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**Applied Behavior Analysis: Medically Necessary Interventions for
Autism Spectrum and Related Disorders**

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What is applied behavior analysis (ABA)?

- Behavior (not “behavioral”) analysis is a natural science discipline whose subject matter is behavior interacting with environmental events. It was founded in the 1930s by B.F. Skinner. Like other scientific disciplines, behavior analysis has theoretical, experimental, and applied branches; journals; scholarly and professional organizations; university training programs; and well-established professional credentials (see below and www.bacb.com).

Skinner and other behavior analysts developed research methods that are uniquely suited for studying behavior, which occurs only at the level of the individual and involves continuous interactions between actions and various aspects of the environment. Those methods generally involve selecting one or a few observable behavior(s), measuring occurrences of the behavior(s) directly and repeatedly in the presence and absence of specific environmental events that may affect the behavior(s), graphing the resulting data, and analyzing the graphed data visually to determine if behavior changed and if that change was due to the environmental events.

- The applied branch of the discipline (ABA) was developed by blending Skinner’s experimental analysis of behavior with information about human development. It involves applying scientific principles and procedures discovered through basic research (e.g., positive reinforcement) to improve socially significant behavior to a meaningful degree.
- To be characterized accurately as ABA, interventions must have these 7 defining features (from Baer, Wolf, & Risley, 1968):
 - Applied – addresses behaviors that are socially significant for the client and his/her significant others.

- Behavioral – focuses on the client behavior(s) in need of improvement and measures those directly (as opposed to measuring the behavior of others who interact with the client, measuring client behavior indirectly, etc.).
 - Analytical – consistently produces change in a measured aspect of the target behavior(s) when the intervention is in place vs. when it is not.
 - Technological – described with sufficient detail and clarity that a reader has a reasonable chance of replicating the intervention.
 - Conceptually systematic – grounded in the conceptualization that behavior is a function of environmental events and described in terms of behavior analytic principles.
 - Effective – improves target behaviors to a practical degree.
 - Generalized – produces changes in target behaviors that last over time, occur in situations other than those in which the interventions were implemented initially, and/or spread to behaviors that were not treated directly.
- Although many people use information about ABA that is in the public domain, the practice of ABA is a distinct profession that requires specialized training. Genuine ABA services are designed and overseen by qualified professional behavior analysts: Board Certified Behavior Analysts-Doctoral®, Board Certified Behavior Analysts®, Licensed Behavior Analysts (where applicable), and licensed psychologists with documented training and competence in behavior analysis. Services are delivered by those professionals and Board Certified Assistant Behavior Analysts® or Licensed Assistant Behavior Analysts (where applicable), behavior technicians, and others under their supervision in models ranging from **focused interventions** addressing a small number of treatment targets to **comprehensive interventions** addressing multiple targets.
 - In contemporary practice, competently designed and delivered ABA programming (a) comprises many scientifically proven techniques or procedures for developing useful skills, building relationships, and reducing behaviors that impede healthy, successful functioning; (b) stresses positive reinforcement and scientific evaluations of effectiveness; (c) is highly individualized and client-centered; (d) involves active engagement of clients and their significant others; (e) is flexible and dynamic, with intervention adjusted continuously based on data representing repeated measurement of target behaviors over time; (f) is often intricate and complex; and (g) is typically carried out in a variety of everyday environments (homes, schools, clinics, hospitals, nursing homes, group homes, universities, offices, factories, etc.).
 - ABA studies are **controlled clinical trials** (CCTs) in which each participant experiences both the control (baseline) and the treatment conditions; target behaviors are measured directly, objectively, and repeatedly; and comparisons of treatment and control conditions are replicated within and/or across participants. These studies yield rich, precise data on behavior change procedures and individual responses to treatment. Thousands of behavior analytic CCTs published since the early 1960s have demonstrated the effectiveness of scores of ABA procedures – singly and in various combinations – for building skills and reducing problem behaviors in many clinical and non-clinical populations in a wide range of settings. That is, the efficacy as well as the generality (external validity) of many ABA procedures has been demonstrated empirically through multiple replications.
 - Some of the many areas in which ABA interventions have been shown to be effective are general and special education (all levels); interventions for autism spectrum disorders, intellectual and developmental disabilities, attention deficit disorder, movement disorders, brain injuries and diseases, behavior disorders, substance abuse disorders, dementia, and feeding disorders; home and

workplace safety; vehicular and pedestrian safety; organizational behavior management; animal welfare and training; conservation; parenting; child welfare; sports; and health and fitness.

What are “medically necessary” interventions for autism spectrum disorder (ASD) and related disorders?

- Medical necessity is defined in various ways, but the term generally refers to treatments that ameliorate or manage symptoms, improve functioning, and/or prevent regression or deterioration.
- The American Academy of Pediatrics has stated that “...the pediatric definition of medical necessity should be as follows: health care interventions that are evidence based, evidence informed, or based on consensus advisory opinion and that are recommended by recognized health care professionals, such as the AAP, to promote optimal growth and development in a child and to prevent, detect, diagnose, treat, ameliorate, or palliate the effects of physical, genetic, congenital, developmental, behavioral, or mental conditions, injuries, or disabilities. (American Academy of Pediatrics Committee on Child Health Financing [2013]. Essential contractual language for medical necessity in children. *Pediatrics*, 132, 398-401).

Focused and comprehensive ABA interventions for ASD and related disorders meet criteria for medical necessity.

- ASDs are neurodevelopmental conditions that manifest in *behavioral* difficulties in three core domains (social interaction, communication, and interests and activities) as well as other areas that jeopardize health, safety, and overall functioning.
- ABA interventions (both focused and comprehensive) have proved effective for ameliorating core symptoms and for building other skills that enhance health and functioning in people with ASD and related disorders *of all ages*, such as
 - Hygiene and self-care skills
 - Personal safety skills
 - Eating a healthy diet
 - Sleeping
 - Cooperating with medical and dental procedures
- ABA interventions have also proved effective for improving behaviors that directly jeopardize the health and welfare of people with ASD and related disorders *of all ages*. These behaviors account for large proportions of healthcare costs for people with those disorders:
 - Self-injurious behaviors
 - Property destruction
 - Pica (ingesting inedible items)
 - Aggression
 - Elopement (wandering)
 - Obsessive behaviors
 - Hyperactivity
 - Fearful behaviors

Best available scientific evidence on comprehensive, intensive ABA interventions for young children with ASD

- Many controlled between-groups outcome studies of the Lovaas/UCLA model and some (but not all) broad-based ABA models have been published.
- Several meta-analyses of published studies show that genuine early intensive ABA intervention overseen by professional behavior analysts produced substantially larger improvements than less

intensive ABA, eclectic (mixed-method) intervention, and typical early intervention.

- **Strongest evidence:** Eldevik, S., Hastings, R.P., Hughes, J. C., Jahr, E., Eikeseth, S., & Cross, S. (2010). Using participant data to extend the evidence for intensive behavioral intervention for children with autism. *American Journal on Intellectual and Developmental Disabilities, 115*, 381- 405.
 - Mega-analysis of individual participant data from 16 published studies (309 children – ABA; 39 children – intensive eclectic [mixed-method] autism interventions; 105 children – nonintensive eclectic early intervention). Main findings:
 - ABA intervention was substantially more effective than intensive and nonintensive eclectic interventions.
 - Effect sizes for ABA were moderate to large and comparable to those found for medical and psychological treatments for major depression, obsessive-compulsive disorder, and bulimia.
 - ABA intervention for 36+ hrs/wk, ≥ 2 yrs was found to be necessary to produce reliable gains on measures of intellectual and adaptive skills (defined as increases of 27 and 21 standard score points, respectively).
- Other meta-analyses and systematic reviews:

Eldevik, S., Hastings, R.P., Hughes, J.C., Jahr, E., Eikeseth, S., & Cross, S. (2009). Meta-analysis of early intensive behavioral intervention for children with autism. *Journal of Clinical Child & Adolescent Psychology, 38*, 439-450.

Klintwall, L., Eldevik, S., & Eikeseth, S. (2015). Narrowing the gap: Effects of intervention on developmental trajectories in autism. *Autism, 19*, 53-63.

Reichow, B. (2012). Overview of meta-analyses on early intensive behavioral intervention for young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 42*, 512-520.

Reichow, B. & Wolery, M. (2009). Comprehensive synthesis of early intensive behavioral interventions for young children with autism based on the UCLA Young Autism Project model. *Journal of Autism and Developmental Disorders, 39*, 23-41.

Smith, T. & Iadarola, S. (2015). Evidence base update for autism spectrum disorder. *Journal of Clinical Child & Adolescent Psychology, 44*, 897-922.

Virués-Ortega, J. (2010). Applied behavior analytic intervention for autism in early childhood. *Clinical Psychology Review, 30*, 387-399.

Best available scientific evidence on focused ABA interventions for people with ASD and related disorders

- Recent comprehensive reviews of research:

Wong et al. (2014) *Evidence-Based Practices for Children, Youths, and Young Adults with Autism Spectrum Disorder* – available at <http://autismpdc.fpg.unc.edu/node/21>

- The 27 practices that met criteria as evidence-based “...consist of interventions that are fundamental applied behavior analysis techniques (e.g., reinforcement, extinction, prompting), assessment and analytic techniques that are the basis for intervention (e.g., functional behavior assessment, task analysis), and combinations of primarily behavioral practices used in a routine and systematic way that fit together as a replicable procedure

(e.g., functional communication training, pivotal response training).” (p. 19).

National Autism Center (2015). *Findings and Conclusions: National Standards Project, Phase 2* -- available at <http://www.nationalautismcenter.org/national-standards-project/phase-2/>

- For people with ASD ages 0-21 years, the large majority of the 14 interventions that met criteria as established are ABA interventions (both comprehensive and focused) or incorporate some ABA procedures. The largest category, labeled “behavioral interventions,” comprises “packages” of procedures involving modification of environmental events to increase or decrease target behaviors – that is, ABA interventions.
 - For people with ASD ages 22 and older, the only category of interventions identified as established is behavioral interventions, defined above.
- Other systematic reviews and meta-analyses of data from multiple, aggregated behavior analytic CCTs:

Brosnan, J. & Healy, O. (2011). A review of behavioral interventions for the treatment of aggression in individuals with developmental disabilities. *Research in Developmental Disabilities, 32*, 437-406.

Campbell, J.M. (2003) Efficacy of behavioral interventions for reducing problem behavior in persons with autism: A quantitative synthesis of single-subject research. *Research in Developmental Disabilities 24* (2003) 120-138.

Dixon, D.R., Bergstrom, R., Smith, M.N., & Tarbox, J. (2010). A review of research on procedures for teaching safety skills to persons with developmental disabilities. *Research in Developmental Disabilities, 31*, 985-994.

Hagopian, L.P., Rooker, G.W., & Rolider, N.U. (2011). Identifying empirically supported treatments for pica in individuals with intellectual disabilities. *Research in Developmental Disabilities, 32*, 2114-2120.

Heath, A., Ganz, J., Parker, R., Burke, M., & Ninci, J. (2015). A meta-analytic review of functional communication training across mode of communication, age, and disability. *Review Journal of Autism and Developmental Disorders, 2*, 155-166.

Heyvaert, M., Maes, B., Van den Noortgate, W., Kuppens, S., & Onghena, P. (2012). A multilevel meta-analysis of single-case and small-n research on interventions for reducing challenging behavior in persons with intellectual disabilities. *Research in Developmental Disabilities, 33*, 766-780.

Jennett, H.K., & Hagopian, L.P. (2008). Identifying empirically supported treatments for phobic avoidance in individuals with intellectual disabilities. *Behavior Therapy, 39*, 151-161.

Kurtz, P.F., Boelter, E.W., Jarmolowicz, D.P., Chin, M.D., & Hagopian, L.P. (2011). An analysis of functional communication training as an empirically supported treatment for problem behavior displayed by individuals with intellectual disabilities. *Research in Developmental Disabilities, 32*, 2935-2942.

Lang, R., Rispoli, M., Machalicek, W., White, P.J., Kang, S., Pierce, N., Mulloy, A., Fragale, T., O’Reilly, M., Sigafoos, J., & Lancioni, G. (2009). Treatment of elopement in individuals with developmental disabilities: A systematic review. *Research in Developmental Disabilities, 30*, 670-681.

Ma, H-H. (2009) The effectiveness of intervention on the behavior of individuals with autism: A meta-analysis using percentage of data points exceeding the median of baseline phase (PEM). *Behavior Modification, 33*, 339-359.

Ninci, J., Neely, L.C., Hong, E. R....Vannest, K.J. (2015). Meta-analysis of single-case research on teaching functional living skills to individuals with ASD. *Review Journal of Autism and Developmental Disorders, 2*, 184-198.

Reichow, B. & Volkmar, F.R. (2010). Social skills interventions for individuals with autism: Evaluation for evidence-based practices within a best evidence synthesis framework. *Journal of Autism and Developmental Disorders, 40*, 149-166.

Richman, D. M., Barnard-Brak, L., Grubb, L., Bosch, A., & Abby, L. (2015). Meta-analysis of noncontingent reinforcement effects on problem behavior. *Journal of Applied Behavior Analysis, 48*, 131-152.

Roth, M.E., Gillis, J.M., & Reed, F.D.D. (2014). A meta-analysis of behavioral interventions for adolescents and adults with autism spectrum disorders. *Journal of Behavioral Education, 23*, 258-286.

Sharp, W.G., Jaquess, D.L., Morton, J.J., & Herzinger, C.V. (2010). Pediatric feeding disorders: A quantitative synthesis of treatment outcomes. *Clinical Child and Family Psychology Review, 13*, 348-365.