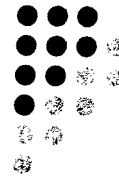


Applied Behavior Analysis in the Treatment of Autism

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1

Topics

- Overview of applied behavior analysis (ABA) intervention for autism
 - What ABA is
 - What is known from research on
 - Focused ABA interventions for autism
 - Intensive, comprehensive ABA intervention for young children with autism
- Health insurance coverage of ABA intervention for autism
 - Rationale
 - Self-insured companies
 - TRICARE demonstration program
 - State mandates
 - Proposed federal mandate
- Summary and conclusions



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Applied behavior analysis



- Behavior (*not* "behavioral") analysis: a natural science approach to understanding and changing behavior; focus is on relations between behavior and environment
 - A scientific discipline with
 - Conceptual, experimental, and applied components
 - Unique research methodology
 - Professional journals and organizations
 - Professional credentialing program for practitioners
 - Managed by Behavior Analyst Certification Board (see www.BACB.com)
 - Accredited by National Commission for Certifying Agencies
- Applied behavior analysis (ABA): Application of scientific principles of behavior discovered through basic research (e.g., reinforcement) to improve socially significant behavior to a meaningful degree
 - *Many* applications in addition to autism
 - Based on the work of many researchers and practitioners

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ABA



- An approach comprising many evidence-based techniques or procedures for changing behavior
- Effective for building skills and reducing problematic behaviors in people of all ages, with and without disabilities
- Stresses positive reinforcement and scientific demonstrations of effectiveness
- Highly individualized
- Flexible and dynamic; intervention is adjusted continuously based on data
- Continuously evolving

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Behavior analysis research methods

- Direct observation and measurement of behavior, and single-case research designs
 - Intensive study of individual behavior interacting with environmental variables over time under control and treatment conditions
- Akin to methods used in other natural sciences, and by some medical researchers
- Focus is on *clinically important changes in individual behavior over time*, not statistical comparisons of group average scores
- Included in several protocols for developing evidence-based practice guidelines for behavioral interventions (e.g., American Psychological Association, National Association of School Psychologists) and for interventions for autism (e.g., New York State Department of Health Early Intervention Program, National Autism Center's National Standards Project, California Department of Developmental Services ASD Guidelines Project).

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ABA for autism: Research on focused interventions

- Hundreds of published studies document effectiveness of many ABA techniques for developing many important skills in people with autism *of all ages* (e.g., Matson et al., 1996; New York State Department of Health, 1999; Wolery, Barton, & Hine, 2005; *Journal of Applied Behavior Analysis*):
 - Learning to learn: looking, listening, imitating, following instructions, discriminating and matching stimuli, etc.
 - Communication: verbal and nonverbal; comprehension and production; from simple to complex
 - Social : simple reciprocal exchanges, playing with peers, sharing, expressing emotions, empathizing, dramatic play, etc.
 - Self-care: hygiene, personal safety, community living, dental and healthcare routines, etc.
 - Academics
 - Motor and leisure
 - Vocational
- Hundreds more document effectiveness of ABA methods for reducing problem behaviors (e.g., see Campbell, 2003)

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6

Early intensive ABA for autism: Treatment model



- *Early*: generally, children enter treatment before age 6
- *Intensive*: 25-40 hrs/wk, year around, 1- 4 yrs
- *Comprehensive*:
 - Addresses skills in all domains -- "learning to learn," communication, social, self-care (e.g., safety, hygiene, eating, sleeping), cognitive, preacademic, play -- broken down into small components or steps
 - Many evidence-based ABA techniques used to develop functional skills, reduce problem behaviors
- Usually started in home, but can be done in centers
- Highly individualized to child and family needs and characteristics
- Treatment program designed and overseen by professional behavior analyst with at least a master's degree and specific training in autism

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Early intensive ABA (cont'd)



- Each learner's strengths and weaknesses assessed by direct observation and measurement
- Each component skill developed via many carefully planned learning opportunities
 - in both structured and naturalistic situations
 - using written protocols
 - with lots of repetition and positive reinforcement
 - in 1-to1 format initially; gradually changed to small group
- Problem behaviors are not reinforced; appropriate alternative behaviors are
- Where possible, child makes gradual transition to regular preschool or elementary school program

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Early intensive ABA (cont'd)



- Behavior analyst
 - Designs treatment program (goals and objectives, intervention methods) in collaboration with parents and other team members
 - Trains parents and “tutors” or “therapists” to deliver most intervention, under close supervision
 - Reviews graphed data on every skill and problem behavior at least weekly, modifies intervention methods as needed
 - Determines when objectives have been obtained or need to be modified
- Treatment goal: help child develop skills that enable safe, successful, independent functioning, both in the short and the long run

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Research on early intensive ABA for autism



- Summaries that follow are drawn from published studies with
 - Treatment group that received ABA intervention *directed by qualified behavior analysts* and one or more comparison groups of similar children
 - Intensive ABA: 25 - 40 hrs/wk
 - Low-intensity ABA: less than 20 hrs/wk
 - Children in *all groups* had autism or PDD-NOS, average developmental rates of about .50 in most skill domains except motor skills pre-treatment
 - ABA intervention provided mainly by tutors, college students, paraprofessionals, and parents trained by the behavior analysts
 - Comparison groups received interventions (e.g., “eclectic” or mixed-method intervention, standard early intervention) from qualified professionals trained in autism

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Research on early intensive ABA for autism



- Excluded: studies with other populations; single-group studies (e.g., Weiss, 1999); studies with "ABA" intervention directed by individuals with inadequate or unknown training in behavior analysis (e.g., Magiati, Charman, & Howlin, 2007; Sheinkopf & Siegel, 1998).
- Tables of effectiveness data show average gains [+] and losses [-] on standardized tests of developmental levels/cognitive skills, communication skills, social skills, and adaptive skills administered by independent evaluators in most studies
- Several researchers also measured academic skills, educational placement, problem behaviors, autism characteristics, parental stress, etc. -- data not shown in tables

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Between-groups studies of intensive ABA - UCLA model

Study	Group assignment	Tx Gp (Int ABA)	Comp Gp 1	Comp Gp 2
Lovaas (1987); McEachin, Smith, & Lovaas (1993) [US]	Case control (therapist availability)	N = 19 40 hrs/wk, 2+ yrs In homes	N = 19 ABA 10 hrs/wk + spec ed	N = 21 Standard spec ed
Sallows & Graupner (2005) [US]	Random*	N = 13 38 hrs/wk, 2+ yrs In homes	N = 10 <i>Parent-managed</i> ABA, 31 hrs/wk, 2+ yrs	
Cohen, Amerine-Dickens, & Smith (2006) [US]	Case control (IFSP/IEP teams)	N = 21 35-40 hrs/wk, 3+ yrs In homes	N = 21 Standard spec ed	
Eikeseth, Smith, Jahr, & Eldevik (2002, 2007) [Norway]	Case control (supervisor availability)	N = 13 28 hrs/wk 1 yr, 18 hrs/wk 2nd yr In classrooms	N = 12 Int eclectic, 29 hrs/wk 1 yr, 16 hrs/wk 2nd yr	
Smith, Groen, & Wynne (2000) [US]	Random	N = 15 25 hrs/wk, 33m In homes	N = 13 <i>Parent-managed</i> ABA, 10 hrs/wk + spec ed, 33m	

*Both groups received intensive ABA

Between-groups studies of intensive ABA - other models

Study	Group assignment	Tx Gp (Int ABA)	Comp Gp 1	Comp Gp 2
Howard, Sparkman, Cohen, Green, & Stanislaw (2005) [US]	Case control (IFSP/IEP teams)	N = 29 25-40 hrs/wk, 14m In homes	N = 16 Int eclectic, 25-30 hrs/wk, 14m	N = 16 Nonint eclectic, 15 hrs/wk, 14m
Zachor, Ben-Itzhak, Rabinovitch, & Lahat (2007) [Israel]	Case control	N = 20 35 hrs/wk, 1 yr In classrooms	N = 19 Eclectic/developmental 35 hrs/wk, 1 yr	
Remington, Hastings, Kovshoff, Espinosa, Jahr, Brown, Alsford, Lemaic & Ward (in press) [UK]	Case control (parent selected)	N = 23 25 hrs/wk, 2 yrs In homes	N = 21 Standard spec ed 16 hrs/wk, 2 yrs	

Effectiveness: Intensive ABA vs. parent-managed ABA or special ed

Study	Measures	Mean Changes - ABA Tx Gp	Mean Changes - Comp Gp 1	Mean Changes - Comp Gp 2
Lovaas (1987)	IQ*	+20	Low-int ABA +spec ed 0	Standard spec ed 0
Sallows & Graupner (2005)	IQ* Nonverbal IQ* Rec lang* Exp lang* Adaptive*	+22.2 +7.0 +17.0 +5.4 +9.5	Parent-mgd int ABA +27.5 +6.7 +27.0 +10.8 +5.8	
Cohen et al (2006)	IQ* Nonverbal IQ* Rec lang* Exp lang* Adaptive*	+25 +13 +20 +25 +9	Standard spec ed +14 +13 +9 +15 -4	
Smith, Green & Wynne (2000)	IQ* Nonverbal IQ** Rec lang** Exp lang** Adaptive*	+16.0 +42.7 +29.4 +29.4 -52.2	Parent-mgd ABA -01.0 +27.3 +19.3 +19.9 -66.7	
Remington et al (in press)	IQ* Adaptive***	+12.0 +68.1	Standard spec ed -2.2 +19.3	

*Standard scores, **age equivalent scores, ***raw scores

Effectiveness: Intensive ABA vs. eclectic intervention

Study	Measures	Mean Changes - ABA Tx Gp	Mean Changes - Comp Gp 1	Mean Changes - Comp Gp 2
Eikeseth et al (2002, 2007)	IQ* Adaptive*	+25 +11	Intensive eclectic + 7 -10	
Howard et al (2005)	IQ* Nonverbal IQ* Rec lang* Exp lang* Adaptive*	+29.7 +20.6 +20.2 +20.1 +10.5	Intensive eclectic +8.4 +6.1 +3.9 +3.8 - 0.6	Nonint eclectic +8.9 +2.3 - 4.8 - 4.5 - 2.8

*Standard scores

Note: Zachor et al. (2007) not included because authors did not use same standardized tests as in other studies, but they did find that intensive ABA produced greater reductions in autism symptoms than intensive eclectic/developmental intervention, based on the Autism Diagnostic Observation Survey.

Between-groups studies of low-intensity ABA

Study	Group assignment	Tx Gp (Int ABA)	Comp Gp
Birnbrauer & Leach (1993) [Australia]	Case control (supervisor availability)	N = 9 18.7 hrs/wk, 2 yrs In homes	N = 5 Standard special ed, hrs/wk, 2 yrs
Eldevik, Eikeseth, Jahr, & Smith (2006) [Norway]	Case control (education teams)	N = 13 12.5 hrs/wk, 20m In classroom	N = 15 Eclectic, 12 hrs/wk, 21m

Effectiveness: Low-intensity ABA vs.
special ed and intensive eclectic intervention

Study	Measures	Mean Changes - ABA Tx Gp	Mean Changes - Comp Gp
Birnbauer & Leach (1993)	IQ*	+ 7	Standard spec ed
	Nonverbal IQ*	+ 29	NT
	Lang*	+ 6	NT
	Adaptive*	- 5	- 8
Eldevik et al (2006)	IQ*	+ 8.2	- 7
	Nonverbal IQ*	+ 8.6	- 10.5
	Rec lang*	+ 6.8	- 7.7
	Exp lang*	+ 11.0	- 6.4
	Adaptive*	- 0.2	- 4.8

*Standard scores; NT = untestable

Main findings

- Professionally directed early intensive ABA (25-40 hrs/wk) produced larger improvements than typical EI/special ed, eclectic interventions, and low-intensity ABA in
 - Cognitive skills (full-scale and nonverbal IQ)
 - Communication skills (receptive and expressive)
 - Social skills
 - Play skills
 - Academic skills
 - Adaptive and self-care skills
 - Problem behaviors
 - Autism characteristics
 - Parental stress
- Just under 50% of children receiving early intensive ABA made large gains in multiple skill domains, achieved normal or near-normal functioning
 - ~ 40% made modest gains and ~10% made small gains as measured on standardized tests

Main findings

- Proportions of children who moved from delayed to normal range on IQ (all between-groups studies combined):
 - Intensive ABA: $61/133 = 46\%$
 - Typical special ed: $14/79 = 18\%$
 - Intensive eclectic: $4/28 = 14\%$
- Largest gains occurred when intervention was most intensive (≥ 30 hrs/wk)
- Parent-managed ABA (with consultation) produced mixed results

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19

Main findings

- Low-intensity ABA produced smaller gains than intensive ABA (not clinically significant), but larger than typical and eclectic intervention
- Other interventions produced negligible gains or losses in most studies
 - Eclectic intervention (mixture of developmental, TEACCH, sensory integration, speech therapy, PECS, and/or ABA methods) was largely ineffective *even when individualized and intensive*
 - *Intensity alone isn't sufficient; type of intervention matters*
- Several uncontrolled studies and case reports with objective measures corroborate effectiveness of early intensive ABA

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20

Health insurance coverage of ABA treatment for autism: Rationale (Autism Speaks)



- Children with autism have greater health care needs than children without autism.
- Treatments are difficult to access, often inadequate and delayed; parents must pay out of pocket or children must go without needed treatment.
- Mandated insurance coverage will bring effective treatment to children who need it. ABA has proved effective.
- Several government and scientific organizations endorse ABA.
- Cost of insurance coverage of ABA is relatively small, will result in savings by improving outcomes for children and reducing lifetime cost of care.

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21

Health insurance coverage of ABA treatment for autism



- At least 20 self-insured companies provide ABA benefit, recognize Board Certified Behavior Analysts (BCBAs) as providers
 - Includes Microsoft, Home Depot, Intel, Cisco Systems, Eli Lilly, Mayo Clinic
- U.S. military's insurance (TRICARE) provides ABA benefit under a "demonstration program"
- Medicaid provides some coverage in some states, but typically inadequate for children to make meaningful improvements

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Health insurance coverage of ABA treatment for autism



- 8 states have legislation mandating private health insurance coverage of ABA
 - IN - dollar limits cannot be less favorable than those for physical illnesses
 - SC - up to \$50k per year through age 16
 - TX - up to \$50k per year, ages 3-6
 - FL - up to \$36k per year, \$200k lifetime
 - AZ - up to \$50k per year through age 8, \$25k per year ages 9-16
 - LA - up to \$36k per year, \$144k lifetime
 - PA - up to \$36k per year, no lifetime cap
 - IL - up to \$36k per year through age 21
 - Most place no limits on number of visits for ABA
- Bills planned for 26 states this year (see www.autismvotes.org)
- President-elect Obama has proposed federal mandate

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Summary and conclusions



- Contemporary ABA intervention for autism rests on more than 40 years of scientific research
 - At present, no other approach to autism intervention has comparable scientific support (Eikeseth, 2008; Myers et al/AAP, 2007; New York State Department of Health, 1999).
- Best available evidence indicates that *competently directed and delivered* early intensive ABA intervention is especially effective (Dawson, 2008; Eikeseth, 2008; Myers et al/AAP, 2007; New York State Department of Health, 1999; Rogers & Vismara, 2008; U.S. Department of Defense, 2007; U.S. Surgeon General, 1999).

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24

Summary and conclusions



- Estimated savings from investment in early intensive ABA:
 - At least \$2 million per individual in childhood and adult services costs combined [using 1996 Pennsylvania costs] (Jacobson, Mulick, & Green, 1998)
 - Millions in health care costs over the lifespan (e.g., Leslie & Martin, 2007; Mandell, 2007)
- Focused ABA interventions are also effective for building specific skills and reducing problem behaviors -- thereby reducing health care costs -- for people with autism of all ages

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25

For more information on ABA for autism, please see...



- www.behavior.org/autism (Cambridge Center for Behavioral Studies)
- www.autismspeaks.org/whattodo/what_is_aba.php (Autism Speaks)
- www.apbahome.net (Association of Professional Behavior Analysts)
- www.asatonline.org (Association for Science in Autism Treatment)

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26

For qualifications to practice applied behavior analysis, please see...



- Behavior Analyst Certification Board -- www.BACB.com
- Association of Professional Behavior Analysts -- www.APBAhome.net
- Association for Behavior Analysis Autism Special Interest Group Consumer Guidelines - <http://www.autismsig.org>
- American Psychological Association Specialty in Behavioral Psychology -- <http://www.apa.org/crsppp/archivbehav.html>