Cigna Medical Coverage Policy

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Coverage Policy

In addition, some states mandate coverage of intensive behavioral interventions and/or treatment of autism spectrum disorders (ASD) for benefit plans regulated under state law. For example, New York law requires regulated benefit plans to provide coverage for the screening, diagnosis and treatment of ASD, including applied behavioral analysis.

Please refer to the applicable benefit plan document to determine terms, conditions and limitations of coverage.

Cigna does not cover intensive behavioral interventions (e.g., early intensive behavior intervention [EIBI], intensive behavior intervention [IBI], Lovaas therapy, applied behavior analysis [ABA]) for any indication because it is considered experimental, investigational or unproven.

In situations when a state mandate requires coverage or a plan specifically covers applied behavior analysis therapy, please refer to the Cigna Behavioral Health medical necessity criteria for Applied Behavior Analysis (ABA).

General Background

Intensive behavioral interventions are comprehensive treatment programs that utilize a combination of interventions with the aim of improving cognitive and intellectual function, social and adaptive skill development and behavior problems. They have been proposed to treat autism spectrum disorders as well as other conditions that involve behavioral difficulties. The programs emphasize early intervention, individualization of treatment and an intensive approach. The programs may also be referred to as early intensive behavior
intervention (EIBI), intensive behavior intervention (IBI) or early intensive behavioral treatment (EIBT). At times, the terms EIBI, IBI, EIBT are used interchangeably with applied behavior analysis (ABA), Lovaas therapy or Lovaas University of California Los Angeles (UCLA) Program. These programs started in the 1980s, as researchers began to report positive outcomes of early intensive behavior intervention programs, including increases in developmental levels, gains in intelligence quotient (IQ) scores, and improvements in social behavior. Interventions may be applied in a clinical treatment setting, a classroom and or in the home. Treatment is typically developed and overseen by a specialty trained licensed and or certified behavior analyst, but may be delivered by a clinician, educator and or caretaker after formal assessment and a treatment plan is developed.

These programs incorporated behavior modification and applied behavior analysis. Behavior analysis is a behavioral assessment of the child and environmental conditions that may be used to help the child develop higher skills through behavioral procedures. These methods are based on research in the application of learning principles to the education of autistic children and incorporate behavior modification, training and education. The Lovaas Model of Applied Behavior Analysis is a form of ABA initially started at UCLA and currently provided at various Lovaas clinics. The programs are intensive and range from 15 to 40 hours per week, delivered over a long period of time, sometimes extending to years. The programs are increasingly utilized by school systems as an intervention that is part of the individualized educational plan (IEP). In younger children these treatments may also be provided in the home and or delivered by the caretaker and or parent. The intensive behavior programs focus on identifying behaviors that interfere with normal developmental processes, understanding the relationship between a behavior and the child’s environment and modifying those behaviors in such a way so as to improve the child’s functional capacity. Treatment goals focus on improving adaptive behavior, language/communication skills, decreasing problem behaviors, as well as improving cognitive/intellectual status and academic/developmental achievements. Treatment provided with the primary objective of improving academic performance and cognitive/intellectual status is considered educational or training in nature.

Definitive patient selection criteria, including patient characteristics, have not been established for these interventions. There are questions remaining regarding the optimum duration and intensity of the treatment. The therapy may be provided by a variety of professionals including psychologists, speech-language pathologists, physicians, social workers, teaching professionals, and behavioral therapists. There is a formal credentialing process of professional behavior analysts through the Behavior Analyst Certification Board® (BACB) for Board Certified Behavior Analysts® (BCBA) or Board Certified Assistant Behavior Analysts® (BCaBA). This certification is relatively new and not all providers have gone through the education and certification process. While there are formal programs for Applied Behavior Analysis, many providers who render this treatment have not received this training.

Intensive intervention programs other than those that focus on behavior analytic treatment have also been developed. These include, but are not limited to:

- **TEACCH program:** The TEACCH program (Treatment and Education of Autistic and Related Communication Handicapped Children) is an educational intervention focused on improving motor coordination and cognitive skills and has been implemented in many special education programs for autistic children. It includes behavioral analytic approaches for some skills but uses other interventions as well.
- **Denver Model:** The focus of the Colorado Health Sciences program (Denver Model) is learning through play based on Piaget and object relations theories. Behavior analytic techniques are included for behavior management.
- **Rutgers program:** The Rutgers program is known as the Douglas Developmental Disabilities Center (based at Rutgers University), has three programs small-group segregated preschool, and integrated preschool and intensive home-based intervention, and uses ABA techniques and similarities to the Lovaas program. Families are trained in the program and provide the treatment when they are available and or hire staff trained in the program.
- **Learning Experiences and Alternative Program (LEAP):** LEAP program includes both a preschool program and a behavioral skill training program for parents, as well as national outreach activities. The program includes an individualized curriculum that targets goals in social, emotional, language, adaptive behavior, cognitive, and physical developmental areas (National Research Council [NRC], 2001).
- **Relationship Development Intervention (RDI):** RDI is a program designed to empower and guide parents of children, adolescents and young adults with ASD and similar developmental disorders to function as
facilitators for their children’s mental development (Gutstein, 2009). RDI is based on instructing the parents to have an important role in improving critical emotional, social and meta-cognitive abilities through carefully graduated, guided interaction in daily activities.

- Floortime: this is also referred to as DIR® (Developmental, Individual Difference, Relationship-based model), DIR® Floortime, or Greenspan Floor-Time Model. This is a developmentally-based, one-on-one treatment program delivered 10 to 25 hours per week. The primary intervention method used in this model is intensive interactive “floor-time” play sessions, in which an adult follows a child’s lead in play and interaction. The program consists of three components: home-based play sessions, individual therapies, and early education programs.

- Pivotal Response Therapy: This is also known as Pivotal Response Treatment (PRT)®, Pivotal Response Training®, Pivotal Response Teaching® or Pivotal Response Intervention. It is a behavioral intervention model based on the principles of ABA. The treatment focuses on altering gateway/pivotal behaviors considered central to broad areas of functioning and in which improvements would lead to improvements in behaviors; pivotal behaviors include motivation to initiate or and respond to stimuli, self-direction of behavior, and responsiveness to cues/stimuli; typically involves extensive parent/family training components (Warren, et al., 2011).

**Intensive Behavioral Interventions for Autism Spectrum Disorders**

The essential features of autism spectrum disorder are persistent impairment in reciprocal social communication and social interaction and restricted, repetitive patterns of behavior, interests or activities. These symptoms are present from early childhood and limit or impair everyday functioning. Manifestations of the disorder vary greatly depending on the severity of the autistic condition, developmental level, and chronological age, which leads to the term spectrum. Autism spectrum disorder encompasses disorders previously referred to as early infantile autism, childhood autism, Kanner’s autism, high-functioning autism, atypical autism, pervasive developmental disorder not otherwise specified, childhood disintegrative disorder, and Asperger’s disorder (American Psychiatric Association, 2013).

There are no medical interventions that are effective in achieving a cure for autism; however, the condition may be managed through a combination of behavioral, pharmacological and educational interventions.

**Literature Review—Intensive Behavioral Interventions for Autism Spectrum Disorders**

The outcomes utilized in the research for intensive behavioral interventions include measurements that address adaptive behavior, language/communication skills, problem behaviors, parental/family well-being, as well as measurements for cognitive/intellectual status and academic/developmental achievement.

A widely used measure of adaptive behavior used in many of the studies is the Vineland Adaptive Behavior Scales for measurement of adaptive behavior. This scale provides measurement in the following domains: communication; daily living skills; socialization; and for children under five years of age, motor skills. Measures for intellectual/cognitive abilities include the Bayley scales and Standard Binet Intelligence Scale. The Bayley scales is designed for children up to 42 months of age and is appropriate for children with intellectual disabilities or those whose language skills are not sufficiently advanced to take a full-scale intelligence test. The Reynell developmental language-scales are utilized for assessment of language-communication outcome measurements.

**Technology Assessments**

**Hayes Directory Report:** Hayes (2014; 2015) conducted a review of the literature to determine if ABA-based approaches (i.e., intensive behavioral intervention [IBI] or Early Start Denver Model [ESDM]) are effective for improving behavioral, intellectual, or academic outcomes in children with ASD. In addition the review examined if the ABA-based programs vary in effectiveness according to treatment parameters; the safety of the programs; and, if there are definitive patient selection criteria established for ABA-based programs for treatment of children with ASD.

The review included 26 studies with sample size of 15 to 332 children. The studies included children with ASD, autism, or pervasive developmental disorder not otherwise specified (PDD-NOS) with the interventions of IBI and ESDM. The comparisons included minimal treatment, eclectic therapies for autism, school-based services, and wait-list status. The outcome measures included: autism severity, IQ scores, measures of infant and child development, language skills, visual-spatial or nonverbal skills, adaptive behavior, and school placement and performance. Follow-up in the studies included treatment persisting two months to four years following treatment initiation; with two studies conducting follow-up at two and five years following the cessation of treatment. The
review noted that there were major limitations in design and methodology present in most of the available studies, including lack of randomization and minimal control for confounders in most studies, small sample sizes and lack of power analyses to justify these sample sizes, and lack of independent and/or blinded assessors. In addition, there was variability in the type of control groups, which leads to difficulty in making comparison of results across studies.

The findings of this review included:

- Current evidence allows a reasonably confident conclusion that applied behavior analysis (ABA)-based therapies that are intensively applied (i.e., intensive behavioral intervention [IBI] or Early Start Denver Model [ESDM]) are superior to other interventions for improvement of intelligence/cognitive skills and language skills over the short term.
- There is positive evidence suggesting that IBI therapy is superior to other interventions for placement of children in regular classroom settings, but additional evidence is needed to confirm this conclusion and the conclusion could be refuted by future evidence.
- Conclusions regarding the benefit of ABA-based therapies on other outcomes such as adaptive behavior cannot be made at this time.
- The variation in results in some studies suggests that the cognitive benefits are particularly pronounced for a subpopulation of children and may be minimal in other children, but criteria to identify children likely to have a good response have not been identified.
- There is insufficient evidence to permit a conclusion about the minimum duration of therapy required for long-term benefits or if benefits persist after discontinuation of the therapy.
- No conclusions are possible regarding the impact of various treatment parameters on treatment effectiveness.
- No adverse outcomes or side effects have been reported with the use of ABA-based therapies, and there is no evidence that they cause harm or increase the severity of the disorder.

The Agency for Healthcare Research and Quality (AHRQ) published a comparative effectiveness review of the effects of available interventions on adolescents and young adults with ASD (ages 13 to 30) (Lounds, et al., 2012). The review focused on the following outcomes: core symptoms of ASD (impairments in social interaction, communication, and repetitive behavior); medical and mental health comorbidities; functional behaviors and independence; the transition to adulthood; and family outcomes. The studies assessed interventions falling into the broad categories of behavioral, educational, adaptive/life skills, vocational, medical, and allied health approaches. The comparators included no treatment, placebo, and comparative interventions or combinations of interventions. Intermediate outcomes included changes in core ASD symptoms and in common medical and mental health comorbidities as well as effects on functional behavior, the transition process, and family outcomes. Long-term outcomes included changes in adaptive/functional independence, academic and occupational attainment or engagement, psychological well-being, and psychosocial adaptation. Harms were also assessed.

Across all categories of interventions, most studies (n=27) were of poor quality, and none was good quality. Five randomized controlled trials (RCT) were fair quality: four that investigated pharmacologic agents and one allied health study that assessed a leisure/recreation program. Although positive results may be reported in individual studies, the poor quality of the studies and the lack of replication of the intervention studies mean that the strength of evidence for the body of evidence around any specific intervention is currently insufficient. Findings for the interventions included:

Behavioral:

- Individual or group-based social skills training: Four poor-quality studies, with two reporting on manualized (i.e., has a published treatment manual) intervention. Some gains in social skills on largely parent-reported measures in short-term studies. Two studies lacked comparison groups; diagnostic approach, participant characteristics, treatment fidelity not clearly reported.
- Computer-based social skills training: Three poor-quality, short-term studies. Some improvements in emotion recognition in treated participants; no differences in measures of generalization. Systematic diagnostic approach not reported within studies; concomitant interventions and treatment fidelity not reported.
• Intensive behavioral treatment: One poor-quality case series with diverse participants. Some gains in adaptive behavior reported. Intervention not clearly described; treatment fidelity and concomitant interventions not reported; assessors not masked.

Adaptive/Life Skills:
• Specific life/transitional skills: Three, poor-quality, short-term studies assessing highly specific skills and unique interventions (e.g., shoe lacing, digital device use, rotating classroom schedule). Some gains seen in individual studies but most lacked comparison groups. Systematic diagnostic approach not reported within studies; participants often not clearly characterized; differences in concomitant interventions and treatment fidelity often not reported.

• Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH)-based model: One poor-quality cohort study; desirability of living situation and use of programming rated more highly for TEACCH than other conditions; group homes rated more desirable than institutions. Nonrandom assignment to groups; systematic diagnostic approach not reported within study; inclusion/exclusion criteria not clearly stated; interventions not fully described; assessors not masked.

In 2014, the AHRQ published a systematic review that updated the behavioral intervention portion of the comprehensive review of therapies for children with ASD that was published in 2011 (Weitlauf, et al., 2014). The review focused on behavioral treatments for children ages two through twelve with ASD and children younger than age two at risk of a diagnosis of ASD. The study designs included:

- Randomized controlled trials
- prospective and retrospective cohort studies
- nonrandomized controlled trials

Other inclusion criteria:
- Studies must be original research studies providing sufficient detail regarding methods and results to enable use and aggregation of the data and results.
- Studies must have relevant population and ≥10 participants with ASD.
- Studies must address one or more of the following for ASD:
  - Behavioral treatment modality
  - Predictors of treatment outcomes
  - Generalization of treatment outcomes to other contexts
  - Drivers of treatment outcomes
- Relevant outcomes must be able to be abstracted from data in the papers.
- Data must be presented in the aggregate (vs. individual participant data).

The updated review includes 79 publications, comprising 65 unique studies that met the criteria. Eight of the studies reported follow-up data to papers included in the 2011 AHRQ review of therapies for children with ASD. The 65 new studies include 48 randomized controlled trials (RCTs) and 17 nonrandomized trials or cohort studies (19 good, 39 fair, and 7 poor quality).

The studies in the review were assigned a strength-of-evidence designation. This was done by considering how confident the reviewers were that the true effect was observed and how stable that effect is likely to be in the face of future research. The report notes that strength of evidence describes the adequacy of the current research in terms of both quantity and quality, as well as the degree to which the entire body of current research provides a consistent and precise estimate of effect. Strength of the evidence is assessed for a limited set of critical outcomes, typically those related to effectiveness of an intervention. Strength of the evidence for studies was assigned for the key questions which deal specifically with the outcomes of intervention.

The maximum strength of evidence possible was established based on criteria for each domain: study limitations, consistency in direction of the effect, directness in measuring intended outcomes, precision of effect, and reporting bias. Then the number of studies and range of study designs for a given intervention-outcome pair was assigned and the rating was downgraded when the cumulative evidence was not sufficient to justify the higher rating. The possible grades for strength of evidence in this report include:

- High: High confidence that the evidence reflects the true effect. Further research is unlikely to change estimates.
- Moderate: Moderate confidence that the evidence reflects the true effect. Further research may change
confidence in the estimate of effect and may change the estimate.

- Low: Low confidence that the evidence reflects the true effect. Further research is likely to change confidence in the estimate of effect and is also likely to change the estimate.
- Insufficient: Evidence is either unavailable or does not permit a conclusion.

The AHRQ report includes the following key questions and findings:

- Effects of Behavioral Interventions on Core and Commonly Associated Symptoms in Children With ASD:
  - Studies of Early Intensive Behavioral and Developmental Interventions: the review included 25 new studies that addressed these interventions. The studies included five RCTs of good quality, six of fair quality, and one of poor quality. Individual studies using intensive University of California, Los Angeles (UCLA)/Lovaas-based interventions, the Early Start Denver Model (ESDM), the Learning Experiences and Alternate Program for Preschoolers and their Parents (LEAP) program, and eclectic variants reported improvements in outcomes for young children. The improvements were seen mostly in cognitive abilities and language acquisition, with fewer improvements seen in adaptive skills, core ASD symptoms severity, and social functioning. Evidence for the impact of early intensive intervention on core ASD symptoms is limited and mixed. The symptom severity often decreased during treatment, but these improvements often did not differ from those of children in control groups. The better quality studies reported positive effects of intervention on symptom severity, but multiple lower quality studies did not. There was improvement noted in cognitive functioning and language skills in young children receiving high-intensity applied behavior analysis (ABA)-based interventions over extended time frames (i.e., 8 months–2 years) relative to community controls. It was noted that the magnitude of these effects varied across studies and that the variation may reflect subgroups showing differential responses to particular interventions. It is not clear how the intervention response is likely moderated by treatment and child factors and the report notes that even with multiple studies of early intensive treatments, intervention approaches still vary substantially, which makes it difficult to distinguish what these unique treatment and child factors may be. The long-term impact of these early skill improvements is not yet clear, with many studies not following the children beyond late preschool or early school years.
  - Social Skills Studies: the review included 13 studies that addressed interventions for social skills including 11 RCTs (two good and 10 fair quality). The interventions varied widely in terms of scope and intensity. A few studies replicated interventions using the Skill streaming model, which uses a published treatment manual to promote a consistent approach. Other studies incorporated peer-mediated and/or group-based approaches, and others described interventions that focused on emotion identification and Theory of Mind training. There was varied intensity, with most consisting of 1–2 hour sessions/week for approximately 4–5 weeks. There were some group-based approaches that lasted 15–16 weeks. Most studies reported short-term gains in either parent-rated social skills or directly tested emotion recognition. However, the confidence or strength of evidence in that effect is low and limited by the diversity of the intervention protocols and measurement tools (i.e., no consistent outcome measures used across studies). In addition, the studies included only participants considered high-functioning and/or with IQ test scores >70, which limits generalization of results to children with more significant impairments. The maintenance and generalization of these skills beyond the intervention setting are inconsistent, with variability in performance across environments.
  - Play-/Interaction-Focused Studies: The review includes 11 RCTs of good and fair quality and suggests that joint attention interventions may be associated with positive outcomes for toddler and preschool children with ASD, in particular when joint attention skills are targeted as well as related social communication and language skills. Although joint attention intervention studies demonstrated changes within this theoretically important domain, the data is more limited regarding the ability to improve broad developmental skills (e.g., cognition, adaptive behavior, and ASD symptom severity) beyond direct measures of joint attention and related communication and language gains over time.
Studies of Interventions Targeting Conditions Commonly Associated With ASD: Six RCTs (five good, one fair quality) of interventions addressing conditions commonly associated with ASD identified for the current update measured anxiety symptoms as a primary outcome. Five studies reported significantly greater improvements in anxiety symptoms in the intervention group compared with controls. Two found positive effects of cognitive behavioral therapy (CBT) on the core ASD symptom of socialization, and one reported improvements in executive function in the treatment group. The one RCT that did not find a significant benefit of CBT compared it with social recreational therapy rather than with treatment as usual or a wait-listed control group. The studies examining the effects of CBT on anxiety had largely consistent methodologies. Six studies provided follow-up data reflecting treatment effects that lasted beyond the period of direct intervention. Due to the nature of CBT, (language intensive and requires a certain level of reasoning skills to make abstract connections between concepts) most studies included only children with IQs much greater than 70. These studies report positive results regarding the use of CBT to treat anxiety in children with ASD. They also report some positive results in socialization, executive function, and communication; however, less robust results, and unclear in some studies if the improvements exceeded improvements related to the impact of improved anxiety itself.

Other Behavioral Studies: Two RCTs (one fair, one poor quality) examined neurofeedback and found some improvements on parent-rated measures of communication and tests of executive function. Three fair-quality RCTs reported on sleep-focused interventions, with little positive effect of a sleep education pamphlet for parents in one, improvements in sleep quality in treatment arms in another, and some improvements in time to fall asleep in one short-term RCT of sleep education programs for parents. One poor-quality study of parent education to mitigate feeding problems reported no significant effects.

Modifiers of Treatment Effects: Among the potential modifiers or moderators of early intensive ABA-based interventions, younger age at intake was associated with better outcomes for children in a limited number of studies. Greater baseline cognitive skills and higher adaptive behavior scores were associated with better outcomes across behavioral interventions, but these associations were not consistent. In general, children with lower symptom severity or less severe diagnoses improved more than participants with greater impairments. Many studies (e.g., social skills, CBT) restricted the range of participants’ impairment at baseline (e.g., recruiting only participants with IQs >70), which limits understanding of intervention impact on broader populations. Regarding intervention-related factors, an inconsistent effect was found for duration of treatment. Overall, the report found that most studies were not adequately designed or controlled to identify true moderators of treatment response.

Treatment Phase Changes That Predict Outcomes: The studies offered little suggestions about what specific early changes from baseline measurements of child characteristics might predict long-term outcome and response.

Treatment Effects That Predict Long-Term Outcomes: Few studies assessed end-of-treatment effects that may predict outcomes.

Generalization of Treatment Effects: The majority of the social skills and behavioral intervention studies targeting associated conditions attempted to determine outcomes based on parent, self, teacher, and peer report of the targeted symptoms at home, at school, and in the community. While these ratings outside of the clinical setting may suggest generalization in that they improve outcomes in the daily context/life of the child, in most cases, these outcomes are parent reported and not confirmed with direct observation.

Treatment Components That Drive Outcomes: there were no studies that met inclusion criteria that addressed this question.

Treatment Approaches for Children Under Age 2 at Risk for Diagnosis of ASD: In the studies addressing interventions for younger children, children who received behavioral interventions seemed to improve regardless of intervention type. Most outcome measures of adaptive functioning were based on parent
report, and the effect of parental perception of treatment efficacy on perception of child functioning was generally not explored.

AHRQ Limitations of the Evidence Base: the AHRQ report notes that despite improvements, the existing literature has significant methodological concerns that in many ways continue to limit the strength of the conclusions. Evidence for the impact of intensive ABA-based interventions on cognitive, language, and adaptive skills and ASD symptoms emphasizes the important limitations of current treatment modalities. Children who demonstrate clinically significant improvements in these areas often continue to display substantial impairment in these and other areas over time and not all children receiving intensive ABA-based intervention showed robust improvements in these domains. Therefore, it remains challenging to predict long-term functional and adaptive outcomes on an individual level. While children who receive early intensive developmental and behavioral intervention may display substantial improvements, the magnitude of these effects varies across studies and may indicate subgroups showing variable responses to particular interventions. There is substantial variation in intervention approaches, which leads to difficulty in determining what the unique treatment and child factors may be. Provider type and qualifications are variably reported, and the impact of this on treatment outcomes is unclear. Study sample sizes are typically small (range from 11 to 284 for studies in the current review, median=40), with some studies considered pilots for larger studies that may respond to questions about intervention intensity and moderators of effects. The report notes that presently the evidence is insufficient to adequately identify and target the children who are most likely to benefit from specific interventions.

In conclusion, the AHRQ report notes that a growing evidence base suggests that behavioral interventions are associated with positive outcomes for some children with ASD. However, the report concludes that even with improvements in the quality of the included literature, there remains a need for studies of interventions across settings and continued improvements in the methodologic rigor and that substantial scientific advances are needed to improve the understanding of which interventions are most effective for specific children with ASD and to determine the elements or components of interventions most associated with effects.

The AHRQ report found for early intensive behavioral and developmental intervention that is ABA based a moderate effect for strength of the evidence in the areas of IQ/cognitive and language/communication. In the area of IQ/cognitive, it was found that approaches across the studies varied substantially and not all the improvements were maintained at long-term follow-up. In the area of language/communication, it was found that most studies found a positive effect of treatment on language/communication, however the specific domain of improvement (e.g., receptive vs expressive language) varied across studies and some of the initial between-group differences were not present at long-term follow-up. In addition, in this area of language/communication some studies utilized direct testing, while others used parent-reported measures. The review found a low effect for strength of the evidence in the areas of adaptive behavior, symptom severity, and social skills/social behavior. The intervention approach varied across studies and there is uncertainty regarding which intervention will affect and benefit which sub-group of children with ASD.

The Agency for Healthcare Research and Quality (AHRQ) published a comparative effectiveness review of therapies for children with autism spectrum disorders. The review was prepared by the Vanderbilt Evidence-based Practice Center (Warren, et al., 2011). The review included 183 articles, representing 159 unique studies. Thirteen studies were determined to be good quality, 56 were fair quality and 90 trials were poor quality. The treatments in the review included behavioral, educational, medical, allied health, and complementary and alternative medicine (CAM) interventions. The CAM interventions included acupuncture and massage. The comparators included no treatment, placebo, and comparative interventions or combinations of interventions. The outcomes included changes in core ASD symptoms and in commonly associated symptoms. The findings of this review included:

- Behavioral interventions:
  - There were 78 unique behavioral studies. Early intensive behavioral and developmental intervention may improve core areas of deficit for individuals with ASDs; however, few randomized controlled trials (RCTs) of sufficient quality have been conducted, no studies directly compare effects of different treatment approaches, and little evidence of practical effectiveness or feasibility exists.
  - Within the behavioral category, the studies of UCLA/Lovaas-based interventions report greater improvements in cognitive performance, language skills, and adaptive behavior skills than broadly defined eclectic treatments available in the community. However, the strength of evidence is currently low. Further, not all children receiving intensive intervention demonstrate
rapid gains, and many children continue to display substantial impairment. Although positive results are reported for the effects of intensive interventions that use a developmental framework, such as the Early Start Denver Model (ESDM), evidence for this type of intervention is currently insufficient because few studies have been published to date.

- Less intensive interventions focusing on providing parent training for bolstering social communication skills and managing challenging behaviors have been associated in individual studies with short-term gains in social communication and language use. The current evidence base for such treatment remains insufficient, with current research lacking consistency in interventions and outcomes assessed.

- Although all of the studies of social skills interventions reported some positive results, most have not included objective observations of the extent to which improvements in social skills generalize and are maintained within everyday peer interactions. Strength of evidence is insufficient to assess effects of social skills training on core autism outcomes for older children or play- and interaction-based approaches for younger children. Several studies suggest that interventions based on cognitive behavioral therapy are effective in reducing anxiety symptoms. The strength of evidence for these interventions, however, is insufficient pending further replication.

- Educational interventions: There were 15 unique studies in this category. Most research on the Treatment and Education of Autistic and Communication related handicapped CHildren (TEACCH) program was conducted prior to the date cutoff for our review (before 2000). Newer studies continue to report improvements among children in motor, eye-hand coordination, and cognitive measures. The strength of evidence for TEACCH, as well as broad-based and computer-based educational approaches included in this category, to affect any individual outcomes is insufficient because there are too few studies and they are inconsistent in outcomes measured.

A systematic review was performed by Blue Cross Blue Shield Association (BCBSA), Technology Evaluation Center (TEC) (2009; updated 2010) that examined the research literature on the use of early intensive behavioral intervention (EIBI) based on Applied Behavior Analysis among young children with autism, pervasive developmental disorder, or Asperger’s disorder. The review included sixteen studies that included two randomized, controlled trials, nine nonrandomized comparative studies; and five single-arm studies with no studies found that included children with Asperger’s disorder. It was noted that overall the quality and consistency of results of the body of evidence are weak and that consequently no conclusions can be drawn from this literature on how well EIBI works. The findings included:

- Regarding the question of how effective is EIBI in improving the functioning of children with ASD and how it compares to other early intervention approaches: two randomized, controlled trials provided some evidence; however, however, there were weaknesses in research design, differences in the treatments and outcomes compared, and inconsistent results. The evidence is insufficient to determine whether or not EIBI is more effective than alternative approaches for children with ASDs.

- Regarding the question if patient characteristics can be identified that predict better outcomes from EIBI: this question cannot be answered. Age and cognitive functioning (measured with IQ) at intake were the most commonly studied characteristics in the studies. Three of the four studies examining the impact of pretreatment cognitive functioning found that it significantly predicted outcomes, while one (a randomized, controlled trial) did not. The findings on age were variable, with some studies suggesting that younger age at the start of therapy is a predictor of better outcomes, while other studies found no difference based on initial age.

- Regarding the question of whether the effect of EIBI varies with intensity of treatment: the findings in this area were inconsistent and no conclusions can be drawn.

- Additional research is needed to identify those characteristics of treatments (e.g., content, technique, intensity, starting and ending age) that maximize its effectiveness.

**Systematic Reviews:**
Roth et al. (2014) reported on a meta-analysis of 43 published single-case research studies that evaluated the effectiveness of behavioral interventions for adolescents and adults with autism spectrum disorders (ASD). A metric for calculating effect size in single-case research, nonoverlap of all pairs, was utilized, along with, the certainty of evidence, a system to evaluate research methodology, was applied to the studies. Articles were classified as having suggestive, preponderant, or conclusive certainty of evidence. Findings included: 32 articles were classified as having suggestive evidence (74.4 %), indicating low confidence in the findings; Four studies
(9.3 %) had reponderant certainty of evidence, indicating medium confidence in the findings; Seven studies (16.3 %) had conclusive certainty of evidence, indicating strong confidence in the findings. Strong effects were observed for interventions addressing academic skills, phobic avoidance, and vocational skills whereas interventions for adaptive skills, problem behavior, and social skills had medium effects. A majority of studies (77 %) reviewed lacked treatment integrity. The authors note that additional research and dissemination are needed to fill the gap between research and practice to meet needs as individuals with ASD age. This study was limited by the small number of participants. Most of the studies had a low certainty of evidence. Further well-designed studies with larger number of participants in this age group with ASD are needed.

Bishop-Fitzpatrick et al. (2013) reported on a systematic review of studies evaluating psychosocial interventions for adults with ASD. Thirteen studies met inclusion criteria: five single-case studies; four RCTs; three nonrandomized controlled trials; and one an uncontrolled pre-post trial. Six studies evaluated the efficacy of social cognition training, five studies evaluated the efficacy of Applied Behavior Analysis (ABA) techniques, and two studies evaluated the efficacy other types of community-based interventions. All of the studies that involved ABA were single case studies and had goal to reduce the instances of an undesirable behavior or increase the instances of a desirable behavior. The ABA studies reported positive benefits of treatment, although the maintenance of this benefit varied between studies. The effect size was not reported for the ABA studies since they were based on a single subject. This study was limited by reviewing single-case studies. Further research with well-designed studies is needed for this population of adults with ASD.

Strauss et al. (2013) reported on a synthesis of six meta-analyses of early intensive behavioral interventions for children with ASD published 2009-2011 (20 studies), the most frequent type of study was quasi-experimental group comparison, followed by quasi-experimental single group pre/post designs. True experimental design was employed only twice. Overall sample sizes were relatively small with a range in studies from 9-158 children. Intervention included EIBI, ABA and comprehensive ABA interventions. The comparator intervention included eclectic therapies and treatment as usual. Outcomes in the studies included: not specified, cognitive, adaptive behavior and language. The intent was to consider the extent of parent inclusion in different delivery formats. Information on treatment intensity measured as treatment hours per week was not always provided in a clear way. Five studies reported a range of treatment hours, from 15–20 hours of parent-mediated program, to 35–40 hours. The mean duration of ABA programs without parent inclusion was M=37.12 (SD = 24.01) months. Programs favoring parent inclusion in skill generalization had a duration of approximately M=20.09 (SD = 8.93), while ABA programs with parents as treatment providers lasted M = 23.90 (SD = 17.65) and controls lasted M = 20.28 (SD = 6.21) months. There was no statistically significant difference in treatment duration between study and control groups, or between models of treatment delivery.

Although both treatment intensity and duration were considerably less, particularly in parent-mediated EIBI programs, these differences fell short of statistical significance, reflecting the heterogeneity in treatment characteristics and inclusion criteria that created a wide range of variance. The results suggest that EIBI leads generally to positive medium-to-large effects for three available outcome measures: intellectual functioning, language skills and adaptive behaviors. Although favorable effects were apparent across comparative studies, analysis by type of delivery format revealed that EIBI programs that include parents in treatment provision are more effective. Mediator analyses suggest that treatment variables and child characteristics impact program effectiveness when accounting for the extent of parent inclusion.

Reichow et al. (2012) conducted a Cochrane review of the evidence for the effectiveness of early intensive behavioral intervention (EIBI) in increasing the functional behaviors and skills of young children with ASD. The review included one randomized control trial (RCT), and four clinical control trials (CCTs) with 203 participants. All of the studies used a treatment-as-usual comparison group. It was noted by the authors that reliance on synthesis from four CCTs limits the evidential base and this should be considered when interpreting the results. Positive effects in favor of the EIBI treatment group were found for all outcomes. The mean effect size for adaptive behavior was g = 0.69 (95% confidence interval [CI] 0.38 to 1.01; P < 0.0001). The mean effect size for IQ was g = 0.76 (95% CI 0.40 to 1.11; P<0.0001). Three measures of communication and language skills all showed results in favor of EIBI: expressive language g = 0.50 (95% CI 0.05 to 0.95; P=0.03), receptive language g = 0.57 (95% CI 0.20 to 0.94; P=.03), and daily communication skills g = 0.74 (95% CI 0.30 to 1.18; P=0.0009). The mean effect size for socialization was g = 0.42 (95% CI 0.11 to 0.73; P=0.0008), and for daily living skills was g = 0.55 (95% CI 0.24 to 0.87; P=0.0005). The authors concluded that while there is some evidence that EIBI is an effective behavioral treatment for some children with ASD, the current state of the evidence is limited because of the reliance on data from non-randomized studies and the small number of children. Additional studies using RCT research designs are needed to make stronger conclusions.
Warren et al. (2011) conducted a systematic review of evidence for early intensive behavioral and developmental interventions for young children with ASD. This review is a component of an Agency for Healthcare Research and Quality (AHRQ)–commissioned comparative-effectiveness review of therapies for children with ASDs that was conducted by the Vanderbilt Evidence-Based Practice Center. The study included 34 unique studies: 17 were case series; 2 were randomized controlled trials. The studies were rated: one study as good quality; ten as fair quality; and 23 as poor quality. The overall strength of the evidence ranged from insufficient to low. Studies of UCLA/Lovaas-based interventions and variants reported clinically significant gains in language and cognitive skills in some children, as did 1 randomized controlled trial of an early intensive developmental intervention approach (the Early Start Denver Model). Specific parent-training approaches demonstrated gains in short-term language function and some challenging behaviors. There was data that suggested subgroups of children displayed more prominent gains across studies, but participant characteristics associated with greater gains are not well understood. The authors concluded that studies of Lovaas-based approaches and early intensive behavioral intervention variants and the Early Start Denver Model resulted in some improvements in cognitive performance, language skills, and adaptive behavior skills in some young children with ASDs, although the literature is limited by methodologic concerns. The authors note that, “There is not yet adequate evidence to pinpoint specific behavioral intervention approaches that are the most effective for individual children with ASDs.” The quality of the studies including in the assessment, however, were insufficient to draw conclusions regarding appropriate patient selection, treatment frequency or duration, or clear clinical utility.

Peters-Scheffer et al. (2011) reported on a meta-analysis that investigated the effectiveness of EIBI based on ABA in young children with ASD. There were 11 studies with 344 children with ASD. The meta-analysis synthesized the outcomes of comprehensive EIBI programs in which data were collected in group designs using full scale, verbal and performance IQs and measures of adaptive behavior. One study was a fully randomized control trial with the other studies using a pre-test/post-test control group design, which was not fully randomized. Experimental groups received on average 12.5 to 38.6 h of EIBI for ten months to more than two years. Control groups consisted of less intensive EIBI (<10 h per week), 12.5–29.08 h per week eclectic treatment, parent-directed ABA or treatment as usual (e.g., public early intervention, nursery provision, Portage, school based intervention). The EIBI group outperformed the control group on all dependent variables. Full scale and non-verbal IQ improved in the EIBI group 11.98 and 11.09 points more than in the control groups, respectively. For receptive and expressive language, the average increases were 13.94 and 15.21 points more, respectively. The EIBI groups surpassed the control groups on composite adaptive behavior, communication, daily living skills and socialization subscales the experimental groups surpassed the control groups by 5.92, 10.44, 5.48, and 4.96 points, respectively. Limitations of the analysis includes that studies in this area contain several methodological limitations including small sample sizes, non-randomized assignments to groups, non-uniform assessments protocols, use of quasi-experimental designs, lack of equivalent groups, lack of adequate fidelity measures, unknown characteristics of comparison conditions, and selection bias.

The Centre for Reviews and Dissemination (CRD) (University of York) completed a critical assessment on the reliability of the review and the conclusions drawn in the above meta-analysis by Peters-Scheffer et al. (2011). The review noted that restriction to published articles in English in the final selection of studies meant that associated biases could not be ruled out. The review process included attempts to minimize error and bias in the assessment of study quality, but the presentation of summary quality scores without details of the individual criteria made further interpretation difficult. The CRD noted there was potential for reviewer error and bias in study selection and data extraction. It was unclear whether the chosen method of synthesis was appropriate, given the level of statistical and clinical heterogeneity acknowledged by the authors. In view that results for the RCT were not consistent with other studies on outcomes other than IQ, the authors’ conclusion does not reflect the total evidence presented and may be overstated. Inadequate reporting of the review process means that caution is required when considering the reliability of the review findings.

Virués-Ortega (2010) reported on a meta-analysis of 22 clinical trials of ABA intervention for children with autism, citing the lack of availability of literature offering precise quantification of ABA intervention effectiveness. The meta-analysis purports to statistically analyze the 22 studies conducted in various countries, with marked variability in quality of design, randomization, presence of control, baseline level of impairment and function, type and duration of interventions, and outcome measures. Some variables across studies were combined to increase sample size (such as duration intervals of treatment), and studies where there were inadequate control groups and or follow-up of control were considered as all having a within subject design. The authors concluded
that the overall results suggested that long-term, comprehensive ABA intervention leads to (positive) medium to large effects in terms of intellectual functioning, language development, acquisition of daily living skills and social functioning in children with autism. It was noted that although favorable effects were found across all outcomes, language-related outcomes (IQ, receptive and expressive language, communication) were superior to non-verbal IQ, social functioning and daily living skills, with effect sizes approaching 1.5 for receptive and expressive language and communication skills. Place of service and qualification of intervention provider did not impact outcomes uniformly. No treatment duration effect was noted for a number of measures. Receptive language effect was neutralized when comparisons involving an actual control group were used. Expressive language effect was noted to be impacted by significant publication bias. Only 13 studies used a control group, of which only six were random or quasi randomized. Control subjects generally received eclectic interventions. In general, quality standards were inconsistently observed including standards specific to this field, e.g., comparable pre-intervention IQ across groups and treatment fidelity standards. Significant heterogeneity and publication bias in some measured outcomes was noted by the authors. The study does not offer guidance clear conclusions as to what characteristics may define any groups may benefit from any specific intervention, who should deliver the intervention or for how long the intervention should be delivered.

Makrygianni et al. (2010) reported on a meta-analysis of 14 studies that reviewed the effectiveness of behavioral intervention programs for children with ASDs. The review included 14 published controlled studies of over 400 children. Studies were included if they: evaluated an early comprehensive behavioral analytic treatment; included children with ASD; included children aged 54 months or younger at treatment onset; provided assessments of the children's intellectual, language, and/or adaptive behavior provided comparable results for at least one developmental outcome; and, had moderate to high methodological quality. The outcomes assessed included: IQ, language, and adaptive behavior. The results of the meta-analyses indicated that early intensive behavioral treatments are effective in improving the intellectual language, communication and social abilities of children with ASD from pre to post treatment. The results indicated that behavioral early intervention programs are more effective than eclectic control conditions in improving the intellectual and language abilities and adaptive functioning. Additional analysis demonstrated that improvement of intellectual and adaptive behavior abilities of children appear to be affected by the intensity of the program. The authors note that further studies and meta-analyses in the field are still necessary; in particular, these should address the limitation of the previous studies and meta-analysis. It is noted that most of the included studies in this meta-analysis are characterized by some methodological limitations, whose impact on the result cannot be estimated. Limitations of some of the included studies are: their small sample size; the lack of comparison group, matched groups, or random assignment of the children; the use of a variety of measures in the same study, which may have different emphasis on particular skills, as well as potential floor effects.

Spreckley et al. (2009) reported on a systematic review and meta-analysis of the effectiveness of applied behavior intervention (ABI) programs for preschool children with ASD in areas of cognitive, adaptive behavior, and language development. Thirteen studies met the inclusion criteria. Six of these studies were randomized or quasi-randomized controlled trials with adequate methodological quality. Four of the studies had adequate data to enable meta-analysis to be performed. The meta-analysis of these studies indicated that ABI did not result in significant improvement in cognitive, language, or adaptive behavioral outcomes when compared with standard care. The analysis concluded that compared with standard care, in the cognitive/intellectual area, ABI programs did not significantly improve the cognitive outcomes of children in the experimental group who scored a standardized mean difference (SMD) of 0.38 (95% confidence interval [CI] –0.09 to 0.84; p=.1). In area of language: no additional benefit was found over standard care for expressive language; SMD of 0.37 (95%CI –0.09 to 0.84; p=.11), for receptive language: SMD of 0.29 (95%CI –0.17 to 0.74; p=.22). In the area of adaptive behavior: SMD of 0.30 (95%CI –0.16 to 0.77; p=.20). Limitations included: high variability in the studies included; difficulty establishing control groups; no standardization of the comparison intervention; poor homogeneity; limited information on retention in the intervention groups; and lack of strict inclusion and exclusion criteria.

Seida et al. (2009) conducted a review of systematic reviews of the effectiveness of psychosocial interventions for ASD. The review included 30 systematic reviews. The majority of reviews evaluated interventions based on behavioral therapy (n=9) or communication-focused therapies (n=7). Positive outcomes were reported in most of the reviews; however methodological quality of the reviews was generally poor. The review included five broad types of psychosocial treatments: interventions based on behavioral theory such as applied behavior analysis, communication-focused interventions, parent-mediated interventions, sensory motor interventions, and social skills development interventions. It was noted that all of the nine reviews on behavioral therapy interventions
were rated as having low methodological quality. In particular the reviews lacked a comprehensive search strategy, reliable study selection and assessment of the quality of primary studies. While some reviews conclude that there robust evidence to support an intervention, there remains little information of the relative effectiveness of one intervention compared with another.

Eldevik et al. (2009) reported on a systematic review of EIBI for children with autism. The review included nine studies which were controlled designs either having a comparison or a control group. A meta-analysis was completed that for a standardized mean difference effect size for two available outcome measures: change in full-scale intelligence and/or adaptive behavior composite. The average effect size was 1.10 for change in full-scale intelligence (95% confidence interval - .87, 1.34) and .66 (95% confidence interval= .41, .90) for change in adaptive behavior composite. Limitations of the study include: the number of studies may be considered small; and the literature lacks comparisons between EIBI and other approaches, other than the eclectic one. Also, while there appears to be a clear difference in outcome between EIBI and the comparison intervention, it may be due to differences in the amount and frequency of supervision and training—there was not have enough data to control for this in the present study. The authors’ note that based on the information in the studies included, it is apparent that the EIBI group in general received more frequent and more total hours of supervision and training which is a threat for the validity of conclusions about the superiority of EIBI in relation to comparison intervention. The authors conclude that while EIBI did produce large to moderate effect size in this review, randomized controlled trials comparing EIBI to other interventions are still needed, in particular, where the comparison intervention is of similar intensity and where staff receive similar training and supervision.

Howlin et al. (2009) conducted a systematic review of controlled studies of EIBI for young children with autism. The review included 11 studies, with two being randomized controlled trials. The studies varied with respect to the characteristics of children involved, the duration and intensity of interventions, and the methods used to assess outcome. The only variable reported consistently across all studies was IQ, and this measure was derived from different tests between and within studies. The authors noted that while EIBI is highly effective for some children, gains are not universal and some children make only modest progress while others show little or no change, at times with extremely lengthy periods in treatment. It is not clear for which children EIBI is most and least effective. There is an indication that the immediate impact of EIBI decreases over time, with the first year of treatment appearing to result in the most substantial gains. It is not clear what the optimal duration of therapy and the age at which it should begin. The authors also noted that,” there is also a need to demonstrate that EIBI is substantially more effective than alternative, high quality autism specific interventions, such as specialized preschool provision”. It is noted in the review that in most of the studies that the alternative intervention has generally been of lower intensity and/or lesser quality than the EIBI program to which it is compared.

Reichow and Wolery (2008) conducted a comprehensive synthesis of early intensive behavioral interventions (EIBI) for young children with autism based on the UCLA Young Autism Project Model. The synthesis was comprised of three components: descriptive analyses; effect size analyses; and a meta-analysis. The review included data from 14 samples from 13 research reports. The selection of studies for this review involved seven inclusion criteria: study specified the EIBI was based on the UCLA model based on a replication of Lovaas; participants had diagnoses of autistic disorder, autism spectrum disorders (ASD), PDD, PDD-NOS; participants had a mean chronological age less than 84 months at the beginning of treatment; mean duration of EIBI was greater than or equal to 12 months; at least one child outcome measure was reported; experimental research designs (e.g., pre-test/post-test multiple-group design) or quasi-experimental research designs (i.e., nonequivalent control group design, one-group pre-test/post-test design) were used and (g) publication in English in a peer-reviewed journal. Effect sizes were calculated for the outcome data from the constructs of IQ, adaptive behavior, expressive language, and receptive language. The mean effect size was 0.69 (p<0.001) which took into account effect sizes for IQ, adaptive behavior, expressive language, and receptive language. There were more samples (12 of 14) that had sufficient data to calculate the effect sizes for IQ than for the other measures. Limitations of the review included that the inclusion criteria were narrow. In addition the studies included limitations such as: participants were not selected randomly, they were not assigned randomly to groups, study sizes were small, narrow and questionable measures were used and treatment fidelity data were not reported. The authors concluded that, “No comparisons between EIBI and other widely recognized treatment programs have been published. Without comparisons between EIBI and empirically validated treatment programs, it is not possible to determine if EIBI is more or less effective than other treatment options.”
Studies: Mohammadzaheri et al. (2014) conducted a randomized, controlled study to compare two applied behavior analysis (ABA) intervention procedures, a naturalistic approach, pivotal response treatment (PRT) with a structured ABA approach in a school setting. Thirty children, ranging in age from six to 11 years, diagnosed with autism by a child psychiatrist according to the DSM-IV-TR were randomized to an ABA treatment group (n=15) and their matched counterparts to a PRT treatment group (n=15). Treatment sessions were conducted twice weekly for 60 min per session over a 3 month period. The results of this study indicated that the PRT intervention was more effective at improving social communication skills for children with autism than the structured ABA treatment. The children who participated in this study demonstrated greater gains in both the targeted area as well as overall gains in pragmatic skills, including inappropriate initiation, coherence, stereotyped language, use of context, and rapport, as measured by the Children’s Communication Checklist (CCC). The study was limited by the small sample size and the length of time of treatment and follow-up time.

Fernell et al. (2011) reported on a longitudinal, prospective, naturalistic study over a period of two years of a population-based group of 208 children, aged 20-54 month, with ASD referred for intervention. The aims were to examine the outcome in terms of adaptive functioning in ASD over the two-year period and relate this to type and intensity of intervention. The children fell into three cognitive subgroups: one with learning disability, one with developmental delay, and one with normal intellectual functioning. Intervention was classified into intensive applied behavior analysis (ABA) (n=93) and non-intensive, targeted interventions (n=105), also based on ABA principles. Assessments were conducted by a research team before the onset of intervention, and then, again, two years later. Change in Vineland adaptive behavior scales composite scores from intake (T1) to leaving the study (T2) was set as the primary outcome variable. The research team was blind to the type and intensity of interventions provided. One hundred and ninety-eight (95%) of the original samples remained in the study throughout the whole two-year period and 192 children had a complete Vineland composite score results both at T1 and T2. Vineland composite scores increased over the two-year period. This increase was accounted for by the subgroup with normal cognitive functioning. There was no significant difference between the intensive and non-intensive groups. There was considerable individual variation noted, but no child in the study was "problem-free" at follow-up. The data does not support that children with ASD generally benefit more from the most intensive ABA intervention programs than from less intensive interventions or targeted interventions based on ABA.

Zachor et al. (2011) examined the relation between autism severity at baseline, type of intervention employed and outcomes in young children with ASD. The study included 78 children with ASD, aged 15–35 months who received either applied behavioral analysis (ABA) or integration of several intervention approaches (eclectic) in community center-based programs. The outcome was measured after one year of intervention using standardized autism diagnostic tests, and cognitive and adaptive skills evaluations. Both intervention groups improved significantly in verbal cognitive abilities and in socialization and communication adaptive skills, but no significant difference between the intervention groups was documented. Less severe autism symptoms at baseline appeared to be related with better progress in adaptive skills and in cognitive abilities. Within the group with less severe autism symptoms, those who received eclectic intervention had a better outcome than those who received ABA in communication and socialization adaptive skills as reported by the parents, but not in the standardized cognitive test results. The author’s note that based on the findings that the child’s baseline social abilities and deficits appear to be crucial variables for intervention outcomes and should be considered in treatment approach decision-making.

Smith et al. (2010) conducted a cohort study of 45 children with ASD that were treated with the Nova Scotia early intensive behavior intervention model (NS EIBI). This treatment was designed to be feasible and sustainable in community settings. It combines parent training and naturalistic one-to-one behavior intervention employing Pivotal Response Treatment (PRT). The children were followed for 12 months. Mean gains of 14.9 and 19.5 months were observed on expressive and receptive language measures, respectively, for children with an IQ of 50 or more at baseline compared to 6.1 and 8.4 months for children with IQs less than 50. There was a decrease in behavior problems over the one-year treatment for both groups, but autism symptoms decreased only for those with an IQ of 50 or more. Limitations of the study include the lack of randomization and small subject group.

Remington et al. (2007) reported on a non-randomized study of preschool children with autism treated either with early intensive behavioral intervention or treatment as usual. Children in the intervention group (n=23), that were identified on the basis of parent preference, received home-based early intensive behavioral intervention for two years. One-to-one teaching based on applied behavior analysis for 25.6 hours per week on average was
delivered by trained tutors and parents. The comparison group (n=22) received their local education authorities’ standard provision for young children with autism—a variety of interventions designed to ameliorate the impact of autism and enhance functioning, none of which were intensive or delivered on one-to-one basis for most of the time. Prospective assessment was performed before treatment, after 1 year of treatment, and again after 2 years. Norm-referenced instruments were used to gather the cognitive, language, and behavioral outcome data. The measurements included: for intellectual functioning the Bayley scales and Standard Binet Intelligence Scale fourth edition was used. The Bayley scales is designed for children up to 42 months of age and is appropriate for children with intellectual disabilities or those whose language skills are not sufficiently advanced to take a full-scale intelligence test. The Reynell developmental language-scales-third edition was utilized for language assessment. Adaptive skills were measured with the Vineland Adaptive Behavior Scale-Survey Form. In the area of child behavior the Positive Social subscale of the Nisonger Child Behavior Rating form along with the parent report versions of the Developmental Behavior Checklist were used. In the area of intellectual functioning and IQ, there was a significant main effect of group (p=.008), but no interaction effect. Significant group effects (but no interactions) were also found for Vineland Daily Living Skills (p=.016), and Vineland Motor Skills (p=.040), but not for the Vineland Composite score or the Socialization and Communication domains. In all cases, the children receiving early intensive behavioral intervention appeared to out-perform the children in the comparison group. At baseline assessments the groups did not differ, but after 2 years, it was noted that there were strong differences that favored the intensive behavioral intervention in areas of intelligence, language, daily living skills, positive social behavior, and a statistical measure of best outcome for individual children.

Ben-Itzchak and Zachor (2007) reported on a study that assessed the relation between pre-intervention variables including cognition, socialization and communication, to outcome in young children with autism. The study included 25 children with autism who were enrolled in intensive behavior intervention. The children attended a center-based applied behavior analysis (ABA) program. A trained behavior analyst planned and supervised the individual intervention curriculum of each child and the treatment was provided one-on-one by skilled behavioral therapists for at least 35 weekly hours. The treatment included parents taught how to use behavioral methods at home and working with the program supervisor on developmental goals for use in natural environments. The children were separated into groups based on IQ scores and on the severity of social interaction and communication deficits. Six developmental-behavioral domains were assessed at pre- and post-one year of intervention times. The domains included imitation, receptive language, expressive language, nonverbal communication skills, play skills and stereotyped behaviors. After one year of intervention, significant progress was noted in all the six developmental-behavioral domains. Children with higher initial cognitive levels and children with fewer measured early social interaction deficits demonstrated an increased acquisition of skills in three developmental areas, receptive language expressive language and play skills. Better progress in receptive language skills was seen in both groups. Improved progress in expressive language was associated with the child’s social abilities, while more significant progress in play skills was related to pre-intervention cognitive level.

Magiati et al. (2007) conducted a prospective study to compare outcome for pre-school children with ASD receiving autism-specific nursery provision or home-based early intensive behavioral intervention (EIBI) in a community setting. The study included 44 children, (aged 23- to 53-months) with ASD. Twenty-eight children were in EIBI home-based programs and 16 in autism-specific school based nursery provision which included a minimum of 15 hours per week. Cognitive, language, play, adaptive behavior skills and severity of autism were assessed initially and two years later. Improvements were noted in both groups in age equivalent scores but standard scores changed little over time. At follow-up, no significant group differences were noted in cognitive ability, language, play or severity of autism. The only difference approaching significance (p=.06), in favor of the EIBI group, was for Vineland Daily Living Skills standard scores. There were large individual differences in progress, with intake IQ and language level best predicting overall progress.

Eikeseth et al. (2007) reported on outcomes for children who began intensive behavioral treatment between ages four and seven (mean age of 5.5 years). The children were assigned to either a behavioral treatment (n=13) or eclectic treatment (n=11 boys) based on staff availability. Children in both groups received treatment for a minimum of 20 hours a week from trained therapists at their local schools. The children in the behavioral group received ABA and the children remained in education programs that combined a variety of interventions (e.g., ABA, TEACCCCH, sensory integration and other approaches). In 2007, results were reported when the children had mean age of eight years, two months and follow-up was 31.4 months in the behavioral group and 33.3 in the eclectic group. When the children entered school the hours were reduced to a mean of 18 hours for the behavioral group and 16 hours for the eclectic group. Intellectual functioning was evaluated with the WPPSI-
R, Wechsler Intelligence Scale for Children-Revised, or Bayley Scales of Infant Development-Revised. The behavioral treatment group showed larger increases in IQ and adaptive functioning than did the eclectic group (p<.05). The largest gain was noted in IQ. The behavioral treatment group also displayed fewer aberrant behaviors and social problems at follow-up. The behavioral treatment group showed an increase of 25 points (from 62 to 87) as compared to 7 points (from 65 to 72) in the eclectic treatment group. Gains on the Vineland Adaptive Behavior Scales ranged from 9 points for Daily Living Skills to 20 points for Communication; in contrast, mean scores in the eclectic treatment group declined 6 to 12 points. Limitations of the study included that it was quasi-random rather than random group assignment, small sample size, and no direct quality control measures of treatment. The author notes that replications of the study are needed.

Sallows and Graupner (2005) reported on a study of children with autism that were randomly assigned to a clinic-directed group, replicating the parameters of the early intensive behavioral treatment developed at UCLA, or to a parent-directed group that received intensive hours but less supervision by equally well-trained supervisors (Wisconsin Early Autism Project [Madison]). Twenty–three children were assigned to either clinic-directed group (n=13) replicating parameters of the UCLA intensive behavioral treatment or to the parent-directed group (n=10), which was intended to be a less intensive treatment. Children in the clinic group received an average of 39 hours of direct treatment in the first year and 37 in the second year with gradual decrease in hours as children entered school. The average for the parent-directed group was 32 hour in first year, 31 in the second year with one family choosing to receive 14 hours both years. Among the 23 children, the average Full Scale IQ increased from 51 to 76. After one year of treatment eight of the children reached IQ of 85 or higher, (five clinic-directed and three parent directed) and three children reached this level after three to four years of treatment (three parent-directed) which was a total of 11 or 48% of the children. It was noted that children with higher pre-treatment IQs were more likely to reach four year IQs in the average range. It was noted that these children also demonstrated increases in language and adaptive areas — succeeding in regular first or second grade classes, demonstrating generally average academic abilities, spoke fluently and had peers with whom they played regularly. The parent-directed children did approximately as well as the clinic-directed children which was unexpected. It was noted that low IQ (below 44) and absence of language (no words of 36 months) predicted limited progress. It is planned that these children will be followed for several more years to determine outcome in adolescence and adulthood. At this time, it does not appear that follow-up studies have been published.

Howard et al. (2005) studied the effects of three treatment approaches on preschool-age children with autism spectrum disorders (ASD). Intensive behavior analytic intervention (IBT) with a 1:1 adult: child ratio at 25–40 hours a week was provided to 29 children in community, home and school setting. Intensive “eclectic” intervention, which was a combination of methods (combination of TEACCH, sensory integration therapy and some applied analysis methods) with a 1:1 or 1:2 ratio, at 30 hours a week was provided to a comparison group (n=16) in public special education classrooms (AP group). A second comparison group (GP) (n=16) in a non-intensive public early intervention programs received a combination of methods, provided in small groups, at 15 hours per week. Standardized tests for cognitive ability and intellectual functioning included the Bayley Scales of Infant Development. The Reynell Developmental Language Scales was used to assess receptive and expressive language development. Adaptive skills were measured with the Vineland Adaptive Behavior Scales. Testing was administered at intake and approximately 14 months after treatment began. At intake the groups were similar on key variables. It was noted that at follow-up, there did not appear to be statistically significant differences between the mean scores of children in the AP and GP groups. The IBT group had higher mean scores in all domains than the AP and GP groups that appeared to be statistically significant. An exception to this general finding was in the motor skills domain, which did not produce a statistically significant group difference when results were expressed as learning rates. At follow-up, the IBT group had mean standard scores in the normal range on cognitive, non-verbal, communication, and motor skills, whereas the only mean score in the normal range for the AP and GP groups was in motor skills. Limitations of the study included: assignment was parent-determined, not random; the examiners who performed the assessments were not blind as to the group assignments at follow-up testing; results were analyzed in terms of performances on standardized, norm-referenced assessments conducted in formal testing situations, rather than repeated direct observational measurement of behavior in situ that characterized applied behavior analysis.

Sheinkopf and Siegel (1998) conducted a small (n=22) prospective, case-matched controlled trial which partially replicated the UCLA project. Children received less intensive treatment, an average of 18 to 25 hours/week, and providers received less supervision from senior staff. After treatment, all children in the experimental group (n=11) had IQ estimates above 65 (one had missing data). By contrast, only 6 of the 11 children in the control
group (n=11) had IQ above 65 at follow-up. The study suggested that treatment need not be as intensive as that provided in the UCLA Lovaas study to be effective. Definitive conclusions could not be made, however, because of the small sample size.

Lovaas therapy is based on a prospective, quasi-randomized trial published by O. Ivar Lovaas in 1987. In the University of California, Los Angeles (UCLA) Young Autism Project, subjects were assigned to an intensive-treatment experimental group (n=19) or control group (n=19) (Lovaas, et al., 1987). Outcome measures were limited to IQ and school placement. Student therapists trained in the technique provided more than 40 hours of one-on-one treatment per week in the home, school or community for two or more years to those assigned to the experimental group. Parents received extensive training in the treatment procedures and worked as part of the treatment team to ensure that treatment continued during most of the child’s waking hours. The primary teaching method relied on discrete trial discrimination learning and compliance with simple commands. Aggressive and self-stimulatory behaviors were ignored and appropriate behaviors were reinforced. In some cases physical punishment (slap on the thigh) or verbal reprimands (a loud “No!”) were used to decrease inappropriate behavior. Children in the minimal treatment group received up to 10 hours per week of one-on-one behavioral treatment combined with special education. A second control group was created by selecting 21 children from a larger group (62) of young autistic children treated at another facility. These participants were never referred to or evaluated by the Lovaas team. Data from this control group were included in the study to guard against the possibility that subjects referred to the UCLA study were likely to have more or less favorable outcomes. The mean age and sex of participants in the second control group were not reported, nor were details on the specific treatment provided. The lack of random assignment to experimental or control groups and the fact that subjects were assigned based on proximity to the UCLA campus and on staff availability raises the possibility of selection bias. The UCLA Lovaas study reported that 47% of those in the intensive treatment group achieved normal intellectual and educational functioning, with normal IQ scores and successful first-grade performance in public schools. Another 42% were reported as having a mild mildly intellectual disability and assigned to classes for the language delayed, and only 10% were deemed profoundly intellectually disabled and assigned to classes for the autistic/intellectually disabled. No children in the minimal-treatment control group and only one of 21 in the second control group (5%) achieved normal educational and intellectual functioning. A total of 45% were reported as mildly intellectually disabled and placed in language-delayed classes, and 53% were severely intellectually disabled and placed in autistic/ intellectually disabled classes. Based on the results of this study, the researchers felt that Lovaas therapy was an effective treatment option for children with autism. A follow-up study (McEachin, et al., 1993) was conducted to assess the long-term effects of therapy provided in the Lovaas trial and concluded that long-lasting and significant gains could be made with early intensive behavioral treatment.

There were a number of methodological flaws identified in the above Lovaas and McEachin studies, including:

- very small sample size
- group assignment based on staff availability, not truly randomized
- sample not representative of autism population (higher level of functioning, children on medications excluded, ratio of males to females not representative of that in population)
- autism subset classification of subjects not available
- different IQ tests used for different children at intake (examiner selection)
- social functioning not assessed after treatment; no outcome measures other than IQ scores and school placement

A review of the literature by Smith (1999) regarding outcomes of early intervention for children with autism indicates that there were several school-based studies performed on the subject of LEAP (Learning Experiences: an Alternative Program), and the Princeton Child Development Institute (PCDI) program. The studies were conducted using intensive behavioral therapy during the 1980s and early 1990s, yielding inconsistent results (Smith, 1999). Improvements were reported, but the nature of the improvements varied significantly across studies (Smith, 1999). No clear correlation could be made between treatment intensity, treatment model and outcome (Smith, 1999). All of these studies contained many methodological weaknesses, including small numbers of patients and a lack of a procedure to randomly assign participants to groups. Participants were diagnosed as autistic by independent clinicians, but in most of these studies a standardized diagnostic tool, the Childhood Autism Rating Scale (CARS), was not used. Some children may not have met generally accepted autism diagnostic criteria (Smith, 1999).
Intensive Behavioral Interventions for Other Conditions

Although intensive behavioral interventions were developed initially to treat children with autism spectrum disorders (ASD) it has recently been proposed to treat children with other conditions, including learning disabilities and Attention-Deficit/Hyperactivity Disorder (ADHD). There is a lack of scientific evidence to support the efficacy of the programs for ADHD, learning disabilities or other conditions.

Professional Societies/Organizations

American Academy of Child and Adolescent Psychiatry (AACAP): The AACAP updated their practice parameters for the assessment and treatment of children and adolescents with autism spectrum disorders. The guidelines include the following regarding treatment (Volkmar, et al., 2014):

The clinician should help the family obtain appropriate, evidence-based and structured educational and behavioral interventions for children with ASD (evidence base: CS).

The guidelines note that, “Structured educational and behavioral interventions have been shown to be effective for many children with ASD and are associated with better outcome. As summarized in the National Research Council (NRC) report, the quality of the research literature in this area is variable, with most studies employing group controls or single-subject experimental methods. In general, studies employing more rigorous randomized group comparisons are sparse, reflecting difficulties in random assignment and control comparisons. Other problems include lack of attention to subject characterization, generalization of treatment effects, and fidelity of treatment implementation. Despite these problems, various comprehensive treatments approaches have been shown to have efficacy for groups of children, although none of the comprehensive treatment models has clearly emerged as superior.”

Regarding behavioral interventions, the guidelines note that, “Behavioral interventions such as Applied Behavioral Analysis (ABA) are informed by basic and empirically supported learning principles. A widely disseminated comprehensive ABA program is Early Intensive Behavioral Intervention (EIBI) for young children, based on the work of Lovas et al. EIBI is intensive and highly individualized with up to 40 hours per week of one to one direct teaching, initially using discrete trials to teach simple skills and progressing to more complex skills such as initiating verbal behavior. A meta-analysis found EIBI effective for young children, but stressed the need for more rigorous research to extend the findings. Behavioral techniques are particularly useful when maladaptive behaviors interfere with provision of a comprehensive intervention program. In such situations a functional analysis of the target behavior is performed, in which patterns of reinforcement are identified and then various behavioral techniques are used to promote a desired behavioral alternative. ABA techniques have been repeatedly shown to have efficacy for specific problem behaviors, and ABA has also been found to be effective as applied to academic tasks, adaptive living skills, communication, social skills, and vocational skills. Because most children with ASD tend to learn tasks in isolation, an explicit focus on generalization is important.”

American Academy of Pediatrics (AAP): A clinical report for the management of children with autism spectrum disorders (ASD) was published by the American Academy of Pediatrics (AAP) (Myers, et al., 2007). The report notes that, “Educational interventions, including behavioral strategies and habilitative therapies, are the cornerstones of management of ASDs. These interventions address communication, social skills, daily-living skills, play and leisure skills, academic achievement, and maladaptive behaviors.” The AAP report notes that these programs may differ in philosophy and relative emphasis on particular strategies. The early childhood educational programs share many common goals. There is an increasing consensus that important principles and components of effective early childhood intervention for children with ASDs include the following (Myers, et al., 2007):

- An entry into intervention as soon as an ASD diagnosis is seriously considered rather than deferring until a definitive diagnosis is made.
• A provision of intensive intervention, with active engagement of the child at least 25 hours per week, 12 months per year, in systematically planned, developmentally appropriate educational activities designed to address identified objectives
• A low student-to-teacher ratio to allow sufficient amounts of one-to-one time and small-group instruction to meet specific individualized goals
• An inclusion of a family component, including parent training as indicated
• A promotion of opportunities for interaction with typically developing peers to the extent that these opportunities are helpful in addressing specified educational goals
• An ongoing measurement and documentation of the individual child's progress toward educational objectives, resulting in adjustments in programming when indicated
• An incorporation of a high degree of structure through elements such as predictable routine, visual activity schedules, and clear physical boundaries to minimize distractions
• An implementation of strategies to apply learned skills to new environments and situations (generalization) and to maintain functional use of these skills
• The use of assessment-based curricula that address the following:
  ➢ functional, spontaneous communication
  ➢ social skills, including joint attention, imitation, reciprocal interaction, initiation, and self-management
  ➢ functional adaptive skills that prepare the child for increased responsibility and independence
  ➢ reduction of disruptive or maladaptive behavior by using empirically supported strategies, including functional assessment
  ➢ cognitive skills, such as symbolic play and perspective taking
  ➢ traditional readiness skills and academic skills as developmentally indicated

In regard to the efficacy of education interventions, the AAP report notes that the treatment “should be based on sound theoretical constructs, rigorous methodologies, and empirical studies of efficacy. Proponents of behavior analytic approaches have been the most active in using scientific methods to evaluate their work, and most studies of comprehensive treatment programs that meet minimal scientific standards involve treatment of preschoolers using behavioral approaches. However, there is still a need for additional research, including large controlled studies with randomization and assessment of treatment fidelity. Empirical scientific support for developmental models and other interventions is more limited, and well-controlled systematic studies of efficacy are needed.” (Myers, et al., 2007).

National Research Council (NRC): The assessment by the NRC on educational intervention for children with autism included a review of comprehensive programs for the treatment of ASD (NRC, 2001). They note that although there are limitations in outcome research, it is likely that many children benefit substantially from the programs. They include a review of ten model programs in their report, but note that not all existing programs are included. The report notes that “while substantial evidence exists that treatments can reach short-term specific goals in many areas, gaps remain in addressing larger questions of the relationships between particular techniques, child characteristics, and outcomes.”

Technical Expert Panel (TEP) and HRSA Autism Intervention Research–Behavioral (AIR-B) Network: TEP published recommended guidelines and further research needs for nonmedical interventions for children with ASD based on evidence and the expert panel (Maglione, et al., 2012). The TEP included practitioners, researchers, and parents. The report notes that the strength of evidence of efficacy varied by intervention type from insufficient to moderate, with none reaching high strength. The evidence included studies with a sample size of at least 10; control group not necessary and observational studies were included. The scientific literature is not clear as to which individual participant characteristics are associated with success of various approaches. The TEP noted that:
• According to commonly accepted standards, the evidence that comprehensive intervention programs, often referred to as “intensive” interventions, are effective at improving core deficits of ASD is moderate strength. Even though controlled studies have been conducted, few have randomly selected their subjects or enrolled large samples. Several meta-analyses of programs based on applied behavioral analysis or the Lovaas method have been conducted to increase statistical power; they have found promising results in the areas of language, adaptive skills, and IQ.
• Evidence is insufficient to suggest the superiority of one behavioral curriculum over others. There is moderate evidence that greater intensity of treatment (hours per week) and greater duration (in months) lead to better outcomes.
• Regarding developmentally based intensive programs and environmental programs such as TEACCH, the strength of evidence is lower.
• Overall, autonomous social skills programs for high-functioning children and adolescents have a moderate strength of evidence of efficacy; however, our analyses could not determine which approaches, settings, and modalities were superior.
• For children with little or no verbal language, the Picture Exchange Communication System (PECS) has moderate strength of evidence of efficacy, and no controlled trials or uncontrolled observational studies of augmentative communication devices were identified.
• Auditory integration training was found ineffective in four of five.

The review identified future research priorities:
• There was significant heterogeneity in outcome measures used in trials of interventions for ASD. Research priority: assessment and monitoring of outcomes
• The needs of preverbal children may differ considerably from those of verbal children, but exiting studies rarely focus on preverbal children (or minimally verbal or nonverbal). Research priority: understanding and addressing the needs of pre-verbal and nonverbal individuals with ASD.
• The appropriate intensity, duration and type of program for adolescents with ASDs cannot be determined from the current literature, since few studies report on interventions for this age group. Research priority: understanding and addressing the needs of adolescents and adults with ASDs.
• While some reviews found that applied behavioral analysis is a highly effective component of a comprehensive intervention in addressing IQ and communication skills, it is unclear which other components affect which specific core deficits. Research priority: Identifying the most effective strategies to impact the specific core deficits of ASDs.
• Comparative effectiveness studies of different intensities and durations of ASD interventions are relatively lacking from the existing literature, but are important. Research priority: Identification of the most effective dose and duration of interventions.

Use Outside of the US
National Institute for Health and Clinical Excellence (NICE): NICE published clinical guidelines for the management and support of children and young people on the autism spectrum. The guidelines include the following recommendations for specific interventions for core features of autism (NICE, 2013):

Psychosocial interventions
• Consider a specific social-communication intervention for the core features of autism in children and young people that includes play-based strategies with parents, carers and teachers to increase joint attention, engagement and reciprocal communication in the child or young person. Strategies should:
  ➢ be adjusted to the child or young person’s developmental level
  ➢ aim to increase the parents’, carers’, teachers’ or peers’ understanding of, and sensitivity and responsiveness to, the child or young person’s patterns of communication and interaction
  ➢ include techniques of therapist modeling and video-interaction feedback
  ➢ include techniques to expand the child or young person’s communication, interactive play and social routines
• The intervention should be delivered by a trained professional. For pre-school children consider parent, carer or teacher mediation. For school-aged children consider peer mediation.

The guidelines note in a discussion section of intensive and targeted education for children that that extends beyond the remit of most parent training interventions, “Some parents seek a programme of intensive and targeted education for their children that extends beyond the remit of most parent training interventions, and which are often delivered in the home and sometimes in school settings. Such interventions are designed to teach new skills, to minimise the negative consequences of impairments and to assist in the generalisation of learning. These programmes are not routinely delivered within the NHS or social care services, and, when publicly funded, are usually supported from education budgets.”
Academy of Medicine Singapore-Ministry of Health (AMS-MOH): this organization published clinical practice guidelines for autism spectrum disorders (ASD) in pre-school children. The guidelines include the recommendations for interventions for ASD (AMS-MOH, 2010):

- Every pre-school child diagnosed with ASD should have an individualized intervention plan that sets out the goals, type(s), frequency and intensity of intervention, in order to address particular developmental and educational needs. (Grade D, Level 4)
- An individualized intervention plan should consist of a variety of quality programs and activities. This includes attendance in comprehensive early intervention programs, programs targeting specific needs and also positive engagement with parents and/or caregivers. (Grade D, Level 4)
- All pre--school children with ASD should undergo early intervention as soon as significant developmental need is recognized by a trained professional because outcomes improve with early intervention. (Grade C, Level 2++)
- The intensity of intervention should be continually monitored and varied according to the child’s changing need. (Grade D, Level 4)
- Early Intensive Behavior Intervention (EIBI) can be recommended as an intervention option for children with ASD. (Grade A, Level 1++)

Regarding applied behavior analysis, (ABA), the guidelines note, “Recent systematic reviews showed that EIBI was efficacious but had variable outcomes, suggesting that EIBI was not effective for all children with ASD.” They note that, “No studies replicated the magnitude of efficacy reported by Lovaas (i.e., significant gains on intelligence tests and claims of ‘recovery’ as defined by a placement in mainstream schools without assistance).” The guidelines note that, “Parents should be informed that EIBI, in its original form, is an expensive intervention that may place significant financial strain on families.”

Grade of recommendation:
A: At least one meta-analysis, systematic review of RCTs, or RCT rated as 1+ + and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B: A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1+ + or 1+
C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2+ +
D: Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+
GPP: (good practice points) Recommended best practice based on the clinical experience of the guideline development group.

Levels of evidence:
1+ +: High quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias.
1+: Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.
1-: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias.
2+ +: High quality systematic reviews of case control or cohort studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.
2+: Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.
2-: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal.
3: Non-analytic studies, e.g. case reports, case series
4: Expert opinion

Scottish Intercollegiate Guidelines Network (SIGN): Evidenced-based clinical guidelines for the assessment, diagnosis and clinical interventions for children and young people with autism spectrum disorders have been published by SIGN (2007). Regarding intensive behavioral programs they note that most intensive behavioral programs for autism spectrum disorders (ASD) are based on principles of behavior modification using applied behavior analysis (ABA). The programs are intensive, usually involving 20-140 hours or intervention per week. The most well-known is the Lovaas program. The recommendation is that the Lovaas
program should not be presented as an intervention that will lead to normal functioning. They report did recommend “behavioural interventions be considered to address a wide range of specific behaviors in children and young people with ASD, both to reduce symptom frequency and severity and to increase the development of adaptive skills.”

Summary
There is insufficient evidence in the published peer-reviewed medical literature to demonstrate the comparative effectiveness and impact of intensive behavioral interventions (e.g., early intensive behavior intervention [EIBI], intensive behavior intervention [IBI], Lovaas therapy, applied behavior analysis [ABA]) on long term outcomes for improvements in functional and social adaptation, and cognitive skills including language and communication skills, intellectual function, or other measures for children with autism or other condition. There is a significant amount of variation in the different types of intensive behavioral interventions, particularly in areas of approach, intensity, delivery, duration, and scope of the treatment. This variation, along with the limited quality and consistency of the published studies, as well as limited long term follow-up, leads to difficulty in interpretation of the clinical utility of the research regarding this intervention. The comparative effectiveness of specific intervention strategies, the duration and intensity of the interventions, the most appropriate setting and the characteristics of children who respond have not been established.

Coding/Billing Information

Note: 1) This list of codes may not be all-inclusive.
   2) Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

There are no specific codes that represent Intensive Behavioral Interventions/ABA. Intensive Behavioral Interventions/ABA may be submitted using various codes including, but not limited to the codes below. Intensive Behavioral Interventions/ABA are considered Experimental/Investigational/Unproven and not covered regardless of the code submitted.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>90785</td>
<td>Interactive complexity (List separately in addition to the code for the primary procedure)</td>
</tr>
<tr>
<td>90832</td>
<td>Psychotherapy, 30 minutes with patient</td>
</tr>
<tr>
<td>90833</td>
<td>Psychotherapy, 30 minutes with patient when performed with an evaluation and management service (List separately in addition to the code for primary procedure)</td>
</tr>
<tr>
<td>90834</td>
<td>Psychotherapy, 45 minutes with patient</td>
</tr>
<tr>
<td>90836</td>
<td>Psychotherapy, 45 minutes with patient when performed with an evaluation and management service (List separately in addition to the code for primary procedure)</td>
</tr>
<tr>
<td>90837</td>
<td>Psychotherapy, 60 minutes with patient</td>
</tr>
<tr>
<td>90838</td>
<td>Psychotherapy, 60 minutes with patient when performed with an evaluation and management service (List separately in addition to the code for primary procedure)</td>
</tr>
<tr>
<td>90899</td>
<td>Unlisted psychiatric service or procedure</td>
</tr>
<tr>
<td>96152</td>
<td>Health and behavior intervention, each 15 minutes, face-to-face; individual</td>
</tr>
<tr>
<td>0359T</td>
<td>Behavior identification assessment, by the physician or other qualified health care professional, face-to-face with patient and caregiver(s), includes administration of standardized and non-standardized tests, detailed behavioral history, patient observation and caregiver interview, interpretation of test results, discussion of findings and recommendations with the primary guardian(s)/caregiver(s), and preparation of report</td>
</tr>
<tr>
<td>0360T</td>
<td>Observational behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by one technician; first 30 minutes of technician time, face-to-face with the patient</td>
</tr>
<tr>
<td>0361T</td>
<td>Observational behavioral follow-up assessment, includes physician or other</td>
</tr>
</tbody>
</table>
qualified health care professional direction with interpretation and report, administered by one technician; each additional 30 minutes of technician time, face-to-face with the patient (List separately in addition to code for primary service)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>0362T</td>
<td>Exposure behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by physician or other qualified health care professional with the assistance of one or more technicians; first 30 minutes of technician(s) time, face-to-face with the patient</td>
</tr>
<tr>
<td>0363T</td>
<td>Exposure behavioral follow-up assessment, includes physician or other qualified health care professional direction with interpretation and report, administered by physician or other qualified health care professional with the assistance of one or more technicians; each additional 30 minutes of technician(s) time, face-to-face with the patient (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>0364T</td>
<td>Adaptive behavior treatment by protocol, administered by technician, face-to-face with one patient; first 30 minutes of technician time</td>
</tr>
<tr>
<td>0365T</td>
<td>Adaptive behavior treatment by protocol, administered by technician, face-to-face with one patient; each additional 30 minutes of technician time (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>0366T</td>
<td>Group adaptive behavior treatment by protocol, administered by technician, face-to-face with two or more patients; first 30 minutes of technician time</td>
</tr>
<tr>
<td>0367T</td>
<td>Group adaptive behavior treatment by protocol, administered by technician, face-to-face with two or more patients; each additional 30 minutes of technician time (List separately in addition to code for primary procedure)</td>
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<tr>
<td>0368T</td>
<td>Adaptive behavior treatment with protocol modification administered by physician or other qualified health care professional with one patient; first 30 minutes of patient face-to-face time</td>
</tr>
<tr>
<td>0369T</td>
<td>Adaptive behavior treatment with protocol modification administered by physician or other qualified health care professional with one patient; each additional 30 minutes of patient face-to-face time (List separately in addition to code for primary procedure)</td>
</tr>
<tr>
<td>0370T</td>
<td>Family adaptive behavior treatment guidance, administered by physician or other qualified health care professional (without the patient present)</td>
</tr>
<tr>
<td>0371T</td>
<td>Multiple-family group adaptive behavior treatment guidance, administered by physician or other qualified health care professional (without the patient present)</td>
</tr>
<tr>
<td>0372T</td>
<td>Adaptive behavior treatment social skills group, administered by physician or other qualified health care professional (without the patient present)</td>
</tr>
<tr>
<td>0373T</td>
<td>Exposure adaptive behavior treatment with protocol modification requiring two or more technicians for severe maladaptive behavior(s); first 60 minutes of technicians' time, face-to-face with patient</td>
</tr>
<tr>
<td>0374T</td>
<td>Exposure adaptive behavior treatment with protocol modification requiring two or more technicians for severe maladaptive behavior(s); each additional 30 minutes of technicians' time face-to-face with patient (List separately in addition to code for primary procedure)</td>
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<tr>
<th>HCPCS Codes</th>
<th>Description</th>
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<tbody>
<tr>
<td>G9012</td>
<td>Other specified case management service not elsewhere classified</td>
</tr>
<tr>
<td>H0004</td>
<td>Behavioral health counseling and therapy, per 15 minutes</td>
</tr>
<tr>
<td>H0031</td>
<td>Mental health assessment, by non-physician</td>
</tr>
<tr>
<td>H0032</td>
<td>Mental health service plan development by non-physician</td>
</tr>
<tr>
<td>H0046</td>
<td>Mental health services, not otherwise specified</td>
</tr>
<tr>
<td>H2012</td>
<td>Behavioral health day treatment, per hour</td>
</tr>
<tr>
<td>H2014</td>
<td>Skills training and development, per 15 minutes</td>
</tr>
<tr>
<td>H2017</td>
<td>Psychosocial rehabilitation services, per 15 minutes</td>
</tr>
<tr>
<td>H2018</td>
<td>Psychosocial rehabilitation services, per diem</td>
</tr>
<tr>
<td>H2019</td>
<td>Therapeutic behavioral services, per 15 minutes</td>
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</table>
References


