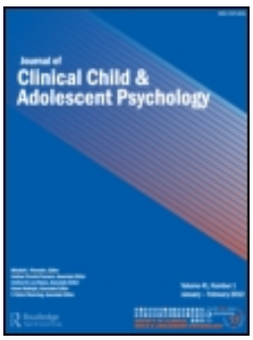

Routledge
Taylor & Francis Group

Journal of Clinical Child & Adolescent Psychology

ISSN: 1537-4416 (Print) 1537-4424 (Online) Journal homepage: http://www.tandfonline.com/loi/hcap20

Evidence Base Update for Autism Spectrum Disorder

Tristram Smith & Suzannah Iadarola

To cite this article: Tristram Smith & Suzannah Iadarola (2015) Evidence Base Update for Autism Spectrum Disorder, Journal of Clinical Child & Adolescent Psychology, 44:6, 897-922

To link to this article: http://dx.doi.org/10.1080/15374416.2015.1077448

Published online: 02 Oct 2015.

Journal of Clinical Child & Adolescent Psychology, 44(6), 897–922, 2015

ISSN: 1537-4416 print/1537-4424 online
DOI: 10.1080/15374416.2015.1077448

Routledge
Taylor & Francis Group

EVIDENCE BASE UPDATE

Evidence Base Update for Autism Spectrum Disorder

Tristram Smith and Suzannah Iadarola
Department of Pediatrics, University of Rochester Medical Center

This evidence base update examines the level of empirical support for interventions for children with autism spectrum disorder (ASD) younger than 5 years old. It focuses on research published since a previous review in this journal (Rogers & Vismara, 2008). We identified psychological or behavioral interventions that had been manualized and evaluated in either (a) experimental or quasi-experimental group studies or (b) systematic reviews of single-subject studies. We extracted data from all studies that met these criteria and were published after the previous review. Interventions were categorized across two dimensions. First, *primary theoretical principles* included applied behavior analysis (ABA), developmental social-pragmatic (DSP), or both. Second, *practice elements* included scope (comprehensive or focused), modality (individual intervention with the child, parent training, or classrooms), and intervention targets (e.g., spoken language or alternative and augmentative communication). We classified two interventions as well-established (individual, comprehensive ABA and teacher-implemented, focused ABA + DSP), 3 as probably efficacious (individual, focused ABA for augmentative and alternative communication; individual, focused ABA + DSP; and focused DSP parent training), and 5 as possibly efficacious (individual, comprehensive ABA + DSP; comprehensive ABA classrooms; focused ABA for spoken communication; focused ABA parent training; and teacher-implemented, focused DSP). The evidence base for ASD interventions has grown substantially since 2008. An increasing number of interventions have some empirical support; others are emerging as potentially efficacious. Priorities for future research include improving outcome measures, developing interventions for understudied ASD symptoms (e.g., repetitive behaviors), pinpointing mechanisms of action in interventions, and adapting interventions for implementation with fidelity by community providers.

Autism spectrum disorder (ASD) is defined by difficulties with reciprocal social communication and stereotyped interests or behaviors (American Psychiatric Association [APA], 2013) that usually emerge in early childhood. About one third of children with ASD have delays in cognitive development and daily living skills (Autism and Developmental Disabilities Monitoring Network, 2014). Co-occurring behavior problems (tantrums, aggression, self-injury, impulsivity, anxiety, extreme food selectivity, insomnia) and medical conditions (e.g., seizure disorder, gastrointestinal disturbance) are also common. Although ASD almost always persists across the lifespan, early intervention can alleviate symptoms (Rogers & Vismara, 2008).

ASD has a prenatal origin related to genetic risk and environmental events; however, the precise etiology has not been determined (Volkmar, Paul, Rogers, & Pelphrey, 2014). Although once considered rare, ASD is now estimated to occur in approximately 1 in 68 individuals (Autism and Developmental Disabilities Monitoring Network, 2014). It remains unknown whether the greater detection of ASD solely reflects changes in practice (broadened diagnostic criteria, heightened awareness,

Correspondence should be addressed to Tristram Smith, Division of Neurodevelopmental and Behavioral Pediatrics, Department of Pediatrics, University of Rochester Medical Center, 601 Elmwood Avenue, Box 671, Rochester, NY 14642. E-mail: Tristram_Smith@URMC.Rochester.edu

and improved screening), or whether there is also an actual rise in ASD. The lifetime cost of caring for an individual with ASD often exceeds $2 million (Buescher, Cidav, Knapp, & Mandell, 2014). However, because this cost does not account for collateral effects of the disorder, such as stress on caregivers and families, it may underestimate the broader public health impact of ASD.

The previous review in this journal (Rogers & Vismara, 2008) portrayed findings on ASD interventions as promising but preliminary. Studies indicated that some interventions have the potential to mitigate core and associated features of ASD and possibly even enable some children with ASD to catch up to their peers. However, few of these studies incorporated methodologically rigorous designs. This situation was (and continues to be) a source of tension between families of children with ASD, who often are eager to enroll their children into what appear to be promising interventions, and funders, who often decline payment for interventions they deem as having insufficient empirical support (Rogers & Vismara, 2008). The tension may be exacerbated by the expense of ASD interventions, some of which involve many hours of highly specialized, individualized services that last 2 or more years.

The confluence of rising prevalence estimates, increasingly precise calculations of financial and social costs associated with ASD, and controversies about empirical support for interventions inspired federal and local legislation that transformed ASD intervention research. Notably, the Combating Autism Act (2006 Initiative, reauthorized in 2011 and 2014), "considered by some to be the most comprehensive piece of single-disease legislation ever passed by the United States Congress" (Autism Speaks, 2011), funded more than $1 billion for research on ASD. Much of this research has focused on intervention (Interagency Autism Coordinating Committee [IACC], 2014). As a result, the literature now includes many more well-controlled intervention studies than were available at the time of the prior review. Whereas Rogers (1998) did not identify any randomized clinical trials (RCTs) on psychological or behavioral interventions for ASD, and Rogers and Vismara (2008) located only five, approximately 50 additional RCTs have been published as of this writing (Weitlauf et al., 2014). Moreover, the pace of ASD intervention research continues to accelerate rapidly (IACC, 2014).

At the local level, 42 states in the United States have now passed legislation mandating insurance coverage of ASD interventions (Autism Speaks, 2015), and many publicly funded early intervention and preschool programs also offer such interventions (Simpson, Mundschenk, & Heflin, 2011). Similar initiatives have taken place in Canada (Perry et al., 2008), the United Kingdom (Kendall et al., 2013), and elsewhere. Growing demand for treatments has also led to an increasing number of specialty providers, such as Board Certified Behavior Analysts. It remains to be seen how successfully these initiatives promote access to and availability of behaviorally based services. Greater public awareness about specialized treatments may also intensify demands for these treatments. Although insurance reimbursement is intended to improve service dissemination, the need for providers and variations in coverage by state may unintentionally raise expectations for access to services that are not immediately available or that differ from services provided in research settings (IACC, 2014). These complex public health and policy issues require scrutiny of the ASD intervention literature. Using diverse methodologies, systematic reviews have been conducted under the auspices of the Cochrane Collaboration (Reichow, Barton, Boyd, & Hume, 2012), RAND Corporation (Maglione et al., 2012), government agencies in the United States (Warren, Veenstra-VanderWeele et al., 2011; Weitlauf et al., 2014; What Works Clearinghouse, 2010) and United Kingdom (Kendall et al., 2013), and many other organizations and teams of investigators (Reichow, 2012). Given all the changes in the climate for research on ASD interventions, an update on the empirical status of such interventions, based on *Journal of Clinical Child & Adolescent Psychology*'s (*JCCAP*'s) methods criteria (developed specifically for evaluating studies of treatments for childhood behavior disorders), is timely.

FINDINGS FROM THE 2008 *JCCAP* REVIEW

Rogers and Vismara (2008) reviewed evidence on early intervention programs for toddlers and preschoolers with ASD. They classified one such intervention as well-established and three others as possibly efficacious. The well-established approach was O. Ivar Lovaas's (1987) model of early intensive behavioral intervention (EIBI). This EIBI model is highly intensive (up to 40 hr per week of one-to-one intervention for 2–3 years) and is based upon applied behavior analysis (ABA), which utilizes learning principles to teach socially significant behaviors in real-life settings (Smith, 2011). Learning readiness, communication, social, and academic skills are broken down into small steps and taught systematically. Over time, intervention strategies become less structured, supporting children's entry into community settings such as schools.

Rogers and Vismara (2008) classified Pivotal Response Treatment (PRT; Koegel & Koegel, 2006) as possibly efficacious. An ABA approach, PRT aims to teach "pivotal" responses that, when acquired, have the potential to improve performance across many other skill areas. It emphasizes incidental teaching, in which intervention occurs in the context of natural learning

opportunities that arise throughout an individual's day, unlike the more contrived, structured format associated with early stages of intervention in EIBI.

Rogers and Vismara (2008) identified three other possibly efficacious treatments. One was a 12-week training program for parents and day care providers (Jocelyn, Casiro, Beattie, Bow, & Kneisz, 1998). Because replications of this program have not been reported, the program is not considered further in the current review. The remaining two possibly efficacious interventions were both parent training programs to promote the child's social communication, (Aldred, Green, & Adams, 2004; Drew et al., 2002). In addition, Rogers and Vismara presented evidence that psychotropic medications showed promise for treating behavior problems associated with ASD in older children and youth with ASD but cautioned that the applicability of this evidence to young children with ASD was unclear. Further, they commented that many other interventions exist for children with ASD but have not been adequately evaluated. Finally, they documented that little information was available on mediators and moderators of response to any intervention for ASD.

METHOD FOR THE CURRENT REVIEW

Parameters

Population

In keeping with the previous review (Rogers & Vismara, 2008), we focus on interventions for young children with ASD, age 5 years or younger at entry into treatment. This focus is based on two considerations: First, more research is available on interventions for young children with ASD than for older individuals (Taylor et al., 2012). Such intervention is likely to have the largest impact because young children with ASD have not yet fallen as far behind and may be more amenable to change than older individuals (Myers & Johnson, 2007). Second, although interventions for younger and older individuals with ASD overlap somewhat in terms of treatment goals and approach, they tend to differ in key respects. Notably, interventions for young children usually occur at home or school and address broad developmental domains (e.g., increasing intellectual functioning or reducing ASD symptoms). In contrast, interventions for older individuals often take the form of outpatient psychotherapies (e.g., social skills groups) and target specific problems (e.g., cognitive-behavioral therapy for reducing anxiety). Although interventions for older individuals with ASD lie outside the scope of the current review, they are important and have attracted increasing research in recent years (Weitlauf et al., 2014). Thus, the literature on these interventions likely warrants a separate review in the near future.

Intervention

We examine psychological and behavioral interventions for children with ASD. The previous review (Rogers & Vismara, 2008) also included studies on psychopharmacological treatments for behavior problems associated with ASD. However, given the exponential growth in the volume of ASD intervention research, we have narrowed the scope of the current review. We refer readers to McPheeters et al. (2011), Dove et al. (2012), and Siegel and Beaulieu (2012) for systematic reviews of empirical reports on psychopharmacological treatments.

Study Design

Rogers and Vismara (2008) sought to summarize all group studies on interventions for children with ASD, including uncontrolled case series. In contrast, evidence tables in the current review present only studies that used random or quasi-experimental assignment to groups and that met all of the remaining *JCCAP* methods criteria (summarized in Table 1). The intensity of some ASD interventions impedes randomization (Lord et al., 2005); we therefore consider quasi-experimental studies along with experimental studies in order to present a complete picture of ASD intervention research.

Because children with ASD are an extremely heterogeneous population and frequently present with idiosyncratic problems, there is a long, rich tradition of single-subject studies in the ASD literature, resulting in the publication of many hundreds of such studies. We cite systematic reviews of such studies in the text. Based on *JCCAP*'s methods criteria (Table 1), single-subject studies can form the basis for classifying an intervention as "possibly efficacious" because they can meet Evidence Criterion 3.3 ("Two or more clinical studies showing the treatment to be efficacious, with two or more meeting the last four [of five] *Methods Criteria*, but none being randomized controlled trials"). However, group studies are required to designate an intervention as "probably efficacious" or "well-established."

Outcomes

We include studies that contain validated measures of associated or defining features of ASD. Associated features that are often targeted in intervention include (a) cognitive delays, evaluated with scores on standardized intelligence tests (i.e., IQ); (b) adaptive behavior (a child's ability to use his or her skills functionally to cope with daily life), measured by standardized observational or parent-report scales; and (c) disruptive behavior, measured by observational or parent-report scales. Evaluation of defining features of ASD may involve

TABLE 1
Journal of Clinical Child & Adolescent Psychology Evidence Base Updates Evaluation Criteria

Methods Criteria

M.1. Group design: Study involved a randomized controlled design
M.2. Independent variable defined: Treatment manuals or logical equivalent were used for the treatment
M.3. Population clarified: Conducted with a population, treated for specified problems, for whom inclusion criteria have been clearly delineated
M.4. Outcomes assessed: Reliable and valid outcome assessment measures gauging the problems targeted (at a minimum) were used
M.5. Analysis adequacy: Appropriate data analyses were used and sample size was sufficient to detect expected effects

Level 1: Well-Established Treatments
Evidence Criteria

1.1. Efficacy demonstrated for the treatment by showing the treatment to be either:
1.1.a. Statistically significantly superior to pill or psychological placebo or to another active treatment OR
1.1.b. Equivalent (or not significantly different) to an already well-established treatment in experiments AND
1.1c. In at least two (2) independent research settings and by two (2) independent investigatory teams demonstrating efficacy AND
1.2. All five (5) of the Methods Criteria

Level 2: Probably Efficacious Treatments
Evidence Criteria

2.1. There must be at least two good experiments showing the treatment is superior (statistically significantly so) to a wait-list control group OR
2.2. One (or more) experiments meeting the Well-Established Treatment level except for criterion 1.1c (i.e., Level 2 treatments will not involve independent investigatory teams) AND
2.3 All five (5) of the Methods Criteria

Level 3: Possibly Efficacious Treatments
Evidence Criteria

3.1. At least one good randomized controlled trial showing the treatment to be superior to a wait list or no-treatment control group AND
3.2. All five (5) of the Methods Criteria OR
3.3. Two or more clinical studies showing the treatment to be efficacious, with two or more meeting the last four (of five) Methods Criteria, but none being randomized controlled trials.

Level 4: Experimental Treatments
Evidence Criteria

4.1. Not yet tested in a randomized controlled trial OR
4.2. Tested in 1 or more clinical studies but not sufficient to meet level 3 criteria.

Level 5: Treatments of Questionable Efficacy

5.1. Tested in good group-design experiments and found to be inferior to other treatment group and/or wait-list control group; i.e., only evidence available from experimental studies suggests the treatment produces no beneficial effect.

Note: Adapted from Silverman and Hinshaw (2008) and Division 12 Task Force on Psychological Interventions' reports (Chambless et al., 1998; Chambless et al., 1996), from Chambless and Hollon (1998), and from Chambless and Ollendick (2001). Chambless and Hollon (1998) described criteria for methodology.

either a global assessment of *all* ASD symptoms (i.e., social-communication and repetitive behavior), usually with a standardized rating scale or behavioral assessment, or a specific symptom such as joint attention, shared enjoyment, and social initiation that contribute to ASD but are not a sufficient proxy for ASD symptomatology on their own. Our approach is more inclusive than many previous reviews, some of which have focused mainly on associated features rather than core features (e.g., Eldevik et al., 2009) or vice versa (e.g., Kendall et al., 2013), or have required that studies contain at least one global or standardized measure (e.g., Rogers & Vismara, 2008). As the variability among reviews suggests, a consensus does not yet exist on which outcome measures are most clinically meaningful and psychometrically sound. Thus, we review studies with a broad range of measures, and in each section we highlight the targeted intervention outcomes.

Other Considerations

Two of *JCCAP*'s methods criteria are controversial in the ASD literature: giving more weight to group studies than single-subject studies and requiring that interventions be standardized in a manual. Other reviews of the ASD intervention literature emphasize single-subject studies more or less than do *JCCAP*'s methods criteria. At one extreme, single-subject and group studies are regarded as equally useful sources of evidence (e.g., Wong et al., 2013); at the other, single-subject studies are excluded from reviews, and only findings from group studies are considered (e.g., Weitlauf et al., 2014). The intermediate position of single-subject studies in *JCCAP*'s criteria is most consistent with consensus guidelines for designing studies of psychological and behavioral interventions for ASD (Smith et al., 2007). According to these guidelines, studies with single-subject designs are especially useful for initial development of a new intervention. Advantages of single-subject studies include (a) individualized, continuous monitoring of intervention effects, providing opportunities to refine treatment techniques and (b) small sample sizes, making it possible for independent practitioners and small teams to have a central role in testing novel therapeutic strategies (Hayes, Barlow, & Nelson-Gray, 1999). However, group studies are needed to evaluate the efficacy of an intervention with a large, representative sample of children with ASD, multiple clinicians, and a range of outcome measures (Smith et al., 2007). For these reasons, we regard *JCCAP*'s methods criteria as suitable for evaluating the strength of evidence for an ASD intervention from single-subject and group studies.

Manuals are controversial in ASD intervention research because of concerns that they do not allow

enough flexibility to customize intervention to meet the diverse individual needs of children with ASD (Smith, 2012). However, a manual that provides step-by-step guidance on implementing an intervention, accompanied by measures of adherence to the manual, is currently the only methodology available to make a multifaceted intervention replicable by independent investigators and clinicians (McHugh & Barlow, 2012). In addition, there are now many resources that describe how to incorporate flexibility into a manual (Smith et al., 2007). Thus, the current review examines only interventions that have manuals.

Summary

As shown in the PICO (Population-Intervention-Comparator-Outcome) chart in Table 2, the current review concentrates on psychological and behavioral interventions for children with ASD who are 5 years old or younger. It examines evidence from (a) group studies that used random or quasi-experimental designs and that met *JCCAP* methods criteria M.2–M.5 (see Table 1) and (b) systematic reviews of single-subject studies that met *JCCAP* methods criteria M.2–M.5 (Table 1). It uses *JCCAP* criteria for classifying the level of evidence for an intervention as "well-established," "probably efficacious," "possibly efficacious," "experimental," or "questionable" (Table 1).

Procedures

We searched for relevant studies on PsycINFO and Medline using the terms *autism* and *early intervention* or the treatment name from 2007 to the time of this writing (February 2014). In addition, we hand-searched the three most detailed reviews of the literature (Kendall et al., 2013; Warren et al., 2011; Weitlauf et al., 2014). We included all studies that fell within the scope of our review (described in the preceding section and Table 2). We relied on cross-checking and consensus between the authors for complete identification of studies and accurate extraction of data. We did not include "gray literature" (e.g., unpublished dissertations or non-peer-reviewed manuscripts such as online reports), conduct a systematic evaluation of publication bias, or generate a quantitative meta-analysis of study findings. However, we report information from such evaluations when available from prior reviews. We focused on child outcome measures at the end of treatment. When possible, we present results in terms of effect size (Cohen's *d*) and 95% confidence intervals, as reported by the investigators or derived from Wilson's (n.d.) effect size calculator, which uses formulas presented by Lipsey and Wilson (2001). Findings from follow-up evaluations, analyses of mediators and moderators, and assessments of family impact are described in the text when available.

TABLE 2
Focus of the Review

Population	*Children With ASD Younger Than 5 Years*
Intervention	Psychological or behavioral intervention
Comparison	No treatment or alternative treatment (group designs); baseline performance on outcome measures (single-subject designs)
Outcomes	Associated or defining features of ASD (e.g., symptom reduction, IQ, adaptive behavior, challenging behavior, social-communication skills, and social engagement).

Note: Adaptive behavior = Flexible use of skills to meet the demands of everyday situations. ASD = autism spectrum disorder.

Classification of Interventions

Interventions for children with ASD are many and varied. In keeping with guidelines for *JCCAP*'s evidence-based updates (Southam-Gerow & Prinstein, 2014), we categorized interventions into "treatment families" that share theoretical principles and practice elements, instead of concentrating on individual, "brand name" treatments. This approach has the advantage of emphasizing potential mechanisms of action for efficacious treatments, as opposed to specific intervention programs.

Theoretical Principles

The two predominant sets of theoretical principles in ASD intervention research are ABA (Smith, 2011) and *developmental social-pragmatic* (DSP) *models* (also called *developmental, interactive, transactional,* or *interpersonal*; Ingersoll, Dvortcsak, Whalen, & Sikora, 2005). ABA interventions are based on the view that ASD is a learning difficulty that can be addressed with operant conditioning strategies such as systematically reinforcing target behaviors and teaching children to distinguish between different cues (Smith, 2011). Strategies range from highly structured, adult-led didactic instruction (e.g., DTT) to child-led interactions that may occur in the context of play activities or the child's everyday routine. Target behaviors include a range of defining and associated features of ASD, with the goal of improving a child's overall functioning in everyday settings and increasing access to inclusive environments such as general education classrooms (Smith, 2010, 2011). In contrast, DSP interventions are based on the view that a core feature of ASD is an impaired ability to engage in activities jointly with another person and that this impairment leads to a cascade of other problems with social communication and interaction (Mundy & Crowson, 1997). DSP intervention strategies are derived from findings in developmental psychology that show a strong association between caregivers'

responsivity to their young children and the children's subsequent acquisition of skills for communicating and interacting with others (Prizant & Wetherby, 2005). Relying on strategies similar to ones used in interventions to help caregivers be more sensitive to their young, typically developing children (Siller, Morgan et al., 2014; Wallace & Rogers, 2010), DSP interventionists aim to promote social communication and interaction by being responsive to the child in ways such as imitating, expanding on, or joining into play activities that the child initiates (Ingersoll et al., 2005).

ABA and DSP interventions overlap in some respects. Notably, ABA interventions, like DSP interventions, are intended to be appropriate to the child's developmental level and to address deficits in social interaction and communication (Smith, 2011). DSP interventions, like ABA interventions, emphasize helping children with ASD learn new skills (Ingersoll et al., 2005). However, there are also differences. As previously noted, ABA interventions target a range of defining and associated features, whereas defining deficits in social communication and interaction tend to be the highest priority in DSP interventions. Also, ABA interventions involve discrete teaching trials or separate learning units with a clear beginning and end. In contrast, DSP interventions aim for a continuous flow of back-and-forth social communication (Prizant & Wetherby, 2005). DSP interventions also seek to reinforce this communication by imitating the child's actions and verbalizations and by prompting or modelling ways to build on the interaction (Rogers & Dawson, 2009), rather than delivering a reinforcer selected on the basis of the child's individual preferences (e.g., praise or a preferred toy), as is characteristic of ABA strategies. Thus, both DSP and ABA involve reinforcement, but the reinforcement strategies tend to differ.

Some interventions explicitly combine ABA and DSP strategies. For example, they may begin a session with structured ABA intervention strategies and then proceed to play-based, DSP interventions (Kasari, Freeman, & Paparella, 2006). Alternatively, they may incorporate ABA strategies into DSP play sessions (Rogers & Dawson, 2009). We refer to these interventions as ABA + DSP interventions. Another term is "naturalistic developmental behavioral interventions" (Schreibman et al., 2015).

Practice Elements

Some ASD interventions are *comprehensive*, aiming to address all areas of need (e.g., EIBI), whereas others are *focused*, having a more circumscribed set of goals (e.g., parent training to promote children's social communication; Odom, Boyd, Hall, & Hume, 2010). Comprehensive interventions entail many hundreds of hours of direct intervention with the child with ASD (usually more than 1,000 hr). Focused interventions involve fewer than 50 hr of intervention.

ASD intervention strategies diverge along several dimensions, including the recipient of the intervention, techniques, and provider of the treatment. Intervention can involve working individually with the child with ASD, engaging a teacher and peers (e.g., classroom-wide

TABLE 3
Intervention Categories

		Theoretical Principles		
Scope	*Recipient*	*ABA*	*DSP*	*ABA + DSP*
Comprehensive	Child	Adult-led 1:1 instruction	—	DSP play sessions for social engagement + ABA (e.g., priming or instruction on specific skills)
	Teacher/peers	Classroom-wide intervention to promote interactions among children with and without ASD	—	Structured teaching and environmental manipulation[a]
	Parent	—	—	—
Focused	Child	Spoken communication; AAC	Play sessions for increasing social engagement	Adult-led ABA instruction +child-led DSP play session
	Teacher/peers	—	Teacher/peer training for social engagement	Teacher training for social engagement + instruction on specific skills
Parent	Parent training for reducing disruptive behavior or increasing communication		Parent training on strategies to increase social engagement + provide instruction on specific skills	

Note: ABA = applied behavior analysis; DSP = developmental social-pragmatic; ASD = autism spectrum disorder; AAC = augmentative and alternative communication.

[a]Structured teaching models also emphasize instructional strategies based on research on neuropsychology and learning style in ASD.

models), or guiding a parent to deliver intervention. It can emphasize oral communication or augmentative and alternative communication (AAC) systems such as the use of picture symbols or voice output devices to express wants, needs, and interests.

Table 3 displays the classification of interventions in the current review. The columns correspond to the primary theoretical principles (ABA, DSP, or ABA + DSP). The rows separate comprehensive from focused interventions and different recipients of service. Within each box (e.g., individual, comprehensive ABA), we identify treatment families. The remainder of this review examines treatment families presented in each row of Table 3 (individual, comprehensive treatments for the child; then comprehensive, classroom-based treatments; etc.).

COMPREHENSIVE TREATMENTS

Individual, Comprehensive ABA

Individual, comprehensive ABA interventions are commonly referred to as EIBI in the ASD literature. These interventions consist of 20–40 hr per week of treatment for 2–3 years, beginning prior to age 5 years. They involve individualized, adult-led intervention based on a broad curriculum that addresses communication,

TABLE 4
Comprehensive Interventions for Young Children With ASD

Study (Design, N, Age)	*Treatment*	*Outcomes*
Individual, Comprehensive ABA		
Eikeseth et al. (2007) Quasi-Experiment $N = 25$, 4–7 Years	Lovaas model delivered in public school ($n = 13$, $M = 28$ hr per week in 1st year, tapering thereafter) vs. TAU ($n = 12$, $M = 29$ hr per week)	EIBI>TAU: Δ IQ (Bayley/WPPSI) $d = 1.27$, 95% CI [.32, 2.22] Δ VABS $d = .96$, 95% CI [.04, 1.87]
Eldevik et al. (2012) Quasi-Experiment $N = 43$, 2–5 Years	Lovaas model delivered in public preschool for 2 years ($n = 31$, $M = 14$ hr per week, 2 years) vs. TAU ($n = 12$, 5 + hr/week)	EIBI > TAU: IQ (Bayley/SB), $d = 1.06$, 95% CI [.34, 1.72] VABS, $d = .75$, 95% CI [.05, 1.36]
Eikeseth et al. (2012) Quasi-Experiment $N = 59$, 2–7 Years	Lovaas Model in public school ($n = 35$, $M = 23$ hr/week, 1 year) vs. TAU ($n = 24$, amount unspecified)	EIBI > TAU: VABS $d = .93$, 95% CI [.38, 1.48]
Peters-Scheffer et al. (2010) Quasi-Experiment $N = 34$, 4–7 Years	Both groups in TEACCH classes in public schools, with addition of Lovaas model ($n = 12$, $M = 6.5$ hr/week for 8 months) vs. no additional treatment ($n = 22$)	EIBI>No Tx, Δ IQ $d = 1.86$, 95% CI [1.03, 2.69] Δ VABS $d = 1.42$, 95% CI [.64, 2.20] Δ CBCL $d = .23$, 95% CI [−.48, .93] Δ PDD-MRS $d = .09$ [−.62, .79]
Individual, Comprehensive ABA + DSP		
Dawson et al. (2010) RCT $N = 48$ (45 Completers), 18–30 Months	ESDM ($n = 24$, 20 hr/week for 2 years + parent training twice monthly) vs. TAU ($n = 24$, outcome data $n = 21$, amount unspecified)	ESDM>TAU: MSEL $d = .62$, 95% CI [.02, 1.22] VABS $d = .79$, 95% CI [.18, 1.40] ESDM = TAU: ADOS $d = .24$, 95% CI [−.34, .83] RBS $d = .18$, 95% CI [−.41, .77]
ABA Classrooms		
Strain & Bovey (2011) RCT $N = 294$ in Preschool (M age = 50 Months)	LEAP ($n = 177$, 13.75–15 hr per week for 2 years) or TAU ($n = 117$), 13.75–15 hr/week for 2 years	LEAP>TAU: CARS $d = .59$, 95% CI [.38, .83] PLS-4 $d = .92$, 95% CI [.67, 1.17] MSEL $d = .89$, 95% CI [.65, 1.13] SSRS – Positive $d = 1.22$ [.97, 1.47] SSRS – Negative $d = .62$, 95% CI [.38, .86]
ABA + DSP Classrooms		
Boyd et al. (2014) Quasi-Experiment $N = 198$ (185 Completers), M age = 48 Months	LEAP ($n = 54$, half-day of school for 2 years), TEACCH ($n = 85$, five classrooms half-day and 20 classrooms full-day for 2 years), TAU ($n = 59$, 21 classrooms half-day and seven full-day for 1 year)	LEAP = TEACCH = TAU: ASD symptoms, communication, repetitive behaviors, social interaction, fine motor skills

Note: ASD = autism spectrum disorder; ABA = applied behavior analysis; TAU = treatment as usual; Δ = change from pre- to postintervention; EIBI = early intensive behavioral intervention; Bayley = Bayley Scales of Infant Development, 3rd edition, Mental Development Index (Bayley, 2005); WPPSI = Wechsler Preschool and Primary Scales of Intelligence, 3rd Edition, Full Scale IQ (Wechsler, 2002); d = Cohen's d; VABS = Vineland Vineland Adaptive Behavior Scales, Survey Edition–Composite Standard Score (Sparrow, Cicchetti, & Balla, 2005); CI = confidence interval; TEACCH = Treatment and Education of Autistic and related Communication Handicapped Children; Tx = Treatment; CBCL = Child Behavior Checklist–Total Score (Achenbach & Rescorla, 2000); PDD-MRS = Pervasive Developmental Disorder Mental Retardation Scale (Kraijer, 1999); RCT = randomized clinical trial; ESDM = Early Start Denver model; MSEL = Mullen Scales of Early Learning (Mullen, 1995); ADOS = Autism Diagnostic Observation Schedule; RBS = Repetitive Behavior Scale (Bodfish, Symons, & Lewis, 1998) LEAP = Learning Experiences: An Alternative Program for Preschoolers and Parents; CARS = Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1988); PLS-4 = Preschool Language Scale, 4th Edition (Zimmerman, Steiner, & Pond, 2001); SSRS = Social Skills Rating Scale; SB = Stanford-Binet Intelligence Test, 5th Edition, Full-Scale IQ (Roid, 2003).

social skills, self-management, cognition and preacademic skills such as imitation, matching, letter, and number concepts (Smith, 2011). Many structured EIBI models exist (Handleman & Harris, 2001), of which the best known was developed by Lovaas and colleagues at UCLA (Smith, 2010). As already mentioned, Rogers and Vismara (2008) classified the Lovaas model as a well-established treatment. Four subsequent quasi-experimental studies on this model met our criteria for inclusion in Table 4 (Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Eikeseth, Smith, Jahr, & Eldevik, 2007; Eldevik, Hastings, Jahr, & Hughes, 2012; Peters-Scheffer, Didden, Mulders, & Korzilius, 2010). One study (Eikeseth et al., 2007) was a follow-up of a report reviewed by Rogers and Vismara (Eikeseth, Smith, Jahr, & Eldevik, 2002). All studies indicated that the Lovaas model has large effects on IQ, adaptive behavior, or both (Table 4). Encouragingly, these favorable effects were obtained in school settings, rather than in the home (where Lovaas recommended that intervention take place), and with 6–28 hr per week, instead of 40 (as Lovaas advised). Thus, there may be a variety of efficacious ways to implement this model. Of concern, however, the only study that examined changes in ASD symptoms and problem behavior (Peters-Scheffer et al., 2010) found that EIBI had little effect on functioning in these domains. In addition, all of the findings from recent studies must be viewed with caution because they were obtained in quasi-experimental rather than experimental studies.

The extent to which findings on the Lovaas model extend to the rest of the treatment family (i.e., other individual, comprehensive ABA approaches) is difficult to determine. Studies of such approaches have not met our criteria for inclusion in Table 4 and have yielded mixed results. Two quasi-experimental studies reported favorable results (Flanagan, Perry, & Freeman, 2012; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005, summarized by Rogers & Vismara, 2008); one found gains at the end of treatment (Remington et al., 2007) but not at a follow-up 2 years later (Kovshoff, Hastings, & Remington, 2011); and two reported no statistically significant differences between EIBI and treatment as usual (TAU; Magiati, Charman, & Howlin, 2007, with a follow-up by Magiati, Moss, Charman, & Howlin, 2011; Zachor & Itzchak, 2010). Thus, while most findings indicate that various individual, comprehensive ABA programs result in at least temporary developmental gains for children with ASD, the evidence is limited and inconsistent.

Given that results have been predominately favorable, we retain Rogers and Vismara's (2008) classification of the Lovaas model as *well-established* and extend this classification to the treatment family of individual, comprehensive ABA interventions, with the qualification that the evidence is currently more compelling for the Lovaas model than for other models. As is apparent from the preceding discussion and Table 4, evidence from EIBI has come from numerous teams in a wide range of community settings.

Our conclusion accords with nearly all of the many other systematic reviews and meta-analyses that have been performed on studies of individual, comprehensive ABA (Reichow, 2012). Available reviews generally yield moderate to large effect sizes for IQ, ranging from 0.69 (Reichow & Wolery, 2009) to 1.10 (Eldevik et al., 2009) and moderate effect sizes for adaptive behavior (0.66; Eldevik et al., 2009). About 30% of children in EIBI make reliable gains (beyond what could be attributed to random fluctuations in performance) in IQ, and about 20% make reliable gains in adaptive behavior, compared to 7% and 6%, respectively, of children in TAU groups Eldevik et al., 2010).

Nevertheless, reviews revealed that, despite meeting some or all of *JCCAP*'s methods criteria, studies on individual, comprehensive ABA have substantial shortcomings. Notably, both RCTs of this approach (Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000) enrolled small numbers of participants ($N = 24$ and 28, respectively). Moreover, the control group in one of these RCTs (Sallows & Graupner, 2005) received nearly the same intervention as the Lovaas model group, and the intervention and control groups achieved similar outcomes. As such, the study did not allow for comparison of the Lovaas model against alternative approaches. Also, reviewers have questioned whether intervention fidelity has been documented adequately (Kasari, 2002). Further, the precise amount of services often is not reported (Howlin, Magiati, & Charman, 2009). In addition, although most studies have used developmental tests such as IQ as outcome measures, little attention has been devoted to other potentially important outcomes, including reductions in the social communication difficulties that characterize ASD and the impact of intervention on the family (Howlin et al., 2009).

Individual, Comprehensive ABA + DSP

One prominent comprehensive treatment, Early Start Denver model (ESDM), blends ABA strategies, especially PRT (an incidental teaching approach described earlier), with DSP approaches. The DSP component consists of child-led activities, imitation of child behavior, matching of child affect, and sensory regulation. ESDM was evaluated in a well-designed RCT with 48 toddlers with ASD, age 18–30 months at entry into treatment (Dawson et al., 2010). Children in the ESDM group received 20 hr per week of intervention for 2 years. The RCT indicated that ESDM had medium to large beneficial effects, relative to TAU, on measures of developmental quotient and adaptive behavior, but only small, nonsignificant effects on ASD symptoms

(Table 4). Follow-up evaluations suggested that ESDM may normalize children's attention to faces (Dawson et al., 2012). Although independent replications and well-controlled studies of comprehensive ABA + DSP interventions are currently unavailable, the strengths of the Dawson et al. study, notably its exceptionally broad assessment of outcomes and follow-up evaluation, gives individual, comprehensive ABA + DSP a classification of *possibly efficacious* (support from "at least one good randomized controlled trial"; Table 1, Criterion 3.1).

Comprehensive ABA Classrooms

Learning Experiences: An Alternative Program for Preschoolers and Parents (LEAP) integrates children with ASD with typically developing peers in early childhood education settings and emphasizes ABA strategies to improve peer interactions. Impressively, a well-controlled, cluster RCT of 294 children with ASD in 56 preschool classes over 2 years found that, compared to TAU, LEAP had moderate, beneficial effects on ASD symptoms and large, positive effects on developmental quotient, language, and social interaction (Strain & Bovey, 2011; Table 4). However, a subsequent quasi-experimental study of 198 children with ASD in 75 classrooms found no statistically significant differences among LEAP, another classroom model called Project Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH; Mesibov, Shea, & Schopler, 2004), or TAU for 1 year. (TEACCH does not fit entirely within the ABA or DSP classifications; rather it is a structured teaching intervention that integrates research on cognitive styles characteristic of individuals with ASD, along with antecedent-based ABA strategies such as environmental manipulations and visual supports; Mesibov et al., 2004.) Pending further research to resolve the conflicting findings, we follow Chambless and Hollon's (1998) recommendation to be conservative and classify classroom ABA interventions as *possibly efficacious*.

Comprehensive ABA + DSP Classrooms

As noted in the preceding section, ABA + DSP classrooms usually incorporate not only ABA and DSP strategies, but also strategies based on other sources such as research on cognitive style in ASD. Some studies suggest that these classrooms are as effective as ABA classrooms (Boyd et al., 2014; Magiati et al., 2007, 2011; Zachor & Itschak, 2010), whereas other studies suggest they are less effective (Eikeseth et al., 2007, 2012; Eldevik et al., 2012; Howard et al., 2005; Peters-Scheffer et al., 2010). (See "Individual, Comprehensive ABA" and "Comprehensive ABA Classrooms" for a description of these studies.) As the available research on specialized classrooms is mixed and does not include evaluation of manualized intervention, we designate this approach as *experimental*.

FOCUSED TREATMENTS

Individual, Focused Interventions

Individual, Focused ABA for Spoken Communication

As mentioned previously, Rogers and Vismara (2008) classified one incidental teaching approach, PRT, as a comprehensive intervention. In the single-subject literature, PRT has been successful for teaching a variety of skills and particularly for reducing social deficits (Koegel, Koegel, Shoshan, & McNerney, 1999; Kuhn, Bodkin, Devlin, & Doggett, 2008). Although PRT has broad applications (Koegel et al., 1999; Koegel & Koegel, 2006; Kuhn et al., 2008), group studies and systematic reviews are available only for spoken communication. Thus, the current review classifies PRT as a focused intervention. Rogers and Vismara documented support for PRT from numerous single-subject studies of children with ASD. A recent review located 21 such studies, including nine on preschoolers, all of which reported substantial improvements in spoken communication or play (Sham & Smith, 2014). The review uncovered evidence of publication bias, as published articles yielded larger effect sizes than unpublished dissertations with similar methodologies. However, even including unpublished reports, PRT appeared efficacious, and the quality of the research was high. PRT is also one of the primary components of ESDM, which, as noted previously, has shown promise in an initial RCT. However, one study that compared PRT to another established approach for increasing social communication (i.e., Picture Exchange Communication System [PECS]) did not yield any group differences (Schreibman & Stahmer, 2014; Table 5). Other incidental teaching approaches have support from single-subject studies (Wong et al., 2013), although most do not have manuals. Because group studies have not confirmed these findings, our application of the *JCCAP* methods criteria leads us to classify incidental teaching approaches such as individual, focused ABA for spoken communication as *possibly efficacious*. However, given the large amount of evidence from single-subject studies and the inclusion of PRT in an intervention that has support from an RCT (ESDM), larger scale investigations of interventions in this treatment family are warranted.

Individual, Focused ABA for AAC

AAC systems such as sign language, gestures, or pictures are used to increase communication in minimally verbal children with ASD. The PECS is a popular ABA-based approach that aims to teach children with ASD to select picture symbols and hand them to another

TABLE 5
Focused Treatments for Young Children With Autism Spectrum Disorder

Study (Design, N, Age)	*Design and Treatment*	*Outcomes*
Individual, focused ABA for AAC		
Yoder and Stone (2006a, 2006b) RCT $N = 36$, (21–54 Months)	PECS ($n = 18$) and parent training for social communication ($n = 18$), 20-min sessions 3×/week for 6 months	Parent training > PECS Object exchange turns $d = .82$, 95% CI [.14, 1.50] PECS > parent training Spoken acts $d = .63$, 95% CI [−.04, 1.29] Spoken words $d = .50$, 95% CI [−.16, 1.16]
Individual, Focused ABA for Spoken Communication		
Schreibman and Stahmer (2014) RCT $N = 39$ (20–45 Months)	PRT ($n = 20$, $M = 247$ hr) vs. PECS ($n = 19$, $M = 247$ hr)	PRT = PECS MSEL Expressive Language $d = .41$, 95% CI [−.22, 1.05] MacArthur number of raw words $d = .06$, 95% CI [−.57, .68] VABS Communication $d = .59$, 95% CI [−.05, 1.24]
Individual, Focused ABA + DSP		
Ingersoll (2010) RCT $N = 21$ (27–47 Months)	RIT ($n = 11$, 10 hr total) vs. No-Treatment Control ($n = 10$)	RIT > Control: Elicited imitation $d = .92$, 95% CI [.02, 1.82] Spontaneous imitation $d = 1.20$, 95% CI [.27, 2.13] Follow-Up Analyses (Ingersoll, 2012) RIT > Control: JA initiations $d = .97$, 95% CI [.06, 1.87] Bayley SES $d = 1.09$, 95% CI [.17, 2.01]
Kasari et al. (2006, 2008, 2012) RCT 12-Month Follow-Up to Kasari et al. (2006) $N = 53$ (3–4 Years)	JA ($n = 20$, 30 min per day for 5–6 weeks) vs. Symbolic Play ($n = 17$, 30 min per day for 5–6 weeks) vs. TAU ($n = 16$, amount unspecified)	JA > TAU: Expressive language $d = .59$, 95% CI [−.08, 1.26] JA initiation $d = 1.01$, 95% CI [.31, 1.71] Joint engagement $d = .83$, 95% CI [.15, 1.52] JA = TAU: JA responding $d = .18$, 95% CI [−.28, .83] Receptive language $d = .36$, 95% CI [−.30, 1.03]
Teacher-Implemented, Focused DSP		
Lawton & Kasari (2012) RCT $N = 16$ (3–5 Years)	JASPER ($n = 9$, 1-hr workshop +1 hr per week for 5 weeks) vs. Delayed Treatment ($n = 7$)	JASPER > Delayed Treatment: JA initiations $d = 1.85$, 95% CI [−.86, 2.59] Pointing $d = 2.02$, 95% CI [.72, 2.30] Showing $d = 1.85$, 95% CI [1.16, 1.85] Object engagement $d = 1.41$, 95% CI [.14, 2.27] JASPER = Delayed Treatment: Giving $d = 1.09$, 95% CI [.04, 2.15] ESCS IJA $d = .67$, 95% CI [−.35, 1.68] IJA during play $d = 2.70$, 95% CI [1.34, 4.06]
Teacher-Implemented, Focused ABA + DSP		
Goods et al. (2013) RCT $N = 15$ (3–5 Years)	JASPER ($n = 7$, 30-min sessions, twice per week for 12 weeks) vs. TAU ($n = 8$, $M = 30$ hr per week in regular school program)	JASPER > TAU: Academic Engagement $d = -1.63$, 95% CI [−2.96, −.24] Spontaneous Play $d = .77$, 95% CI [−.46, 2.00] Requesting $d = 1.60$, 95% CI [.24, 2.97] JASPER = TAU: ESCS Behavior Requests $d = .37$, 95% CI [−.82, 1.56] ESCS Joint Attention $d = -.42$, 95% CI [−1.62, .78]
Kaale et al. (2012) RCT $N = 61$ (29–60 Months)	JA Intervention ($n = 34$, 80 20-min sessions across 8 weeks) vs. TAU ($n = 27$, amount unspecified)	JA Intervention > TAU: Frequency of JA with teacher $d = .55$, 95% CI [.04, 1.07] Joint Engagement with mother $d = .64$, 95% CI [.13, 1.16] JA Intervention = TAU: ESCS JA $d = .00$, 95% CI [−.51, .50] Frequency of JA with mother $d = .44$, 95% CI [−.06, .96] Joint engagement with teacher $d = .16$, 95% CI [−.34, .67] 12-month follow-up (Kaale et al., 2014) JA Intervention > TAU: JA Initiation with teacher Joint engagement with mother JA = TAU: Language (RDLS) Social-Communication skills (SCQ)
Landa et al. (2011) RCT $N = 50$ (21–33 Months)	Developmental Intervention plus Interpersonal Synchrony Condition ($n = 25$, 2.5 hr per day for 6 months) vs. Developmental Intervention alone ($n = 25$, 2.5 hr per day for 6 months)	DI plus IS > DI Alone: Socially Engaged Imitation $d = .29$ DI plus IS = DI Alone: IJA $d = .31$ SPA $d = .21$ MSEL Expressive Language $d = .15$ MSEL Visual Reception $d = .31$
ABA Parent Training		
Hardan et al. (2014) RCT $N = 53$ (24–83 Months)	Parent-mediated PRT ($n = 27$, 1 session per week in groups of 4–6 parents for 12 weeks) vs. Parent psychoeducation ($n = 26$, 1 session per week for 12 weeks)	PRT > Psychoeducation: Total utterances $d = .42$, 95% CI [−.16, 1.0] VABS Communication $d = 34$, 95% CI [−23, .91] CGI Severity $d = -.47$, 95% CI [−1.05, .11] PRT = Psychoeducation MCDI $d = .50$, 95% CI [−.08, 1.08]
Strauss et al. (2012) RCT $N = 44$ (26–81 Months)	Parent-mediated EIBI ($n = 24$, $M = 14$ hr per week) vs. Eclectic ($n = 20$, $M = 12$ hr per week)	EIBI > Eclectic: ADOS Total $d = .08$, 95% CI [−.67, .51] GMDS-ER $d = -.31$, 95% CI [−.91, .28] MCDI Production $d = .48$, 95% CI [−.11, 1.08] EIBI = Eclectic: VABS Composite $d = .31$, 95% CI [−.28, .91]

(*Continued*)

TABLE 5
Continued

Study (Design, N, Age)	*Design and Treatment*	*Outcomes*
Tonge et al. (2012) Quasi-Experiment $N = 105$ (2–5 Years)	Skills training ($n = 35$, 10 sessions) vs. Parent education ($n = 35$, Ten 6-min sessions and ten 90-min groups) vs. TAU ($n = 35$, amount unspecified)	Skills > Education: VABS Daily Living $d = -.52$, 95% CI [−1.01, −.04] VABS Motor Skills $d = -.59$, 95% CI [−.93, .03] Skills > TAU: DBC-ASA $d = -.69$, 95% CI [−1.17, −.21] VABS Communication* Skills and Education > TAU: VABS Socialization* Skills = Education = TAU: PEP-R DQ, RDLS III Comprehension/Expressive Language, CARS *Moderated by lower pre-treatment scores
DSP Parent Training		
Carter et al. (2011) RCT $N = 62$ (15–24 Months)	HMTW ($n = 32$, 8group sessions +3 in-home coaching sessions) vs. TAU ($n = 30$, amount unspecified)	HMTW = No Treatment*: ESCS IJA $d = .12$, 95% CI [−.67, .43] ESCS Behavior Request $d = .19$, 95% CI [−.37, .74] PCFP Comm. $d = .20$, 95% CI [−.80, .40] PIA-CV Nonverbal Comm. $d = .09$, 95% CI [−.67, .48] *Gains for HMTW moderated by object interest
Casenhiser et al. (2011) RCT $N = 51$ (2–5 Years)	MEHRIT center-based training and ongoing consultation ($n = 25$, 3 weeks initial +2 hr per week) vs. TAU ($n = 26$, $M = 3.9$ hr per week)	MEHRIT > TAU: Enjoyment in Interaction $d = .63$, 95% CI [.06, 1.18] Involvement $d = .77$, 95% CI [.21, 1.34] Imitation of Joint Attention $d = 1.02$, 95% CI [.52, 1.70] mCBRS: Attention to activity $d = .69$, 95% CI [.11, 1.24] MEHRIT = TAU: Language Assessment (CASL/PSL-4): $d = .35$, 95% CI [−.20, .91]
Green et al. (2010) RCT $N = 152$ (2–5 Years)	PACT ($n = 77$, 2 hr every 2 weeks for 6 months + monthly boosters for 6 months) vs. TAU ($n = 75$, $M = 9.8$ hr per week)	PACT > TAU: Child initiations $d = .48$, 95% CI [−.07, 1.02] Shared attention $d = .32$, 95% CI [−.22, .87] PACT = TAU: ADOS-G $d = .14$, 95% CI [−.46, ,18] PLS Receptive $d = .09$, 95% CI [−.22, .41] PLS Expressive $d = .00$, 95% CI [−.32, .32] Teacher VABS $d = .17$, 95% CI [−.49, .15]
Kasari et al. (2010) RCT $N = 38$ (21–36 Months)	Joint Engagement Intervention ($n = 19$, 24 sessions across 8 weeks) vs. Waitlist ($n = 19$, $M = 22.1$ hr, excluding school hours)	Joint Engagement > Waitlist: Frequency of JA Responses $d = 3.22$, 95% CI [2.25, 4.18] Functional Play Acts $d = .86$, 95% CI [.19, 1.52] Joint Engagement $d = .87$, 95% CI [.20, 1.53] Object Engagement $d = -1.09$, 95% CI [−1.77, −.41] Joint Engagement = Waitlist: Engagement $d = .87$, 95% CI [.20, 1.53] Frequency of JA Initiations $d = .18$, 95% CI [−.82, .45] Symbolic Play $d = .24$, 95% CI [−.88, .40]
Keen et al. (2010) RCT $N = 39$ (2–4 Years)	Professionally Supported Intervention ($n = 17$, 2-day workshop + 10 home-based consults) vs. Self-Directed Video Based Intervention ($n = 22$, amount unspecified)	Supported > Self-Directed: CSBS – Caregiver $d = .38$, 95% CI [−.25, 1.02] Supported = Self-Directed: CSBS – Behavior $d = .05$, 95% CI [−.58, .68] SIB-R $d = .51$, 95% CI [−.13, 1.15]
Pajareyea & Nopmaneejumruslers (2011) RCT $N = 32$ (2–6 Years)	FloortimeTM ($n = 15$, $M = 15.2$ hr per week) vs. TAU ($n = 16$, M estimate = 21 hr per week)	Floortime > TAU: CARS $d = .50$, 95% CI [−.21, 1.21] FEAS $d = .77$, 95% CI [.04, 1.5]1. FEDQ $d = .90$, 95% CI [.16, 1.64]
Roberts et al. (2011) RCT $N = 84$ (2–5 Years)	Center-based (CB; $n = 29$, 2hours per week for 40 weeks) vs. Home-based (HB; $n = 27$, 2 hr every other week for 40 weeks) vs. Waitlist (WL; $n = 28$, no treatment hours)	HB > WL: VABS Socialization $d = -.71$, 95% CI [−1.25, −.16] CB = WL: DBC $d = .58$, 95% CI [.05, 1.11] Reynell Comprehension $d = .32$, 95% CI [−.20, .84] Reynell Expression $d = .21$, 95% CI [−.31, .73] VABS Communication $d = .12$, 95% CI [−.40, .63] VABS Socialization $d = .04$, 95% CI [−.56, .47]
Siller et al. (2013) RCT $N = 70$ (3–7 Years)	Focused Playtime Intervention ($n = 36$, $M = 90$ min per week across 12 weeks) vs. Parent Advocacy Coaching ($n = 34$, $M = 90$ min per month)	FPI = PAC: MSEL Expressive Language $d = .73$, 95% CI [.24, 1.21] Baseline expressive language moderated treatment outcomes in favor of FPI Secondary analysis (Siller, Swanson et al., 2014) FPI > PAC Avoidant Behavior Scale $d = .50$, 95% CI [.03, .98] FPI = PAC MPCA $d = .55$, 95% CI [.08, 1.03] PCSB $d = .21$, 95% CI [−.26, .68]
Solomon et al. (2014) RCT $N = 112$ (32–71 Months)	PLAY ($n = 57$, 3-hr monthly consultation across 12 months +110 TAU hr) vs. TAU ($n = 55$, 102 hr)	PLAY > TAU FEAS $d = .48$, 95% CI [.11, .86] MBRS $d = .62$, 95% CI [.25, 1.0] CBRS $d = .54$, 95% CI [.17, .92] PLAY = TAU MSEL developmental quotient $d = .27$, 95% CI [−.10, .65] MacArthur $d = .13$, 95% CI [−.24, .50] SCQ $d = .01$, 95% CI [−.38, .36]

(*Continued*)

TABLE 5
Continued

Study (Design, N, Age)	*Design and Treatment*	*Outcomes*
Venker et al. (2012) RCT $N = 14$ (28–68 Months)	Verbal Responsiveness ($n = 7$, 8 parent education sessions and 3home visits plus 24-hr small group) vs. Waitlist ($n = 7$, amount unspecified)	Verbal Responsiveness > Waitlist: Child prompted communication $d = .77$, 95% CI [−.31, 1.86] Verbal Responsiveness = Waitlist: Child spontaneous communication $d = -.53$, 95% CI [−1.6, .53]
ABA + DSP Parent Training		
Rogers et al. (2012) Multisite RCT $N = 98$ (14–24 Months)	ESDM ($n = 49$, 12 hr total) vs. TAU ($n = 49$, $M = 11.06$ hr per week)	ESDM = TAU: ADOS Social Affect $d = .07$, 95% CI [−.47, .32] MCDI Phrases Understood $d = .24$, 95% CI [−.63, .16] MCDI Vocab Comprehension $d = .18$, 95% CI [−.59, .21] MCDI Vocab Production $d = .05$, 95% CI [−.34, .45] MCDI Gestures $d = .13$, 95% CI [−.53, .26] MSEL Composite $d = .01$, 95% CI [−.39, .40] VABS Composite $d = .27$, 95% CI [−.67, .12]

Note: ABA = applied behavior analysis; AAC = alternative and augmentative communication; RCT = randomized clinical trial; PECS = Picture Exchange Communication System; d = Cohen's d; CI = confidence interval; PRT = Pivotal Response Training; MSEL = Mullen Scales of Early Learning; VABS = Vineland Adaptive Behavior Scales; DSP = developmental social-pragmatic; RIT = Reciprocal Imitation Training; SES = Social-Emotional Scale; TAU = treatment as usual; JA = Joint Attention; JASPER = Joint Attention Symbolic Play Engagement and Regulation; ESCS = Early Social Communication Scales; IJA = Initiating Joint Attention; RDLS-III = Reynell Developmental Language Scales III; SCQ = Social Communication Questionnaire; SPA = Structured Play Assessment; CGI = Clinical Global Impressions; MCDI = MacArthur Communicative Development Inventory; EIBI = early intensive behavioral intervention; ADOS = Autism Diagnostic Observation Schedule; GMDS-ER = Griffiths Mental Development Scale–Extended Revision; DBC-ASA = Developmental Behavior Checklist–Autism Disorder Screening Algorithm; PEP-RDQ = Psychoeducational Profile–Revised Developmental Quotient; RDLS = Reynell Developmental Language Scales; CARS = Childhood Autism Rating Scale; HMTW = Hanen's More Than Words; PCFP = Parent–Child Free Play Procedure; PIA-CV = Parent Interview for Autism–Clinical Version; MEHRIT = Milton & Ethel Harris Research Initiative Treatment program; CBRS = Child Behavior Rating Scale; CASL = Comprehensive Assessment of Spoken Language; MBRS = Maternal Behavior Rating Scale; ADOS-G = Autism Diagnostic Observation Schedule–Generic; PACT = Preschool Autism Communication Trial; PLS = Preschool Language Scale; CSBS = Communication and Symbolic Behavior Scales; SIB-R = Scales of Independent Behavior–Revised; FEAS = Functional Emotional Assessment Scale; FEDQ = Functional Emotional Developmental Questionnaire; MPCA = Maternal Perception of Child Attachment Questionnaire; PCSB = Proximity/Contact Seeking Behavior; PLAY = Play and Language for Autistic Youngsters; ESDM = Early Start Denver Model.

person in order to make requests or comments (Bondy & Frost, 2001). Other AAC systems rely on voice output communication aides, which incorporate technology to translate pictorial or textual icons into spoken words (Shane et al., 2012). As documented in multiple systematic reviews, many single-subject studies indicate that PECS can establish communication in minimally verbal children and older individuals with ASD (Flippin, Reszka, & Watson, 2010; Preston & Carter, 2009; Tien, 2008; Tincani & Devis, 2010). Similarly, a meta-analysis of 24 single-subject studies of 58 individuals with ASD, including 27 preschoolers, showed that voice output communication aides consistently have positive effects on communication (Ganz et al., 2012). However, the extent to which these improvements transfer to new settings and last over time is less clear. One RCT that compared PECS to parent training for social communication (Yoder & Stone, 2006a, 2006b; Table 5) indicated that PECS was moderately more effective than parent training in increasing the number and type of spoken words at posttreatment; parent training was much more effective than PECS in increasing turn-taking, and the groups did not differ in requesting. However, these differences were not maintained at a 6-month follow-up evaluation (Yoder & Stone, 2006a). Comparable findings were reported in an RCT of PECS in 84 school-age children with ASD (Howlin, Gordon, Pasco, Wade, & Charman, 2007) and a quasi-experimental study of 3- to 7-year-old children with ASD (24 receiving PECS and 17 receiving TAU, of insufficient rigor to include in Table 5; Carr & Felce, 2007). Schreibman and Stahmer (2014) conducted a direct comparison of PRT and PECS to teach social communication, with both interventions including direct service and parent training. Although children in both groups gained language, no significant differences were found between the interventions. Furthermore, without a no-treatment control group it cannot be determined whether these treatment effects were uniquely related to the interventions. Nevertheless, because evidence for the efficacy of AAC comes from systematic reviews of single-subject studies, an RCT of preschool children, an RCT of children in early elementary school, and a quasi-experimental group study, ABA-focused AAC is classified as a *probably efficacious intervention*, with the caution that effects may be situation specific and time limited.

Individual, Focused ABA + DSP

Individual, focused ABA +DSP often targets joint attention (JA), which is an early social-communication

skill that involves sharing interest by directing the attention of others through acts such as pointing, making eye contact, or showing objects. JA skills are often underdeveloped in children with ASD, which is concerning because JA is a precursor to language, play, and imitation. Kasari et al. (2006) compared individual, focused ABA + DSP for JA to the same type of intervention for symbolic play, and a no-treatment control group. Results from the initial study and two follow-up evaluations (Kasari, Gulsrud, Freeman, Paparella, & Hellemann, 2012; Kasari, Paparella, Freeman, & Jahromi, 2008) indicate that although the JA and play groups made comparable gains in skills, language, social engagement, and play, both groups made larger gains than the no-treatment group (see Table 5).

Reciprocal Imitation Training (RIT) is an approach that integrates incidental teaching and DSP to teach imitation within naturalistic social-communication contexts. Like other approaches that incorporate incidental teaching, the efficacy of RIT was initially explored in single-subject studies (Ingersoll & Lalonde, 2010; Ingersoll & Schreibman, 2006). Of late, research on RIT has included the use of a published manual and has extended to pilot RCTs. Preliminary findings indicate that children who receive RIT show benefit in social communication, including imitation (Ingersoll, 2010) and joint attention and social-emotional functioning (Ingersoll, 2012; secondary data analysis from the 2010 study; Table 5). One single-subject study independently reproduced these results (Cardon & Wilcox, 2011).

Overall, individual, focused ABA + DSP interventions have been shown to be superior to TAU in two independent RCTs and a series of single-subject studies, but definitive data on generalization and maintenance patterns are not yet available.. As such, they are characterized as *probably efficacious* for specific social-communication outcomes, such as JA, imitation, and play. Additional research in this area may very well add to the evidence base of individual ABA + DSP interventions, as the efficacy of teacher- and parent-implemented ABA + DSP interventions is emerging (see the Teacher-Implemented, Focused ABA + DSP and the ABA + DSP Parent Training sections). Finally, despite the overall classification assigned here, it is important to note that social engagement interventions comprise several different approaches (e.g., JA treatments, RIT), and it is currently unknown whether there are important distinctions among them.

Teacher-Implemented, Focused DSP

As is the case with comprehensive treatments, focused interventions are often offered in classroom settings. These interventions differ from those classified as comprehensive in that they are delivered on a time-limited basis, usually for only part of the day and across a finite number of weeks. At present, we have identified one classroom-based DSP intervention. Lawton and Kasari (2012) evaluated an intervention delivered by preschool teachers that emphasized child-directed play and social engagement opportunities. The results indicated that teachers were able to implement the intervention with high fidelity and that children showed significant improvements in JA and aspects of play (e.g., object engagement). Given that this one study meets all of the JCCAP methods criteria, teacher-implemented, focused DSP interventions are classified as *possibly efficacious.*

Teacher-Implemented, Focused ABA + DSP

Some teacher-delivered interventions also include a blend of ABA and DSP strategies and are often based upon individual, focused treatments. For example, the focused ABA +DSP intervention described in an earlier section (Kasari et al. 2006) was adapted for delivery by classroom teachers, resulting in significant gains over TAU in play diversity and academic engagement (Goods, Ishijima, Chang, & Kasari, 2013). Other interventions that target social-communication skills, such as joint attention and play, have resulted in improvements in these specific skill areas (Kaale, Fagerland, Martinsen, & Smith, 2014; Kaale, Smith, & Sponheim, 2012). To investigate mechanisms of change, one RCT (Landa, Holman, O'Neill, & Stuart, 2011) evaluated the contribution of a specific treatment "ingredient," interpersonal synchrony (matching the child's behavior and affect). As presented in Table 5, results indicated that a focus on interpersonal synchrony led to increases in one aspect of social-communication (socially engaged imitation) but not others (initiating joint attention or play). A few studies have included evaluations of skill generalization and maintenance. JA skills learned during treatment with an interventionist may extend to other people (Kaale et al., 2014; Kaale et al., 2012; Table 5) and hold up over time (Kasari et al., 2012; Kasari et al., 2008). Findings on whether these benefits lead to improvements on more global outcomes are mixed, with some studies documenting long-term change in language (Kasari et al., 2012) and others reporting few ancillary gains (Kaale et al., 2014). Similar to individual focused ABA + DSP interventions, teacher-implemented focused ABA + DSP interventions are consistent with a classification of *well-established* for discrete social-communication skills. However, the current evidence does not clearly indicate whether these benefits extend to more global outcomes.

Focused Parent Training

As mentioned earlier, Rogers and Vismara (2008) classified parent training programs as *possibly efficacious.*

Subsequently, many new RCTs have evaluated such programs, extending prior research indicating that parents can learn to implement a range of intervention strategies (Odom et al., 2003). Although parent training is often an adaptation of interventions that were originally intended to be delivered directly to the child by specialists, we believe there is value in separately evaluating parent training models. First, if interventions can be disseminated to and delivered by ''nonprofessionals,'' children with ASD will have much greater access to a trained ''provider'' who can implement cost-effective intervention. Thus, research on parent training could lead to major changes in service delivery. Second, parent involvement can facilitate generalization and maintenance of acquired skills (Crockett et al., 2007; Kaiser, Hancock, & Nietfeld, 2000) that surpass what specialized interventionists can provide.

ABA Parent Training

Finding effective coping strategies and addressing child challenging behavior are common sources of stress for parents. Many single-subject studies center on guiding parents to use ABA techniques to help their children learn new skills or reduce challenging behavior such as tantrums (Odom et al., 2003). Although these studies show benefits, the available data and methodology do not support more precise conclusions. Two RCTs have used ABA parent training to target challenging behavior. Strauss et al. (2012) found that joint staff- and parent-delivered EIBI resulted in positive child outcomes, such as skill acquisition and reduced challenging behaviors. However, because the treatment group involved both parents and staff interventionists, the unique contribution of parent involvement cannot be determined. Furthermore, parents in the comparison group, which received an eclectic intervention, achieved more positive outcomes than parents in the EIBI group. Tonge, Brereton, Kiomall, Mackinnon, and Rinehart (2014) compared a parent skills intervention to an educational intervention and TAU. We consider the design of this study quasi-experimental, as participants were randomly assigned to one of the two treatment groups but not to the TAU group, which was recruited separately. Children whose parents were involved in the skills group made larger gains than children whose parents were in the other two groups in daily living skills, motor skills, and ASD symptom severity; however, for many outcomes, these benefits were observed mainly in children with the largest delays at entry into treatment.

One RCT (Hardan et al., 2014) compared parent-implemented PRT to a group-based psychoeducation control. Results suggested that the parent training group was associated with improvements in spoken language on experimental and standardized measures, as well as improvements in global social-communication functioning. Overall, evidence from single-subject studies and two group studies suggest that ABA parent training may reduce challenging behavior. Additional single-subject studies and one group study suggest that ABA parent training may improve spoken communication. However, due to design limitations and the variability of chosen outcomes among these studies, the overall empirical support for ABA parent training programs is consistent with a classification of *possibly efficacious*.

DSP Parent Training

Because social-communication deficits, a defining feature of ASD, are particularly stressful for parents (Davis & Carter, 2008), parent-implemented interventions to address these skills are increasingly well researched. Many different models of DSP parent-implemented interventions are now available. One popular example is Floortime^{TM}, which encourages parents to engage their children by matching their behavior, both physically (i.e., by ''getting down on the floor'' to play) and behaviorally (following child's lead, imitating child behavior). Two initial RCTs indicated that Floortime parent training interventions (Casenhiser, Shanker, & Stieben, 2013; Pajareya & Nopmaneejumruslers, 2011) were associated with improvements in communication, decreases in symptom severity, and more responsive parent behaviors, as shown in Table 5. Further, responsive caregiver behavior correlated with positive child outcomes (Casenhiser et al., 2013). In another RCT of an intervention based on Floortime, Solomon et al. (2014) evaluated the Play and Language for Autistic Youngsters (PLAY) program, which included monthly home consultation with parents. Children in the PLAY group showed significant improvements in ASD classification, social-emotional skills, and quality of parent–child interactions but not ASD symptoms, communication skills, or development level.

RCTs of other DSP parent training programs have yielded mixed findings (Table 5). Two programs obtained similarly favorable results with targeted social-communication skills and more global outcomes (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010; Siller, Hutman, & Sigman, 2013). A secondary analysis of Siller's intervention indicated that this program was also associated with gains in some attachment-related behaviors (Siller, Swanson, Gerber, Hutman, & Sigman, 2014). Other RCTs have generally reported more favorable results for communication and social engagement outcomes than in global outcomes (e.g., ASD symptoms). For example, the Preschool Autism Communication Trial (Green et al., 2010) evaluated a parent training program that consisted of 2-hr sessions every other week for 6 months, followed by monthly booster

sessions for another 6 months. This study is the largest RCT included in the current review and had an exceptionally well-designed methodology and analysis plan. At the end of intervention, children in the parent training group initiated communication more often than children in TAU, but the groups did not differ significantly in ASD symptoms or language level. Hanen's More Than Words is a speech and language-based program that aims to improve reciprocal interactions through repetition, turn-taking, and a focus on child preference. In an RCT, Hanen's More Than Words did not reliably change child behaviors (Carter et al., 2011), although it was associated with improvements in parental synchrony with the child (i.e., matching the child's behavior and affect). An additional RCT showed changes solely in parent outcomes (Keen, Couzens, Muspratt, & Rodger, 2010); another found no changes in either parent or child outcomes (Oosterling et al., 2010). Overall, outcomes tend to be more positive for parent behavior than child behavior (Carter et al., 2011; Venker, McDuffie, Weismer, & Abbeduto, 2012).

Roberts et al. (2011) specifically set out to compare parent and child outcomes in DSP parent training and included two approaches to training (i.e., home based and center based) and a TAU condition. Consistent with other studies, the authors found variability in both parent and child outcomes. They observed improvements in receptive language and socialization skills in center-based treatment but no effects of this treatment on other outcomes (e.g., expressive language, developmental behavior). Parents whose children were in center-based treatment made gains in parenting skills and knowledge. However, parents in the home-based group reported greater access to specialized services and social support around special needs. Other measures such as parenting stress were unrelated to either treatment. At present, therefore, factors that may contribute to the inconsistent findings across studies remain unclear.

Overall, the literature on DSP parent training includes many methodologically strong studies such as the Preschool Autism Communication Trial. However, the positive findings in some studies are tempered by a large number of null findings in other studies. Further, the tendency of these types of interventions to focus on highly specific social-communication outcomes, which are inconsistently related to broader, clinically relevant outcomes, detracts somewhat from the strength of the evidence base (Weitlauf et al., 2014). Consistent with the Chambless and Hollon (1998) recommendation to be conservative, the mixed evidence in this area is most consistent with a classification of *probably efficacious*.

ABA + DSP Parent Training

Rogers et al. (2012) conducted an RCT of parent training in ESDM intervention strategies (described in the Comprehensive ABA + DSP Classrooms section). Parent training was provided at low intensity (i.e., 1 hr per week, compared to 20 hr per week in the full ESDM program). Outcomes of children in the parent training program and children in TAU were indistinguishable (Table 5). Thus, despite promising findings from the initial RCT of the full ESDM program (Dawson et al., 2010; Table 5), parent training in ESDM approaches was not found to be efficacious. Yoder and Stone (2006a, 2006b), in a study described in the Individual, Focused ABA for Augmentative and Alternative Communication section, reported that ABA +DSP parent training was more efficacious than ABA for increasing turn-taking but not for other outcomes (Yoder & Stone, 2006a, 2006b). An additional multimethod intervention, integrating ABA and TEACCH (Wang, 2008), yielded positive effects relative to TAU for parental behaviors during parent–child interactions; however, child outcomes were not evaluated. Given the limited evidence that ABA +DSP parent training programs improve child outcomes, these programs are classified as *experimental*.

Summary

The increase in RCTs to evaluate parent training programs is encouraging, given the methodological concerns highlighted in previous reviews (Rogers & Vismara, 2008; Warren, McPheeters et al., 2011). However, additional research is needed to resolve the conflicting findings across studies and determine whether the parent training programs that have support from initial RCTs (e.g., Siller et al., 2013) can be independently replicated (Oono, Honey, & McConachie, 2013; Wetlauf et al., 2014).

PREDICTORS, MEDIATORS, AND MODERATORS

The extent to which analyses of predictors, mediators, and moderators has been conducted varies greatly by treatment approach, with the most detailed investigations done on comprehensive interventions. Although researchers have generally not performed formal mediator and moderator analyses, they have identified both child and intervention characteristics that may predict outcomes. Given the wide range of outcomes documented in this review, it is essential for future research to determine which child and treatment factors are most likely to derive maximal benefit from each intervention approach.

Comprehensive Interventions

Despite the overall positive findings on individual, comprehensive ABA, studies consistently show large

variations in outcomes across children. Learners may show reliable change in IQ and other measures (Sallows & Graupner, 2005), acquire many new skills but not catch up to their peers, or show little or no improvement with this therapy (Lovaas, 1987; Smith et al., 2000). Regarding child characteristics, the most consistent finding thus far is that higher pretreatment IQ predicts better outcome, although this prediction is far from perfect (Eldevik et al., 2009). Potential predictors that have not yet been tested via RCTs include younger age (e.g., Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Smith, Klorman, & Mruzek, 2015) and social and object interest (Klintwall & Eikeseth, 2012; Smith et al., 2015). Other potentially important child and family characteristics (e.g., race, ethnicity, cultural background, socioeconomic status) have received little attention, although the few available findings have not shown an association with outcome (e.g., Smith et al., 2000).

In addition to child factors, particular components of individual, comprehensive ABA could be "active ingredients" that produce favorable outcomes (Kasari, 2002), although few of these have been directly tested. Potential important components include amount of supervision (e.g., Magiati et al., 2011), treatment "dose" (Eldevik et al., 2009; Granpeesheh et al., 2009; Sheinkopf & Siegel, 1998; Smith et al., 2015), and parental involvement (Smith, 2010). Finally, despite varying opinions about the method and content of individual, comprehensive ABA (e.g., the optimal mix of structured and child-led intervention strategies, the most useful skills to target in intervention), systematic comparisons are currently unavailable.

Focused Interventions

The limited available evidence on parent training suggests that favorable response to treatment is moderated by baseline participant characteristics including object interest (Carter et al., 2011) and more limited pretreatment communication skills (Siller, Swanson et al., 2014; Tonge et al., 2014). Other studies focused on predictors of outcome, such as the child's joint attention, involvement, enjoyment (Casenhiser et al., 2013), and age (Rogers et al., 2012); parent's intervention fidelity (Rogers et al., 2012) and quality of engagement (Kasari et al., 2010); and treatment "dose" (Rogers et al., 2012). Although no consistent mediators or moderators of focused, social engagement interventions have been identified, one study indicated that functional language, functional play, and intervention at a younger age predicted success at a 5-year follow-up (Kasari et al., 2012).

Focused interventions vary across several dimensions that may directly relate to outcomes (e.g., duration, intensity, coaching of parents or teachers on intervention strategies with or without children present). However, research is currently unavailable on the effects of these variables.

DISCUSSION

The quantity and quality of research on interventions for young children with ASD have has increased markedly since the previous *JCCAP* review (Rogers & Vismara, 2008), thereby boosting the number of interventions that have some empirical support. Whereas the previous review classified only one intervention as well-established, none as probably efficacious, and three as possibly efficacious, the current review identifies two interventions as well-established (individual, comprehensive ABA and teacher-implemented, focused ABA + DSP), three as probably efficacious (individual, focused ABA for AAC; individual, focused ABA + DSP; and focused DSP parent training), and five as possibly efficacious (individual, comprehensive ABA + DSP; comprehensive ABA classrooms; focused ABA for spoken communication; teacher-implemented focused DSP; and focused ABA parent training). These interventions, summarized in Table 6, are based on diverse theoretical frameworks and practice elements, indicating that a variety of approaches can be efficacious for young children with ASD.

However, even the research on well-established treatments continues to have important gaps, particularly limitations in outcome measures (discussed further in the Complications section). These limitations make it difficult to determine whether the interventions in Table 6 have similar or differing effects. For example, as shown in the table, outcome measures in studies on one well-established intervention (individual, comprehensive ABA) have usually focused on associated features of ASD such as cognitive and adaptive functioning; little is known about the effects of this intervention on defining features of ASD. In contrast, outcome measures in studies on the other well-established intervention (teacher-implemented, focused ABA + DSP) have usually focused on defining features of ASD such as joint engagement, and the effects of this intervention on associated features are unclear.

In addition, recent research has sometimes produced contradictory results, notably the mixed findings across studies on classroom ABA (Table 4) and DSP parent training (Table 5). Information on mediators and moderators of outcome also remains scant. Hence, little guidance is available on how investigators might enhance the potency of interventions or tailor intervention plans for an individual child with ASD.

Despite these caveats, advancements in ASD intervention research and the increase in treatments that have some empirical support are welcome developments

TABLE 6
Summary of Levels of Evidence and Primary Outcomes Reported in Research on Psychological and Behavioral Interventions for Young Children With Autism Spectrum Disorder

Intervention	*Primary Outcomes Reported in Research*
Level 1: Well-Established	
Individual, Comprehensive ABA	IQ/DQ, Parent-rated adaptive functioning
Teacher-Implemented, Focused ABA + DSP	Joint engagement in play activities with caregivers and teachers
Level 2: Probably Efficacious	
Individual, Focused ABA for Augmentative and Alternative Communication	Use of picture symbols to make requests
Individual, Focused ABA + DSP	Initiation of joint attention, Joint engagement in play activities with caregivers and other adults, Imitation, Language and cognitive skills
Focused DSP Parent Training	Joint engagement in play activities with caregivers and other adults, Communication with caregivers, Make-believe play
Level 3: Possibly Efficacious	
Individual, Comprehensive ABA + DSP	DQ, Parent-rated adaptive skills
Comprehensive ABA Classrooms	Examiner-rated ASD symptoms, Language, DQ, Teacher-rated social Skills
Focused ABA for Spoken Communication	Use of spoken words for joint engagement or requesting
Teacher-Implemented, Focused DSP	Initiation of joint attention with teachers, Engagement with objects during interactions with teachers
Focused, ABA Parent-Training	Parent-reported adaptive behavior, Use of utterances or words to communicate
Level 4: Experimental	
Comprehensive, ABA + DSP Classrooms[a]	
Focused ABA + DSP Parent Training	

Note: ABA = applied behavior analysis; DQ = developmental quotient; DSP = developmental social-pragmatic; Comprehensive = intended to address all areas of need; Focused = intended to target a specific outcome (e.g., an ASD symptom).

[a]Comprehensive, ABA + DSP classrooms also emphasize instructional strategies based on research on neuropsychology and learning style in ASD.

for the ASD community. Moreover, this progress is attributable not only to the rise in research funding afforded by initiatives such as the Combating Autism Act (2006) but also to investigators' adroitness in designing and carrying out rigorous group studies of interventions for children with ASD (Lord et al., 2005). As described in the Method for the Current Review section, investigators must overcome many logistical obstacles, including the length and intensity of many interventions, strong parent preferences, and availability of comparable interventions from publicly funded programs in some locations. Nevertheless, they have successfully carried out large, quasi-experimental studies of well-matched groups of participants who are either receiving individual, comprehensive ABA or TAU (Table 4). For comprehensive treatments that are less widely available, such as individual, comprehensive ABA + DSP and classroom ABA, investigators have conducted RCTs comparing these treatments to TAU (Table 4). Such comparisons provide some evidence for the relative efficacy of these treatments, even though the services encompassed in TAU are certainly not uniform.

Another productive strategy has been to study focused treatments that have more circumscribed (yet important) goals. Although research on focused treatments was just emerging at the time of the previous review, many focused DSP interventions have quickly attracted more high-quality RCTs than any other behavioral treatments for children with ASD. The mixed findings on DSP parent training show that focused treatments may fall short for some outcomes. However, studies on individual, focused DSP and perhaps individual, focused ABA suggest that meaningful gains can occur even with a relatively small amount of intervention, often in the range of 10 to 50 hr of direct contact between the service provider and child or family (Table 5).

Practical Implications

Children with ASD, their families, and providers now have more viable treatment options than they did even a few years ago. Research indicates that, although not a cure, comprehensive treatments can accelerate development of cognitive and adaptive skills, and focused treatments can help establish and expand social communication. It is difficult to foresee how far this progress will go toward addressing the myriad public health issues associated with ASD, but research trends do

lay the groundwork for improvement. Useful resources already exist to guide families toward empirically supported treatments and help providers learn to implement them. Information for families includes lay summaries of research findings by the Agency for Healthcare Research and Quality (www.ahrq.gov), Association for Science in Autism Treatment (www.asatonline.org), and Interactive Autism Network (www.iancommunity.org); family-friendly books (*Topics in Autism* series [Woodbine House], Thompson, 2007); toolkits on the website of Autism Speaks (www.autismspeaks.org) consumer guidelines (www.bacb.com/downloadfiles/ABA_Guidelines_for_ASD.pdf); and resource directories (www.autismspeaks.org/family-services/resource-guide). Provider resources include published manuals (e.g., through www.aap.org), online videos illustrating intervention techniques (www.ocali.org), and training opportunities.

Well-established approaches, particularly individual, comprehensive ABA and teacher-implemented, focused DSP, can be considered first-line treatments. However, because of the wide individual variation in outcome and the dearth of information about mediators and moderators linked to these outcomes, an empirical trial with careful monitoring of progress is necessary to determine whether these treatments are helpful for each individual child with ASD. Such trials are especially important for comprehensive interventions, given the extensive commitment of time and resources that these interventions entail. The most intensive of these interventions is individual, comprehensive ABA. Working groups of investigators, providers, and family members have proposed benchmarks to help determine whether this intervention is progressing as intended (Blalock & Perry, 2010; Region 6 Autism Connection, 2006). In addition, investigators have outlined remedial strategies to consider when the intervention is not progressing (Ferraioli, Hughes, & Smith, 2005).

Probably or possibly efficacious interventions also merit consideration. Many of these interventions have techniques and goals that differ greatly from individual, comprehensive ABA and focused, teacher-implemented ABA + DSP. For example, they may rely more on child-led interactions than does individual, comprehensive ABA, and they may focus on associated features more than does focused, teacher-implemented ABA +DSP. As such, they may be beneficial even for children who struggle with well-established treatments, although additional research is needed to verify this supposition.

Besides differences, empirically supported treatments also have commonalities, which, in the view of many investigators, can be regarded as a set of best practices that should always be incorporated into services offered to children with ASD (Iovannone, Dunlap, Huber, & Kincaid, 2003):

1. Individualized services and supports: making use of the particular interests and individual learning style of each child with ASD to increase engagement in activities through interventions such as reinforcement systems and incorporation of preferred activities into intervention sessions.
2. Systematic intervention planning: selecting goals and instructional procedures based on a data-based assessment of each child, monitoring progress, and troubleshooting as needed.
3. Comprehensible, structured environments such as using visual schedules to help children with ASD anticipate transitions between activities and organized work spaces to facilitate task completion.
4. Specific intervention content to address the impairments in social communication and restricted, repetitive behaviors that define ASD.
5. Functional approach to problem behavior: assessing the function or purpose of the behavior and selecting intervention strategies based on this assessment.
6. Family involvement to promote consistency between home and the intervention setting, take advantage of the family's knowledge of the child with ASD, and overcome difficulties that children with ASD are likely to have in conveying information from one setting to another.

Complications

Although investigators have made a concerted and largely successful effort to carry out controlled group studies, much uncertainty remains about outcome measurement and about criteria for appraising studies in systematic reviews. Regarding measurement, many studies have met *JCCAP*'s criteria of incorporating "reliable and valid outcome assessment measures gauging the problems targeted" (Table 1). However, as Tables 4 and 5 make clear, investigators use a broad range of measures to evaluate associated and defining features of ASD, ranging from discrete social-communication skills (e.g., joint attention, eye contact, play) to global, standardized outcome measures (e.g., IQ, adaptive behavior). Even within families of treatments that employ similar methods, investigators lack consensus on which measures to use. The variation in measures across studies makes it difficult to compare findings. Moreover, studies of individual, comprehensive ABA have given priority to changes in associated features of ASD (delays in cognitive and adaptive skills), rather than primary ASD symptoms. Studies on DSP treatments have emphasized changes in laboratory

observations of individual ASD symptoms (especially in the area of social communication), but these measures have uncertain relevance to everyday functioning. Across many treatment families, a few investigators have administered ASD diagnostic tools as outcome measures, but such tools were not intended to be used for this purpose and may not be sensitive to change. Unfortunately, a practical, ecologically valid measure of change in ASD symptoms does not yet exist. There are currently no published, observational measures designed to detect such change in preschool children, although some measures are currently under development (Lord, Carr, & Grzadzinaski, 2013). One study incorporated a neurological measure of change (electroencephalogram recordings of children's responses to faces; Dawson et al., 2012), but no other studies have done so. Although brief symptom checklists have been created to monitor response to treatment in disorders such as attention-deficit/hyperactivity disorder, oppositional-defiant disorder, anxiety, and depression, no checklists of this kind are available for ASD. Longer rating scales have been devised (e.g., Cohen, Schmidt-Lackner, Romanczyk, & Sudhalter, 2003) but were not given in any of the studies listed in Tables 4 and 5. Thus, the need to identify appropriate outcome measures, particularly for ASD symptoms, is acute.

Regarding methods criteria, beyond taking divergent stances on the role of single-subject studies and manuals (described in the Method for the Current Review section), investigators have also applied varying criteria to evaluate group studies and combine evidence across studies. For example, although *JCCAP* requires randomized studies to classify a treatment as well-established, other systems go further and require a clear description of how randomization was accomplished and how the allocation sequence was concealed from the investigators (Warren et al., 2011). In addition, *JCCAP* requires that "sample size was sufficient to detect expected effects" (Table 1), but other systems rate the precision with which effect size can be determined (Maglione et al., 2012). In contrast to the focus in *JCCAP*'s criteria on the number of well-designed studies that support an intervention, other systems rate the consistency of evidence across studies (Warren et al., 2011). Depending on how stringently these criteria are applied, treatments that are classified as well-established in this review have been rated as having low to moderate levels of evidence in some other reviews (Maglione et al., 2012; Reichow et al., 2012; Weitlauf et al., 2014). Conversely, for several intervention approaches (e.g., parent training for problem behavior, incidental teaching), preliminary support in RCTs extends long-standing findings from single-subject research. Alternative review systems that allow single-subject research to support a "well-established" classification may depict the evidence base for some of these intervention approaches as stronger than it appears here.

The limited information on randomization protocols in some studies reflects the absence of a standard in the ASD intervention literature for transparent reporting of study procedures, such as the Consolidated Standards of Reporting Trials (CONSORT) Statement for RCTs (Moher et al., 2010) and the Transparent Reporting of Evaluations with Nonrandomized Trials (TREND) Statement for quasi-experimental studies (Fuller, Pearson, Peters, & Anderson, 2012). At present, specialized journals for research on ASD or other intellectual disabilities do not instruct authors to follow such standards, nor do many other journals that commonly publish ASD intervention research. We do not believe that the extent to which reports adhered to these standards would have influenced the evidence ratings in the current review. However, "transparent reporting" should be considered in both funding and publication as well as in rating individual studies, and it may be advisable for ASD journals to consider requiring authors to follow standard reporting guidelines.

Appraisal of the precision of effect size estimates and consistency of findings across studies may facilitate moving beyond identifying treatments as well-established toward gauging their potential utility in practice. The magnitude and clinical relevance of effects also would be important to assess. Because of the small sample sizes in many studies and the wide range of outcome measures used, effect size estimates remain somewhat imprecise even for well-established treatments. Also, as previously discussed, limitations in the measures reduce the clinical relevance of findings. Inconsistent findings across studies are also a prominent issue, particularly in research on classroom ABA and DSP parent training. Some approaches to conducting systematic reviews allow for assigning separate ratings to the quality of evidence and the strength of clinical recommendations that can be derived from the evidence (e.g., Grading of Recommendations Assessment, Development and Evaluation; Guyatt et al., 2008). It may be beneficial to adapt such a system for use in reviewing ASD intervention studies, particularly as research in this area grows more sophisticated.

FUTURE DIRECTIONS

The development and validation of interventions is a process with a sequence of stages (initial tests for "proof of concept," standardization into a manual and pilot testing, efficacy trials, and effectiveness studies). From this perspective, much work remains to be done at all stages. At the initial stage, research has barely begun on specific interventions for one of the defining features

of ASD: restricted, repetitive behavior. Indeed, no studies on this symptom area met criteria for inclusion in the current review. Also, although research is available on establishing social communication, few studies have examined interventions for more advanced skills such as back-and-forth conversations and complex, sociodramatic play. Thus, proof-of-concept studies are needed to start addressing these key problems in ASD.

Many interventions have support from numerous single-subjects studies and are ready to progress to standardization into a manual. Examples include video modeling to demonstrate social skills (Bellini & Akullian, 2007), functional communication training to teach communication skills as a replacement for problem behavior (Hart & Banda, 2010), and differential reinforcement procedures to address difficulties with sleep (Durand, 2014) and feeding (Sharp, Jaquess, Morton, & Herzinger, 2010). A few interventions (e.g., incidental teaching approaches such as PRT) have been described in a manual (Koegel et al., 1989) but not yet tested in group studies.

At the stage of efficacy trials, most group studies have compared an active intervention against a waitlist control or TAU (Tables 3–5). With noteworthy exceptions (e.g., Boyd et al., 2014; Landa et al., 2011), investigators have not yet contrasted an active treatment with a well-defined control group (i.e., a control condition standardized in a manual; Lord et al., 2005) or another active treatment, conducted dismantling or constructive studies, designed adaptive trials, or employed other strategies that would help pinpoint the "active ingredients" of a treatment. Moreover, few studies have enrolled enough participants to support adequately powered analyses of mediators and moderators. The limited socioeconomic, cultural, and racial or ethnic diversity of study participants also make it difficult to determine whether these factors moderate outcomes. In the absence of such research, treatment families were defined in the present review based on clinical impression, rather than known mechanisms of action. More important, there is no established mechanism for improving upon existing interventions, and providers and families have little basis for selecting one empirically supported intervention over another. Thus, it will be crucial for investigators to go beyond simply comparing an active treatment against no treatment or TAU.

Community effectiveness studies have been reported on individual, comprehensive ABA, classroom ABA, and teacher-implemented, focused DSP. Studies in which providers have received ongoing supervision from experts in the intervention have generally reported favorable outcomes (e.g., Eikeseth et al., 2012; Strain & Bovey, 2011), but studies without such supervision have not (e.g., Boyd et al., 2014; Magiati et al., 2007). Although preliminary, these studies suggest that exporting empirically supported interventions into community settings may prove difficult. Investigators might need to consider strategies such as engaging community partners early in the process of designing interventions or working with them to adapt interventions for use outside of a research context (Kasari & Smith, 2013).

Given that two ongoing developments are an increased focus on RCTs and legislation to increase access to ASD services, it may be possible to merge these two initiatives. New, publicly funded programs usually start small and gradually expand over time. As a result, when the programs begin, most families endure lengthy waits for services or have limited access to these services. Under these circumstances, it may make sense to conduct RCTs comparing outcomes in the new program to community TAU. This has been accomplished in publicly funded initiatives for other groups of children, such as charter schools and mandates to reduce class size (Murnane & Willett, 2010). In ASD research, one such example already exists, involving school-age children with ASD. The School District of Philadelphia decided to introduce ABA classrooms in its self-contained classrooms in early elementary education and agreed to an RCT comparing these classrooms with TAU, enhanced with extra training opportunities for teachers (Mandell et al., 2013). Adding to evidence from early intervention studies that community-based treatment is not always effective, this study revealed that teachers' fidelity of implementation was uneven and that outcomes in classroom ABA did not significantly differ from outcomes with TAU (Mandell et al., 2013). Thus, despite disappointing outcomes, the study was informative and may serve as a model for working with publicly funded programs to conduct RCTs.

At the time of the previous review (Rogers & Vismara, 2008), most group studies centered on a single treatment, the UCLA/Lovaas model of individual, comprehensive ABA. This intervention continues to have stronger empirical support than other comprehensive treatments. However, several of these other treatments show promise and merit further study. Also, a variety of focused treatments have emerged, many of which can be considered possibly or probably efficacious or well-established. Eventually, empirically supported, focused treatments may become available to individual children in a modular format (i.e., treatment components selected based on data). This modular approach could serve as an alternative to comprehensive treatments (Kasari & Smith, 2013). Overall, our review surveys many different behavioral interventions for young children with ASD and highlights the recent evolution toward broader, more rigorous evaluations of such interventions. Well-designed studies that produce interpretable data on a range of treatment modalities will help communities provide appropriate, effective services for children with ASD.

ACKNOWLEDGMENTS

We thank Susan Hyman, Jennifer Katz, and Dan Mruzek for commenting on drafts of the manuscript.

REFERENCES

Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA preschool forms and profiles*. Burlington: University of Vermont.

Aldred, C., Green, J., & Adams, C. (2004). A new social communication intervention for children with autism: Pilot randomized controlled treatment study suggesting effectiveness. *Journal of Child Psychology and Psychiatry*, *45*, 1420–1430. doi:10.1111/j.1469-7610.2004.00338.x

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Autism and Developmental Disabilities Monitoring Network Surveillance Year 2010 Principal Investigators. (2014, March 28). *Prevalence of autism spectrum disorder among children aged 8 years – Autism and developmental disabilities monitoring network, 11 Sites, United States, 2010*. Morbidity and Mortality Weekly Report, 63(SS02), 1–21.

Autism Speaks. (2011). *Background information on the combating autism act*. Retrieved from http://www.autismvotes.org/site/c.frKNI3PCImE/b.3944501/k.C05F/Background_Information_on_the_Combating_Autism_Act.htm

Autism Speaks. (2015). *Hawaii 42nd state to pass autism insurance reform*. Retrieved from https://www.autismspeaks.org/advocacy/advocacy-news/hawaii-42nd-state-pass-autism-insurance-reform

Bayley, N. (2005). *Bayley scales of infant and toddler development-third edition: Administration manual*. San Antonio, TX: Harcourt Assessment.

Bellini, S., & Akullian, J. (2007). A meta-analysis of video modeling and video self-modeling interventions for children and adolescents with autism spectrum disorders. *Exceptional Children*, *73*(3), 264–287. doi:10.1177/001440290707300301

Blalock, K., & Perry, A. (2010). Testing the application of benchmarks for children in Ontario's IBI program: Six case studies. *Journal on Developmental Disabilities*, *2*, 33–43.

Bodfish, J. W., Symons, F. J., & Lewis, M. H. (1998). *The Repetitive Behavior Scale: A test manual*. Morgantown, NC: Western Carolina Center Research Reports.

Bondy, A., & Frost, L. (2001). The picture exchange communication system. *Behavior Modification*, *25*, 725–744.

Boyd, B., Hume, K., McBee, M., Alessandri, M., Gutierrez, A., Johnson, L., … Odom, S. (2014). Comparative efficacy of LEAP, TEACCH and non-model-specific special education programs for preschoolers with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *44*, 366–380. doi:10.1007/s10803-013-1877-9

Buescher, A. V., Cidav, Z., Knapp, M., & Mandell, D. S. (2014). Costs of autism spectrum disorders in the United Kingdom and the United States. *JAMA Pediatrics*, *168*, 721–728. doi:10.1001/jamapediatrics.2014.210

Cardon, T. A., & Wilcox, M. J. (2011). Promoting imitation in young children with autism: A comparison of reciprocal imitation training and video modeling. *Journal of Autism and Developmental Disorders*, *41*, 654–666. doi:10.1007/s10803-010-1086-8

Carr, D., & Felce, J. (2007). The effects of PECS teaching to phase III on the communicative interactions between children with autism and their teachers. *Journal of Autism and Developmental Disorders*, *37*, 724–737. doi:10.1007/s10803-006-0203-1

Carter, A. S., Messinger, D. S., Stone, W. L., Celimli, S., Nahmias, A. S., & Yoder, P. (2011). A randomized controlled trial of Hanen's 'more than words' in toddlers with early autism symptoms. *Journal of Child Psychology and Psychiatry*, *52*, 741–752. doi:10.1111/j.1469-7610.2011.02395.x

Casenhiser, D. M., Shanker, S. G., & Stieben, J. (2013). Learning through interaction in children with autism: Preliminary data from asocial-communication-based intervention. *Autism*, *17*(2), 220–241. doi:10.1177/1362361311422052

Chambless, D. L., Baker, M. J., Baucom, D. H., Beutler, L. E., Calhoun, K. S., Crits-Christoph, P., … Woody, S. R. (1998). Update on empirically validated therapies, II. *Clinical Psychologist*, *51*, 3–16. Retrieved from http://iacp.asu.edu/~horan/ced522readings/div12/chambless98.pdf

Chambless, D. L., & Hollon, S. D. (1998). Defining empirically supported therapies. *Journal of Consulting and Clinical Psychology*, *66*, 7–18. doi:10.1037//0022-006x.66.1.7. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9489259

Chambless, D. L., & Ollendick, T. H. (2001). Empirically supported psychological interventions: Controversies and evidence. *Annual Review of Psychology*, *52*, 685–716. doi:10.1146=annurev.psych.52.1.685

Chambless, D. L., Sanderson, W. C., Shoham, V., Johnson, S. B., Pope, K. S., Crits-Christoph, P., … McCurry, S. (1996). An update on empirically validated therapies. *The Clinical Psychologist*, *9*(2), 5–18. doi:10.1037=e555332011-003

Cohen, I. L., Schmidt-Lackner, S., Romanczyk, R., & Sudhalter, V. (2003). The PDD Behavior inventory: A rating scale for assessing response to intervention in children with pervasive developmental disorder. *Journal of Autism and Developmental Disorders*, *33*, 31–45.

Combating Autism Act of 2006 (Public Law 109–416). (2006, December 19). U.S. Department of Health and Human Services: Health Resources and Services Administration (HRSA). Retrieved from http://www.mchb.hrsa.gov/autism

Crockett, J. L., Fleming, R. K., Doepke, K. J., & Stevens, J. S. (2007). Parent training: Acquisition and generalization of discrete trials teaching skills with parents of children with autism. *Research in Developmental Disabilities*, *28*, 23–36. doi:10.1016/j.ridd.2005.10.003

Davis, N. O., & Carter, A. S. (2008). Parenting stress in mothers and fathers of toddlers with autism spectrum disorders: Associations with child characteristics. *Journal of Autism and Developmental Disorders*, *38*, 1278–1291. doi:10.1007/s10803-007-0512-z

Dawson, G., Jones, E. J., Merkle, K., Venema, K., Lowy, R., Faja, S., … Webb, S. J. (2012). Early behavioral intervention is associated with normalized brain activity in young children with autism. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*, 1150–1159. doi:10.1016/j.jaac.2012.08.018

Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., … Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The early start Denver model. *Pediatrics*, *125*, e17–e23. doi:10.1542/peds.2009-0958

Dove, D., Warren, Z., McPheeters, M. L., Taylor, J. L., Sathe, N. A., & Veenstra-VanderWeele, J. (2012). Medications for adolescents and young adults with autism spectrum disorders: A systematic review. *Pediatrics*, *130*, 717–726. doi:10.1542/peds.2012-0683

Drew, A., Baird, G., Baron-Cohen, S., Cox, A., Slonims, V., Wheelwright, S., … Charman, T. (2002). A pilot randomised control trial of a parent training intervention for pre-school children with autism: Preliminary findings and methodological challenges. *European Child & Adolescent Psychiatry*, *11*, 266–272.

Durand, V. M. (2014). *Sleep better! A guide to improving sleep for children with special needs*. Baltimore, MD: Brookes.

Eikeseth, S., Klintwall, L., Jahr, E., & Karlsson, P. (2012). Outcome for children with autism receiving early and intensive behavioral intervention in mainstream preschool and kindergarten settings.

Research in Autism Spectrum Disorders, *6*, 829–835. doi:10.1016/j.rasd.2011.09.002

Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2002). Intensive behavioral treatment at school for 4- to 7-year-old children with autism: A 1-year comparison controlled study. *Behavior Modification*, *26*, 49–68. doi:10.1177/0145445502026001004

Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2007). Outcome for children with autism who began intensive behavioral treatment between age four and seven: A comparison controlled study. *Behavior Modification*, *31*, 264–278. doi:10.1177/0145445506291396

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

Eldevik, S., Hastings, R. P., Hughes, J. C., Jahr, E., Eikeseth, S., & Cross, S. (2010). Using participant data to extend the evidence base for intensive behavioral intervention for children with autism. *American Journal on Intellectual and Developmental Disabilities*, *115*, 381–405. doi:10.1352/1944-7558-115.5.381

Eldevik, S., Hastings, R. P., Jahr, E., & Hughes, J. C. (2012). Outcomes of behavioral intervention for children with autism in mainstream pre-school settings. *Journal of Autism and Developmental Disorders*, *42*, 210–220. doi:10.1007/s10803-011-1234-9

Ferraioli, S., Hughes, C., & Smith, T. (2005). A model for problem solving in discrete trial training for children with autism. *Journal of Early Intensive Behavioral Intervention*, *2*, 224–246.

Flanagan, H. E., Perry, A., & Freeman, N. L. (2012). Effectiveness of large-scale community-based intensive behavioral Intervention: A waitlist comparison study exploring outcomes and predictors. *Research in Autism Spectrum Disorders*, *6*(2), 673–682.

Flippin, M., Reszka, S., & Watson, L. R. (2010). Effectiveness of the picture exchange communication system (PECS) on communication and speech for children with autism spectrum disorders: A meta-analysis. *American Journal of Speech-Language Pathology*, *19*, 178–185. doi:10.1044/1058-0360(2010/09-0022)

Fuller, T., Pearson, M., Peters, J. L., & Anderson, R. (2012). Evaluating the impact and use of transparent reporting of evaluations with non-randomised designs (TREND) reporting guidelines. *British Medical Journal Open*, *2*(6), e002073. doi:10.1136/bmjopen-2012-002073

Ganz, J. B., Earles-Vollrath, T. L., Heath, A. K., Parker, R. I., Rispoli, M. J., & Duran, J. B. (2012). A meta-analysis of single case research studies on aided augmentative and alternative communication systems with individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *42*, 60–74. doi:10.1007/s10803-011-1212-2

Goods, K. S., Ishijima, E., Chang, Y.-C., & Kasari, C. (2013). Preschool based JASPER intervention in minimally verbal children with autism: Pilot RCT. *Journal of Autism and Developmental Disorders*, *43*, 1050–1056. doi:10.1007/s10803-012-1644-3

Granpeesheh, D., Dixon, D. R., Tarbox, J., Kaplan, A. M., & Wilke, A. E. (2009). The effects of age and treatment intensity on behavioral intervention outcomes for children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *3*, 1014–1022. doi:10.1016/j.rasd.2009.06.007

Green, J., Charman, T., McConachie, H., Aldred, C., Slonims, V., Howlin, P., … Pickles, A. (2010). Parent-mediated communication-focused treatment in children with autism (PACT): A randomised controlled trial. *The Lancet*, *375*, 2152–2160. doi:10.1016/s0140-6736(10)60587-9

Guyatt, G. H., Oxman, A. D., Vist, G. E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., … for the GRADE Working Group. (2008). GRADE: An emerging consensus on rating quality of evidence and strength of recommendations. *British Medical Journal*, *336*, 924–926. doi:10.1136/bmj.39489.470347.ad

Handleman, J. S., & Harris, S. L. (2001). *Preschool education programs for children with autism.* Austin, TX: Pro-Ed.

Hardan, A. Y., Gengoux, G. W., Berquist, K. L., Libove, R. A., Ardel, C. M., Phillips, J., … Minjarez, M. B. (2014). A randomized controlled trial of pivotal response treatment group for parents of children with autism. *Journal of Child Psychology and Psychiatry*, *56*, 884–892. doi:10.1111/jcpp.12354

Hart, S. L., & Banda, D. R. (2010). Picture exchange communication system with individuals with developmental disabilities: A meta-analysis of single subject studies. *Remedial and Special Education*, *31*, 476–488. doi:10.1177/0741932509338354

Hayes, S. C., Barlow, D. H., & Nelson-Gray, R. O. (1999). *The scientist-practitioner: Research and accountability in the age of managed care* (2nd ed.). Boston, MA: Allyn & Bacon.

Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single subject research to identify evidence-based practice in special education. *Exceptional Children*, *71*, 165–179. doi:10.1177/001440290507100203

Howard, J. S., Sparkman, C. R., Cohen, H. G., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities*, *26*, 359–383. doi:10.1016/j.ridd.2004.09.005

Howlin, P., Gordon, R. K., Pasco, G., Wade, G., & Charman, T. (2007). The effectiveness of Picture Exchange Communication System (PECS) training for teachers of children with autism: A pragmatic, group randomised controlled trial. *Journal of Child Psychology & Psychiatry*, *48*, 473–481. doi:10.1111/j.1469-7610.2006.01707.x

Howlin, P., Magiati, I., & Charman, T. (2009). Systematic review of early intensive behavioral interventions for children with autism. *American Journal of Intellectual and Developmental Disabilities*, *114*, 23–41. doi:10.1352/2009.114:23;nd41

Ingersoll, B. (2010). Brief report: Pilot randomized controlled trial of reciprocal imitation training for teaching elicited and spontaneous imitation to children with autism. *Journal of Autism and Developmental Disorders*, *40*, 1154–1160. doi:10.1007/s10803-010-0966-2

Ingersoll, B. (2012). Brief report: Effect of a focused imitation intervention on social functioning in children with autism. *Journal of Autism and Developmental Disorders*, *42*, 1768–1773. doi:10.1007/s10803-011-1423-6

Ingersoll, B., & Lalonde, K. (2010). The impact of object and gesture imitation training on language use in children with autism spectrum disorder. *Journal of Speech, Language, and Hearing Research*, *53*, 1040–1051. doi:10.1044/1092-4388(2009/09-0043)

Ingersoll, B., & Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: Effects on language, pretend play, and joint attention. *Journal of Autism and Developmental Disorders*, *36*, 487–505. doi:10.1007/s10803-006-0089-y

Ingersoll, B., Dvortcsak, A., Whalen, C., & Sikora, D. (2005). The effects of a developmental, social-pragmatic language intervention on rate of expressive language production in young children with autistic spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *20*, 213–222. doi:10.1177/10883576050200040301.

Interagency Autism Coordinating Committee. (2014, April). *IACC strategic plan for autism spectrum disorder (ASD) research –2013 Update. Retrieved from the U.S. Department of Health and Human Services Interagency Autism Coordinating Committee* website: http://iacc.hhs.gov/strategic-plan/2013/index.shtml

Iovannone, R., Dunlap, G., Huber, H., & Kincaid, D. (2003). Effective educational practices for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, *18*, 150–165. doi:10.1177/10883576030180030301

Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology*, *59*, 12–19. doi:10.1037/0022-006x.59.1.12

Jocelyn, L. J., Casiro, O. G., Beattie, D., Bow, J., & Kneisz, J. (1998). Treatment of children with autism: A randomized controlled trial to evaluate a caregiver-based intervention program in community day-care centers. *Journal of Developmental & Behavioral Pediatrics*, *19*, 326–334. doi:10.1097/00004703-199810000-00002

Kaale, A., Fagerland, M. W., Martinsen, E. W., & Smith, L. (2014). Preschool-based social-communication treatment for children with autism: 12-month follow-up of a randomized trial. *Journal of the American Academy of Child & Adolescent Psychiatry*, *53*, 188–198. doi:10.1016/j.jaac.2013.09.019

Kaale, A., Smith, L., & Sponheim, E. (2012). A randomized controlled trial of preschool-based joint attention intervention for children with autism. *Journal of Child Psychology and Psychiatry*, *53*, 97–105. doi:10.1111/j.1469-7610.2011.02450.x

Kaiser, A. P., Hancock, T. B., & Nietfeld, J. P. (2000). The effects of parent-implemented enhanced milieu teaching on the social communication of children who have autism. *Early Education & Development*, *11*, 423–446. doi:10.1207/s15566935eed1104_4

Kasari, C. (2002). Assessing change in early intervention programs for children with autism. *Journal of Autism and Developmental Disorders*, *32*, 447–462.

Kasari, C., Freeman, S., & Paparella, T. (2006). Joint attention and symbolic play in young children with autism: A randomized controlled intervention study. *Journal of Child Psychology and Psychiatry*, *47*, 611–620. doi:10.1111/j.1469-7610.2005.01567.x

Kasari, C., Gulsrud, A., Freeman, S., Paparella, T., & Hellemann, G. (2012). Longitudinal follow-up of children with autism receiving targeted interventions on joint attention and play. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*, 487–495. doi:10.1016/j.jaac.2012.02.019

Kasari, C., Gulsrud, A. C., Wong, C., Kwon, S., & Locke, J. (2010). Randomized controlled caregiver mediated joint engagement intervention for toddlers with autism. *Journal of Autism and Developmental Disorders*, *40*, 1045–1056. doi:10.1007/s10803-010-0955-5

Kasari, C., Paparella, T., Freeman, S., & Jahromi, L. B. (2008). Language outcome in autism: Randomized comparison of joint attention and play interventions. *Journal of Consulting and Clinical Psychology*, *76*, 125–137. doi:10.1037/0022-006x.76.1.125

Kasari, C., & Smith, T. (2013). Interventions in schools for children with autism spectrum disorder: Methods and recommendations. *Autism*, *17*, 254–267. doi:10.1177/1362361312470496

Keen, D., Couzens, D., Muspratt, S., & Rodger, S. (2010). The effects of a parent-focused intervention for children with a recent diagnosis of autism spectrum disorder on parenting stress and competence. *Research in Autism Spectrum Disorders*, *4*, 229–241. doi:10.1016/j.rasd.2009.09.009

Kendall, T., Megnin-Viggars, O., Gould, N., Taylor, C., Burt, L. R., & Baird, G., on behalf of the Guideline Development Group. (2013). Management of autism in children and young people: Summary of NICE and SCIE guidance. *British Medical Journal*, *347*, f4865. doi:10.1136/bmj.f4865

Klintwall, L., & Eikeseth, S. (2012). Number and controllability of reinforcers as predictors of individual outcome for children with autism receiving early and intensive behavioral intervention: A preliminary study. *Research in Autism Spectrum Disorders*, *6*, 493–499. doi:10.1016/j.rasd.2011.07.009

Koegel, L. K., Koegel, R. L., Shoshan, Y., & McNerney, E. (1999). Pivotal response intervention II: Preliminary long-term outcome data. *Research and Practice for Persons with Severe Disabilities*, *24*, 186–198. doi:10.2511/rpsd.24.3.186

Koegel, R. L., & Koegel, L. K. (2006). *Pivotal response treatments for autism: Communication, social, and academic development*. Baltimore, MD: Brookes.

Koegel, R. L., Schreibman, L., Good, A., Cerniglia, L., Murphy, C., & Koegel, L. K. (1989). *How to teach pivotal behaviors to children with autism: A training manual*. Retrieved from http://www.users.qwest.net/~tbharris/prt.htm

Kovshoff, H., Hastings, R. P., & Remington, B. (2011). Two-year outcomes for children with autism after the cessation of early intensive behavioral intervention. *Behavior Modification*, *35*, 427–450. doi:10.1177/0145445511405513

Kraijer, D. (1999). Autism and Autistic-like Conditions in Mental Retardation. *Journal of Intellectual Disability Research*, *43*(4), 341–343. doi:10.1046/j.1365-2788.1999.00043-4-2.x

Kuhn, L. R., Bodkin, A. E., Devlin, S. D., & Doggett, R. A. (2008). Using pivotal response training with peers in special education to facilitate play in two children with autism. *Education and Training in Developmental Disabilities*, *43*, 37.

Landa, R. J., Holman, K. C., O'Neill, A. H., & Stuart, E. A. (2011). Intervention targeting development of socially synchronous engagement in toddlers with autism spectrum disorder: A randomized controlled trial. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *52*, 13–21. doi:10.1111/j.1469-7610.2010.02288.x

Laupacis, A., Sackett, D. L., & Roberts, R. S. (1988). An assessment of clinically useful measures of the consequences of treatment. *New England Journal of Medicine*, *318*, 1728–1733. doi:10.1056/nejm198806303182605

Lawton, K., & Kasari, C. (2012). Teacher-implemented joint attention intervention: Pilot randomized controlled study for preschoolers with autism. *Journal of Consulting and Clinical Psychology*, *80*, 687–693. doi:10.1037/a0028506

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage.

Lord, C., Carr, T., & Grzadzinaski, R. (2013, May). Measuring emerging changes in social communication. In L. B. Adamson & C. Kasari (Chairs), *Measuring treatment change in core symptoms: Novel methods, meaningful outcomes*. Symposium conducted at the International Meeting For Autism Research, San Sebastian, Spain.

Lord, C., Wagner, A., Rogers, S., Szatmari, P., Aman, M., Charman, T., ... Yoder, P. (2005). Challenges in evaluating psychosocial interventions for autistic spectrum disorders. *Journal of Autism and Developmental Disorders*, *35*, 696–708. doi:10.1007/s10803-005-0017-6

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, *55*, 3–9. doi:10.1037/0022-006x.55.1.3

Magiati, I., Charman, T., & Howlin, P. (2007). A two-year prospective follow-up study of community-based early intensive behavioural intervention and specialist nursery provision for children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, *48*, 803–812. doi:10.1111/j.1469-7610.2007.01756.x

Magiati, I., Moss, J., Charman, T., & Howlin, P. (2011). Patterns of change in children with autism spectrum disorders who received community based comprehensive interventions in their pre-school years: A seven year follow up study. *Research in Autism Spectrum Disorders*, *5*, 1016–1027. doi:10.1016/j.rasd.2010.11.007

Maglione, M. A., Gans, D., Das, L., Timbie, J., & Kasari, C., for the Technical Expert Panel, HRSA Autism Intervention Research - Behavioral (AIR-B) Network. (2012). Nonmedical interventions for children with ASD: Recommended guidelines and further research needs. *Pediatrics*, *130*, S169–S178. doi:10.1542/peds.2012-09000

Makrygianni, M. K., & Reed, P. (2010). A meta-analytic review of the effectiveness of behavioural early intervention programs for children

with autistic spectrum disorders. *Research in Autism Spectrum Disorders*, *4*, 577–593. doi:10.1016/j.rasd.2010.01.014

Mandell, D. S., Stahmer, A. C., Shin, S., Xie, M., Reisinger, E., & Marcus, S. C. (2013). The role of treatment fidelity on outcomes during a randomized field trial of an autism intervention. *Autism*, *17*, 281–295. doi:10.1177/1362361312473666

McHugh, R. K., & Barlow, D. H., (Eds.). (2012). *Dissemination and implementation of evidence-based interventions*. Cary, NC: Oxford University Press.

McPheeters, M. L., Warren, Z., Sathe, N., Bruzek, J. L., Krishnaswami, S., Jerome, R. N., & Veenstra-VanderWeele, J. (2011). A systematic review of medical treatments for children with autism spectrum disorders. *Pediatrics*, *127*, e1312–e1321. doi:10.1542/peds.2011-0427

Mesibov, G. B., Shea, V., & Schopler, E. (2004). *The TEACCH approach to autism spectrum disorders*. New York, NY: Springer.

Moher, D., Hopewell, S., Schulz, K. F., Montori, V., Gøtzsche, P. C., Devereaux, P. J., … Altman, D. G. (2010). CONSORT 2010 explanation and elaboration: Updated guidelines for reporting parallel group randomised trial. *British Medical Journal*, *340*, c869. doi:10.1136/bmj.c869

Mullen, E. (1995). *Mullen scales of early learning*. Circle Pines, MN: American Guidance Service.

Murnane, R. J., & Willett, J. B. (2010). *Methods matter: Improving causal inference in educational and social science research*. New York, NY: Oxford University Press.

Mundy, P., & Crowson, M. (1997). Joint attention and early social communication: Implications for research on intervention with autism. *Journal of Autism and Developmental Disorder*, *27*, 653–676.

Myers, S. M., & Johnson, C. P. (2007). Management of children with autism spectrum disorders. *Pediatrics*, *120*, 1162–1182.

Odom, S. L., Boyd, B. A., Hall, L. J., & Hume, K. (2010). Evaluation of comprehensive treatment models for individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *40*, 425–436. doi:10.1007/s10803-009-0825-1

Odom, S. L., Brown, W. H., Frey, T., Karasu, N., Smith-Canter, L. L., & Strain, P. S. (2003). Evidence-based practices for young children with autism: Contributions for single-subject design research. *Focus on Autism and Other Developmental Disabilities*, *18*, 166–175. doi:10.1177/10883576030180030401

Oono, I. P., Honey, E. J., & McConachie, H. (2013). Parent-mediated early intervention for young children with autism spectrum disorders (ASD). *Evidence-Based Child Health: A Cochrane Review Journal*, *8*, 2380–2479. doi:10.1002/ebch.1952

Oosterling, I., Visser, J., Swinkels, S., Rommelse, N., Donders, R., Woudenberg, T., … Buitelaar, J. (2010). Randomized controlled trial of the focus parent training for toddlers with autism: 1-year outcome. *Journal of Autism and Developmental Disorders*, *40*, 1447–1458. doi:10.1007/s10803-010-1004-0

Pajareya, K., & Nopmaneejumruslers, K. (2011). A pilot randomized controlled trial of DIR/Floortime™ parent training intervention for pre-school children with autistic spectrum disorders. *Autism*, *15*, 563–577. doi:10.1177/1362361310386502

Perry, A., Cummings, A., Geier, J. D., Freeman, N. L., Hughes, S., LaRose, L., … Williams, J. (2008). Effectiveness of intensive behavioral intervention in a large, community-based program. *Research on Autism Spectrum Disorders*, *2*, 621–642. doi:10.1016/j.rasd.2008.01.002

Peters-Scheffer, N., Didden, R., Mulders, M., & Korzilius, H. (2010). Low intensity behavioral treatment supplementing preschool services for young children with autism spectrum disorders and severe to mild intellectual disability. *Research in Developmental Disabilities*, *31*, 1678–1684. doi:10.1016/j.ridd.2010.04.008

Preston, D., & Carter, M. (2009). A review of the efficacy of the picture exchange communication system intervention. *Journal of Autism and Developmental Disorders*, *39*, 1471–1486. doi:10.1007/s10803-009-0763-y

Prizant, B. M., & Wetherby, A. M. (2005). Critical issues in enhancing communication abilities for persons with autism spectrum disorders. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental dsorders, Vol. 2: Assessment, interventions, and policy* (3rd ed., pp. 925–945). Hoboken, NJ: Plenum Press.

Region 6 Autism Connection. (2006). *Working together to complete the puzzle* (3rd ed.). Retrieved from http://www.vmrc.net/Adobe_Files/EIBT.pdf

Reichow, B. (2012). Overview of meta-analyses on early intensive behavioral intervention for young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *42*, 512–520. doi:10.1007/s10803-011-1218-9

Reichow, B., Barton, E. E., Boyd, B. A., & Hume, K. (2012). Early intensive behavioral intervention (EIBI) for young children with autism spectrum disorders. *Cochrane Database of Systematic Reviews*, 10. Art. No. CD009260.

Reichow, B., & Wolery, M. (2009). Comprehensive synthesis of early intensive behavioral interventions for young children with autism based on the UCLA Young Autism Project Model. *Journal of Autism and Developmental Disabilities*, *39*, 23–41. doi:10.1007/s10803-008-0596-0

Remington, B., Hastings, R. P., Kovshoff, H., degli Espinosa, F., Jahr, W., Brown, T., … Ward, N. (2007). A field effectiveness study of early intensive behavioral intervention: Outcomes for children with autism and their parents after two years. *American Journal on Mental Retardation*, *112*, 418–438.

Roberts, J., Williams, K., Carter, M., Evans, D., Parmenter, T., Silove, N., … Warren, A. (2011). A randomised controlled trial of two early intervention programs for young children with autism: Centre-based with parent program and home-based. *Research in Autism Spectrum Disorders*, *5*, 1553–1566. doi:10.1016/j.rasd.2011.03.001

Rogers, S. J. (1998). Neuropsychology of autism in young children and its implications for early intervention. *Mental Retardation and Developmental Disabilities Research Reviews*, *4*, 104–112. doi:10.1002/(sici)1098-2779(1998)4:2<104::aid-mrdd7>3.3.co;2-m

Rogers, S. J., & Dawson, G. (2009). *Early Start Denver Model for young children with autism: Promoting language, learning, and engagement*. New York, NY: Guilford.

Rogers, S. J., Estes, A., Lord, C., Vismara, L., Winter, J., Fitzpatrick, A., … Dawson, G. Effects of a Brief Early Start Denver Model (ESDM) based parent intervention on toddlers at risk for Autism Spectrum Disorders: A randomized controlled trial. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*(10), 1052–1065. doi:10.1016/j.jaac.2012.08.003

Rogers, S. J., & Vismara, L. A. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child & Adolescent Psychology*, *37*, 8–38. doi:10.1080/15374410701817808

Roid, G. H. (2003). *Stanford-Binet intelligence scales, examiner manual* (5th ed.). Itasca, IL: Riverside.

Sallows, G. D., & Graupner, T. D. (2005). Intensive behavioral treatment for children with autism: Four-year outcomes and predictors. *American Journal on Mental Retardation*, *110*, 417–438. doi:10.1352/0895-8017(2005)110[417:ibtfcw]2.0.co;2

Schopler, E., Reichler, R. J., & Renner, B. R. (1988). *Childhood autism rating scale*. Austin, TX: Pro-Ed.

Schreibman, L., Dawson, G., Stahmer, A. C., Landa, R., Rogers, S. J., McGee, G. G., … Halladay, A. (2015). Naturalistic developmental behavioral interventions: Empirically validated treatments for autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *45*, 2411–2428. doi:10.1007/s10803-015-2407-8

Schreibman, L., & Stahmer, A. C. (2014). A randomized trial comparison of the effects of verbal and pictorial naturalistic communication strategies on spoken language for young children with autism.

Journal of Autism and Developmental Disorders, *44*, 1244–1251. doi:10.1007/s10803-013-1972-y

Sham, E., & Smith, T. (2014). Publication bias in studies of an applied behavior-analytic intervention: An initial analysis. *Journal of Applied Behavior Analysis*, *47*, 663–678. doi:10.1002/jaba.146

Shane, H., Laubscher, E. H., Schlosser, R. W., Flynn, S., Sorce, J. F., & Abramson, J. (2012). Applying technology to visually support language and communication in individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *42*, 1228–1235. doi:10.1007/s10803-011-1304-z

Sharp, W. G., Jaquess, D. L., Morton, J. F., & Herzinger, C. V. (2010). Pediatric feeding disorders: A quantitative synthesis of treatment outcomes. *Clinical Child and Family Psychology Review*, *13*, 348–365. doi:10.1007/s10567-010-0079-7

Sheinkopf, S. J., & Siegel, B. (1998). Home-based behavioral treatment of young children with autism. *Journal of Autism and Developmental Disorders*, *28*, 15–23.

Siegel, M., & Beaulieu, A. A. (2012). Psychotropic medications in children with autism spectrum disorders: A systematic review and synthesis for evidence-based practice. *Journal of Autism and Developmental Disorders*, *42*, 1592–1605. doi:10.1007/s10803-011-1399-2

Siller, M., Hutman, T., & Sigman, M. (2013). A parent-mediated intervention to increase responsive parental behaviors and child communication in children with ASD: A randomized clinical trial. *Journal of Autism and Developmental Disorders*, *43*, 540–555. doi:10.1007/s10803-012-1584-y

Siller, M., Morgan, L., Turner-Brown, L., Baggett, K. M., Baranek, G. T., Brian, J., … Zwaigenbaum, L. (2014). Designing studies to evaluate parent-mediated interventions for toddlers with autism spectrum disorder. *Journal of Early Intervention*, *35*, 355–377. doi:10.1177/1053815114542507

Siller, M., Swanson, M., Gerber, A., Hutman, T., & Sigman, M. (2014). A parent-mediated intervention that targets responsive parental behaviors increases attachment behaviors in children with ASD: Results from a randomized clinical trial. *Journal of Autism and Developmental Disorders*, *44*, 1720–1732. doi:10.1007/s10803-014-2049-2

Silverman, W. K., & Hinshaw, S. P. (2008). The second special issue on evidence-based psychosocial treatments for children and adolescents: A 10-year update. *Journal of Clinical Child & Adolescent Psychology*, *37*, 1–7. doi:10.1080/15374410701817725

Simpson, R. L., Mundschenk, N. A., & Heflin, L. J. (2011). Issues, policies, and recommendations for improving the education of learners with autism spectrum disorders. *Journal of Disability Policy Studies*, *22*, 3–17. doi:10.1177/1044207310394850

Smith, T. (2010). Early and intensive behavioral intervention in autism. In J. R. Weisz & A. E. Kazdin (Eds.), *Evidence-based psychotherapies for children and adolescents* (2nd ed., pp. 312–326). New York, NY: Guilford.

Smith, T. (2011). Applied behavior analysis and early intensive intervention. In D. G. Amaral, G. Dawson & D. H. Geschwind (Eds.), *Autism spectrum disorders* (pp. 1037–1055). New York, NY: Oxford University Press.

Smith, T. (2012). Evolution of research on interventions for children with autism spectrum disorder: Implications for behavior analysts. *The Behavior Analyst*, *35*, 101–113.

Smith, T. (2013). What is evidence-based behavior analysis? *The Behavior Analyst*, *36*, 7–33.

Smith, T., Groen, A. D., & Wynn, J. W. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation*, *4*, 269–285. doi:10.1352/0895-8017(2000)105<0269:rtoiei>2.0.co;2

Smith, T., Klorman, R., & Mruzek, D. W. (2015). Predicting outcome of community-based early intensive behavioral intervention for children with autism. *Journal of Abnormal Child Psychology*. Advance online publication. doi:10.1007/s10802-015-0002-2

Smith, T., Scahill, L., Dawson, G., Guthrie, D., Lord, C., Odom, S., … Wagner, A. (2007). Designing research studies on psychosocial interventions in autism. *Journal of Autism and Developmental Disorders*, *37*, 354–366. doi:10.1007/s10803-006-0173-3

Solomon, R., Van Egeren, L. A., Mahoney, G., Quon Huber, M. S., & Zimmerman, P. (2014). PLAY Project Home Consultation intervention program for young children with autism spectrum disorders: A randomized controlled trial. *Journal of Developmental and Behavioral Pediatrics*, *35*, 475–485. doi:10.1097/dbp.0000000000000096

Southam-Gerow, M. A., & Prinstein, M. J. (2014). Evidence base updates: the evolution of the evaluation of psychological treatments for children and adolescents. *Journal of Clinical Child & Adolescent Psychology*, *43*, 1–6. doi:10.1080/15374416.2013.855128

Sparrow, S., Cicchetti, D., & Balla, D. (2005). *Vineland adaptive behavior scales: (Vineland II), survey interview form/caregiver rating form*. Livonia, MN: Pearson Assessments.

Spreckley, M., & Boyd, R. (2009). Efficacy of applied behavioral intervention in preschool children with autism for improving cognitive, language, and adaptive behavior: A systematic review and meta-analysis. *The Journal of Pediatrics*, *154*, 338–344. doi:10.1016/j.jpeds.2008.09.012

Strain, P. S., & Bovey, E. H. (2011). Randomized control trial of the LEAP model of early intervention for young children with autism spectrum disorders. *Topics in Early Childhood Special Education*, *31*, 133–154. doi:10.1177/0271121411408740

Strauss, K., Vicari, S., Valeri, G., D'Elia, L., Arima, S., & Fava, L. (2012). Parent inclusion in early intensive behavioral intervention: The influence of parental stress, parent treatment fidelity and parent-mediated generalization of behavior targets on child outcomes. *Research in Developmental Disabilities*, *33*, 688–703. doi:10.1016/j.ridd.2011.11.008

Taylor, J. L., Dove, D., Veenstra-VanderWeele, J., Sathe, N. A., McPheeters, M. L., Jerome, R. N., & Warren, Z. (2012). *Interventions for adolescents and young adults with autism spectrum disorders. Comparative effectiveness review No. 65* (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290–2007-10065-I; AHRQ Publication No. 12-EHC063-EF). Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from http://www.effectivehealthcare.ahrq.gov/reports/final.cfm

Thompson, T. (2007). *Making sense of autism*. Baltimore, MD: Brookes.

Tien, K-C. (2008). Effectiveness of the picture exchange communication system as a functional communication intervention for individuals with autism spectrum disorders: A practice-based research synthesis. The entity from which ERIC acquires the content, including journal, organization, and conference names, or by means of online submission from the author. *Education and Training in Developmental Disabilities*, *43*, 61–76.

Tincani, M., & Devis, K. (2010). Quantitative synthesis and component analysis of single-participant studies on the Picture Exchange Communication System. *Remediation and Special Education*, *32*, 458–470. doi:10.1177/0741932510362494

Tonge, B., Brereton, A., Kiomall, M., Mackinnon, A., & Rinehart, N. J. (2014). A randomised group comparison controlled trial of 'preschoolers with autism': a parent education and skills training intervention for young children with autistic disorder. *Autism*, *18*, 166–177. doi:10.1177/1362361312458186

Venker, C. E., McDuffie, A., Weismer, S. E., & Abbeduto, L. (2012). Increasing verbal responsiveness in parents of children with autism: A pilot study. *Autism*, *16*, 568–585. doi:10.1177/1362361311413396

Virues-Ortega, J., Julio, F. M., & Pastor-Barriuso, R. (2013). The TEACCH program for children and adults with autism: A meta-analysis of intervention studies. *Clinical Psychology Review*, *33*, 940–953. doi:10.1016/j.cpr.2013.07.005

Volkmar, F. R., Paul, R, Rogers, S. J., & Pelphrey, K. A., (Eds.). (2014). *Handbook of autism and pervasive developmental disorders* (4th ed.). New York, NY: Wiley.

Wallace, K. S., & Rogers, S. J. (2010). Intervening in infancy: Implications for autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, *51*, 1300–1320. doi:10.1111/j.1469-7610.2010.02308.x

Wang, P. (2008). Effects of a parent training program on the interactive skills of parents of children with autism in China. *Journal of Policy and Practice in Intellectual Disabilities*, *5*, 96–104. doi:10.1111/j.1741-1130.2008.00154.x

Warren, Z., McPheeters, M. L., Sathe, N., Foss-Feig, J. H., Glasser, A., & Veenstra-VanderWeele, J. (2011). A systematic review of early intensive intervention for autism spectrum disorders. *Pediatrics*, *127*, e1303. doi:10.1542/peds.2011-0426

Warren, Z., Veenstra-VanderWeele, J., Stone, W., Bruzek, J. L., Nahmias, A. S., Foss-Feig, J. H., … McPheeters, M. L. (2011). *Therapies for children with autism spectrum disorders. Comparative effectiveness Review No. 26* (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290–2007-10065-I; AHRQ Publication No. 11-EHC029-EF). Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from http://www.effectivehealthcare.ahrq.gov/reports/final.cfm

Wechsler, D. (2002). *Wechsler preschool and primary scale of intelligence*. San Antonio, TX: The Psychological Corporation.

Weitlauf, A., McPheeters, M., Peters, B., Sathe, N., Travis, R., Aiello, R., … Warren, Z. (2014). *Therapies for children with autism spectrum disorders – Behavioral interventions update* (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290–2007-10065-I; AHRQ Publication No. EHC-2013–09-0038.R1). Rockville, MD: Agency for Healthcare Research and Quality.

What Works Clearinghouse. (2010). *Lovaas model of applied behavior analysis*. Retrieved from http://ies.ed.gov/ncee/wwc/interventionreport.aspx?sid=295

Wilson, D. B. (n.d.). *Practical meta-analysis effect size calculator*. Retrieved from http://www.campbellcollaboration.org/escalc/html/EffectSizeCalculator-SMD5.php

Wong, C., Odom, S. L., Hume, K., Cox, A. W., Fettig, A., Kucharczyk, S., … Schultz, T. R. (2013). *Evidence-based practices for children, youth, and young adults with Autism Spectrum Disorder*. Chapel Hill: The University of North Carolina, Frank Porter Graham Child Development Institute, Autism Evidence-Based Practice Review Group.

Yoder, P., & Stone, W. L. (2006a). A randomized comparison of the effect of two prelinguistic communication interventions on the acquisition of spoken communication in preschoolers with ASD. *Journal of Speech, Language, and Hearing Research*, *49*, 698–711. doi:10.1044/1092-4388(2006/051)

Yoder, P., & Stone, W. L. (2006b). Randomized comparison of two communication interventions for preschoolers with autism spectrum disorders. *Journal of Consulting and Clinical Psychology*, *74*, 426–435. doi:10.1037/0022-006x.74.3.426

Zachor, D. A., & Itzchak, E. B. (2010). Treatment approach, autism severity and intervention outcomes in young children. *Research in Autism Spectrum Disorders*, *4*, 425–432. doi:10.1016/j.rasd.2009.10.013

Zimmerman, I. L., Steiner, V. G., & Pond, R. E. (2001). *Preschool language scale* (4th ed.). San Antonio, TX: The Psychology Corporation.