

What is Applied Behavior Analysis?

Behavior Analysis is the science of behavior. *Applied* behavior analysis (ABA) is the process of systematically applying interventions based upon the principles of learning theory to improve socially significant behaviors to a meaningful degree (Baer, Wolf & Risley, 1968/1987; Malott, 2004; Sulzer-Azaroff & Mayer, 1991). Specifically, ABA refers to a systematic approach to the assessment and evaluation of behavior, and the application of interventions that alter behavior. Over the past 30 years, several thousand published research studies have documented the effectiveness of ABA across a wide range of:

- populations (children and adults with mental illness, developmental disabilities and learning disorders)
- interventionists (parents, teachers and staff)
- settings (schools, homes, institutions, group homes, hospitals and business offices), and
- behaviors (language; social, academic, leisure and functional life skills, self-injury, and stereotyped behaviors)

ABA is an objective discipline focused on the reliable measurement and objective evaluation of observable behavior. Programs based upon ABA methodologies are grounded in the well-established principles of learning and operant conditioning, as influenced by the works of researchers such as Edward L. Thorndike and B.F. Skinner. The use of single case experimental design to evaluate the effectiveness of individualized interventions is an essential component of ABA programs. This process includes the following components which outline a reliable and accountable approach to behavior change (Sulzer-Azaroff & Mayer, 1991):

1. selection of interfering behavior or behavioral skill deficit
2. identification of goals and objectives
3. establishment of a method of measuring target behaviors
4. evaluation of the current levels of performance (baseline)
5. design and implementation of the interventions that teach new skills and/or reduce interfering behaviors
6. continuous measurement of target behaviors to determine the effectiveness of the intervention, and
7. ongoing evaluation of the effectiveness of the intervention, with modifications made as necessary to maintain and/or increase both the effectiveness and the efficiency of the intervention.

ABA generally focuses on the process of behavior change with respect to the development of adaptive, prosocial behavior and the reduction of maladaptive behavior. Specific, "socially significant behaviors" include:

- Cooperation
- Imitation: Motor Imitation, Verbal Imitation, Observational Learning
- Language: Requesting, Naming, Conversation, Abstract Concepts
- Social/Play Skills: Toy Play, Imaginary Play, Peer Play, Games
- Self Help: Dressing, Toileting, Personal Hygiene
- Classroom Participation: Group Instructions, Following Classroom Routines, Working Independently, Recruiting Feedback

For example, ABA methods can be used to:

- teach new skills (e.g. the socially significant behaviors listed above)
- generalize or to transfer behavior from one situation to another (e.g., from communicating with caregivers in the home, to interacting with classmates at school);
- modify conditions under which interfering behaviors occur (e.g., changing the learning environment so as to foster attention to the instructor);
- reduce inappropriate behaviors (e.g., self injury or stereotypy).

Treatment approaches grounded in ABA are now considered to be at the forefront of therapeutic and educational interventions for children with autism and other related developmental disabilities. In general, this behavioral framework utilizes prompt-fading, shaping, discrimination training, errorless learning and the arrangement of consequences to teach new skills and eliminate excessive or problem behaviors. The Discrete Trial is a particular ABA intensive teaching strategy which enables the learner to acquire complex skills and behaviors by first mastering the subcomponents of the targeted skill. For example, if one wishes to teach a child to request a desired interaction, as in "I want to play," one might first teach subcomponents of this skill, such as the individual sounds comprising each word of the request, or labeling enjoyable leisure activities as "play." By utilizing teaching techniques based on the principles of behavior analysis, the learner is gradually able to complete all subcomponent skills independently. Once the individual components are acquired, they are linked together to enable mastery of the more complex and functional targeted skill. This methodology is highly effective in teaching basic communication, play, motor, and daily living skills.

Initially, the program relies on structured Drill Based Instruction (DBI) also known as Discrete Trial Teaching (Lovass, 1986), and the curriculum focuses on teaching basic skills as noted above. However, ABA programs, such as the program implemented at Ready Set Go, place greater emphasis on the generalization and spontaneity of skills learned as the child progresses. The formal DBI approach gives way and is combined with another behaviorally based strategy, Activity Based Instruction (ABI) also known as Natural Environment Training. In this format skills are taught in a more natural environment in a more "playful manner." Moreover, the reinforcers used to increase appropriate responding are always directly related to the task (e.g., a child is taught to say the word for a preferred item such as a "car" and as a reinforcer is given access to the car contingent on making the correct request) during a naturally occurring opportunity. Initially a child's program is comprised mostly of DBI and some ABI however as the child progress the child may have a greater amount of ABI instruction and less DBI instruction. However, these decisions are made individually for each child base upon their particular needs and rapidity of learning.

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Research Supporting ABA

2010 review of early intervention research Using Participant Data to Extend the Evidence Base for Intensive Behavioral Intervention for Children with Autism

Eldevik, S. et al (2010). American Journal on Intellectual and Developmental Disabilities, 115, 381-405.

More children who underwent behavioral intervention achieved reliable change in IQ (29.5%) and adaptive behavior (20.6%) than for the comparison (2.6% & 5.7%) and control groups (8.7% & 5.1%). Within the behavioral intervention sample, IQ and adaptive behavior at intake predicted gains in adaptive behavior. Intensity of intervention predicted gains in both IQ and adaptive behavior.

2008 review of early intervention research Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder

Dawson, G. (2008). Developmental and Psychopathology, 20, 775-803.

A proposal that early detection of ASD can prevent the full onset of the syndrome by implementation of interventions and treatments designed to alter the course of early behavioral development and subsequently brain development.

2008 review of research supporting recovery Can Children with Autism Recover? Is So, How?

Helt, M., Kelley, E., Kinsbourne, M., Pandey, J., Boorstein, H., Herbert, M., & Fein, D. (2008). Neuropsychology Review, 18 (4), 339-366.

A review of existing research demonstrates that between 3% and 25% of children lose their ASD diagnosis following treatment. Behavioral techniques are most often associated with "best outcomes" and the most empirically validated approach. Possible mechanisms of recovery include: normalizing input by forcing attention outward or enriching the environment; promoting the reinforcement value of social stimuli; preventing interfering behaviors; mass practice of weak skills; reducing stress and stabilizing arousal.

2007 study comparing Eclectic-Developmental Approach and ABA Intervention Change in autism core symptoms with intervention

Zachor, D. Ben-Itzhak, E. Rabinovich, A. and Lahat, E. (2007) Research in Autism Spectrum Disorders, (1), 304-317.

Comparison of an Eclectic approach (Mix of Speech Therapy, Occupational Therapy, Special Education Small Group Instruction, Structured cognitive teaching) group (19) compared to ABA group (20) receiving 1:1 ABA, both took place in a preschool setting including typical peer models. Groups were matched on IQ, age, Symptoms Assessments both programs received the same amount of money and children received the same number of hours of service (full day program). After one year ABA group improved in IQ, Language and Communication, reduction in symptoms, changes in diagnostic category (20% of ABA group off-spectrum none in the Eclectic group). Children with higher IQ were better before and after treatment however, higher IQ children do not improve more than lower IQ children. IQ correlates with higher receptive skills but not with reduction in symptoms. Children receiving ABA, regardless of IQ, show significant improvement over the Eclectic group.

**2006 study comparing intensity of therapy
Effects of low-intensity behavioral treatment for children with autism and mental retardation**

Eldevik, S., Eikeseth, S., Jahr, E. & Smith, T. (2006). *Journal of Autism and Developmental Disorders*, 36 (2), 211-224.

A comparison of 2 groups of children receiving either behavioral treatment or eclectic treatment for an average of *12 hours per week* was completed. After 2 years of treatment, the behavioral group made larger gains than the eclectic group. However, *gains were more modest than those reported in previous studies with children receiving more intensive behavioral treatment and it is questionable whether they were clinically significant.*

**2006 study replicating the 1987 Lovaas study results
Early Intensive Behavioral Treatment: Replication of the UCLA Model in a Community Setting.**

Cohen, Howard, Amerine-Dickens, Mila, Smith, Tristram. (2006). *Journal of Developmental & Behavioral Pediatrics*, 27 (2), 145-155.

The most recent replication study of the Lovaas Model of Applied Behavior Analysis by an independent author. Children in behavioral treatment scored significantly higher in IQ and adaptive behavior scores than the comparison group. Further, 29% (6 of 21) children were fully included in regular education without assistance and another 52% (11 of 21) were included with support. This compares to only 5% (1 of 21) children in the control group who were placed in regular education.

**2005 study replicating the 1987 Lovaas study results
Intensive Behavioral Treatment for Children with Autism: Four-Year Outcome and Predictors.**

Sallows, Glen O. & Graupner, Tamlynn D. (2005). *American Journal on Mental Retardation*, 110 (6), 417-438.

Replication study of the Lovaas Model of Applied Behavior Analysis by an independent author. Dr. Sallows states, "We found that 48% of all children showed rapid learning, achieved average posttreatment scores, and at age 7, were succeeding in regular education classrooms. These results are consistent with those reported by Lovaas and colleagues (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993)."

**2005 independent replication study directly comparing three treatments
A Comparison of Intensive Behavior Analytic and Eclectic Treatments for Young Children with Autism.**

Howard, Jane S. , Sparkman, Coleen R., Cohen, Howard G., Green, Gina, & Stanislaw, Harold. (2005).

Research in Developmental Disabilities, 26 (4), 359-383.

The study compared the effects of three treatment approaches on preschool-age children with autism. The experimental group received 25-40 hours per week of 1:1 ABA intervention. A comparison group received 30 hours of "eclectic" interventions in special education programs designed for children with autism. A second comparison group received 15 hours per week of combination of generic educational services involving small group and developmental preschool instruction.

Results from an independent research group that replicate the findings of Eikeseth et al. (2002). As summarized in the journal abstract, "intensive behavioral treatment is considerably more efficacious than 'eclectic' intervention."

**2002 study directly comparing two treatments
Intensive Behavioral Treatment at School for 4- to 7-Year-Old Children with Autism.**

Eikeseth, Svein, Smith, Tristram, & Eldevik, Erik Jahr Sigmund. (2002). Behavior Modification, 26, 49-68.

Demonstrates that a focused behavioral treatment program is far superior than an eclectic special education approach that uses a variety of treatments. (Children in both groups received the same number of hours of treatment by qualified personnel.)

1997 follow up study

Intensive behavioral treatment for preschoolers with severe mental retardation and pervasive developmental disorder.

Smith, T., Eikeseth, S., Klevstrand, M. & Lovaas, O. I. (1993). American Journal on Mental Retardation, 102 (3), 238-249.

Children in the experimental group received 30 hours of 1:1 ABA therapy per week. The comparison group received 10 hours or less of the same therapy per week. The experimental group obtained clinically meaningful gains relative to the comparison group, who remained quite delayed.

1993 follow up study

Long-term outcome for children with autism who received early intensive behavioral treatment.

McEachin, J. J., Smith, T., & Lovaas, O. I. (1993). American Journal on Mental Retardation, 97 (4), 359-372.

Follow-up research in early adolescence showed that children in the 1987 study maintained their skills and could succeed in life without costly special education and residential services.

1987 study pioneering study

Behavioral treatment and normal educational and intellectual functioning in young autistic children.

Lovaas, O. I. (1987). Journal of Consulting and Clinical Psychology, 55, 3-9.

Original research in peer-reviewed journals indicating that 90% of children substantially improved when utilizing the Lovaas Model of Applied Behavior Analysis, compared to the control group. Close to half attained a normal IQ and tested within the normal range on adaptive and social skills.

Program Evaluation Data from Ready, Set, Go!

Figure 1

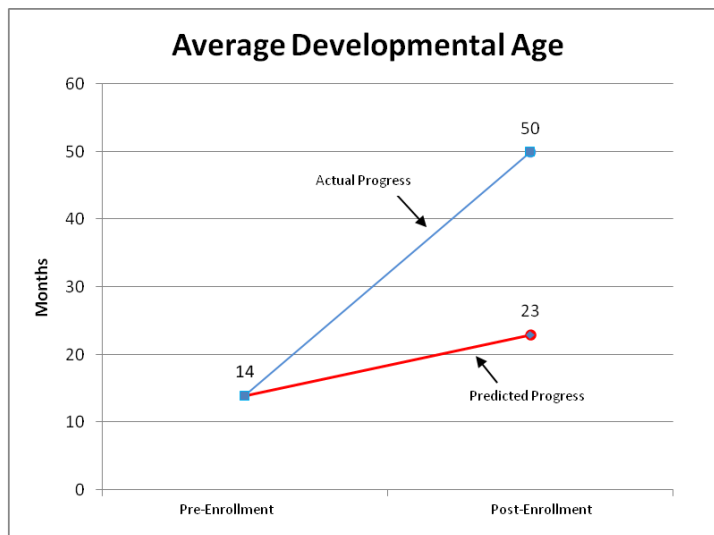


Figure 1 illustrates the positive effect of intervention. Assuming the child’s rate of development from 0 to 3 years of age continues unaltered and the trend is extended, the predicted developmental age by 5.5 years would be 23 months. This is represented by the bottom line. Actual development, represented by the top line shows accelerated development as a result of the intervention; the average developmental level post-intervention is 50 months.

Figure 2

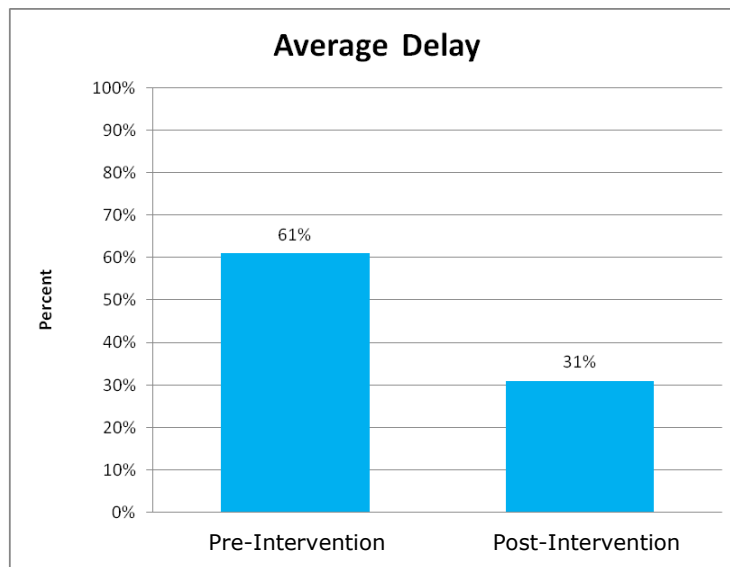


Figure 2 illustrates that intervention decreases the severity of delay. When children enroll the average developmental delay is 61% and when they exit the average delay is 31%.

The figures above represent all children enrolled during a five year period (1994-1999). The typical profile of a child who receives services at RSG is between the ages of three and four years of age. The length of stay lasts from two to three years at which time the child transitions to public school. During their enrollment they attend five days a week averaging approximately 25 to 30 hours per week, daily attendance and length of enrollment varies by individual child. Since these results are averages some children made greater progress while others showed less improvement. Progress was measured using the Uniform Performance Assessment System (Haring et al, 1979).