maurice, G. Green, & S. Luce (Eds.), *Behavioral intervention for young children with autism: A manual for parents and professionals* (pp. 29-44). Austin, TX: Pro-Ed.

Green, G. (1996b). Evaluating claims about treatments for autism. In C. Maurice, G. Green, & S. Luce (Eds.), *Behavioral intervention for young children with autism: A manual for parents and professionals* (pp. 15-28). Austin, TX: Pro-Ed.

Guralnick, M.J. (1998). Effectiveness of early intervention for vulnerable children: A developmental perspective. *American Journal on Mental Retardation, 102*, 319-345.

Lovaas, O. I. (1987). Behavioral treatment and normal intellectual and educational functioning in autistic children. *Journal of Consulting and Clinical Psychology, 55*, 3-9.

Matson, J. L. Benavidez, D. A., Compton, L. S., Paclwaskyj, T., & Baglio, C. (1996). Behavioral treatment of autistic persons: A review of research from 1980 to the present. *Research in Developmental Disabilities, 17*, 433-465.

Maurice, C. (1993). *Let me hear your voice*. New York, NY: Fawcett Columbine.

McEachin, J. J., Smith, T., Lovaas, O. I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation, 97*, 359-372 .