Effectiveness of Community-based Early Intervention for

Children with Autism Spectrum Disorder: A Meta-Analysis

Abbreviated Title: Community-based EI for ASD

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Abstract

Background: Research trials of early intervention (EI) programs for children with autism spectrum disorder (ASD) generally produce medium-to-large gains, on average, compared to "treatment as usual," in different developmental domains. Almost all children with ASD receive their treatment through community-based services, however, and studies suggest that evidence-based interventions rarely make their way into community practice. Understanding the effects of community-based EI and factors associated with these effects is the first step in developing strategies for wide-scale implementation of effective EI.

Methods: Studies of community-based EI for children with ASD were identified through a systematic search. Changes in cognitive, communication, social, and adaptive functioning from pre-treatment to post-treatment were assessed using standardized mean gain scores. Effect sizes were estimated using random effects models. Moderators of interest included type of community EI program, year of publication, intervention duration, and sample selection. Moderator effects were assessed using analysis of variance of mixed-effects models and meta-regression analyses.

Results: Forty-six groups from 33 studies met inclusion criteria (1713 participants, mean age 37.4 months, 81.1% male). There were small but significant gains in each of the four domains. Hedges's g ranged from 0.21 for adaptive behavior to 0.31 for communication outcomes, after removing outliers and correcting for publication bias. EI programs associated with

universities and hospitals were generally superior to other community EI programs across all four outcomes. Only communication outcomes demonstrated increasingly larger effect sizes in more recent years. Intervention duration was negatively associated with effect sizes for communication and adaptive behavior outcomes.

Conclusions: These results indicate that there remains a large gap between outcomes observed in research and community settings.

Keywords: Autism Spectrum Disorders, meta-analysis, early intervention, community programmes

Abbreviations: ASD = Autism Spectrum Disorder, EI = Early Intervention

Effectiveness of Community-based Early Intervention for Children with

Autism Spectrum Disorder: A Meta-Analysis

Early intervention provided by university-based experts can result in large gains in cognition, communication, social skills, and adaptive behavior for young children with autism spectrum disorder (ASD). Early intensive behavior interventions (EIBI) and those based on applied behavior analysis (ABA) have the most evidence. Systematic reviews and meta-analyses of randomized trials find positive effects of both highly-structured, behaviorally-based early intervention and naturalistic developmental behavioral interventions on many developmental domains for young children with ASD (Murza, Schwartz, Hahs-Vaughn, & Nye, 2016; Nevill, Lecavalier, & Stratis, 2018; Reichow, 2012; Reichow, Barton, Boyd, & Hume, 2012).

These studies are encouraging, but do not speak to probable outcomes in care received outside of research studies, otherwise known as "treatment as usual." Evidence-based interventions rarely are implemented in community practice (Hess, Morrier, Heflin, & Ivey, 2008; Stahmer, Collings, & Palinkas, 2005). Although some research demonstrates that community providers can deliver evidence-based interventions for ASD effectively (Shire & Kasari, 2014; Shire et al., 2017), less research has examined outcomes for children with ASD in the community. The few studies reporting child outcomes in community-based intervention find that gains are smaller than those seen in randomized trials. Often these studies include data from a

single site or a small sample, limiting their generalizability (Ben-Itzchak,

Watson, & Zachor, 2014; Magiati, Charman, & Howlin, 2007).

To date, no systematic review or meta-analysis has examined

community outcomes for young children with ASD. The present study

leverages studies of community EI for ASD and control groups from trials of

early intervention. Here we combine community groups across studies to

provide a rigorous assessment of outcomes from community-based

interventions and explore patterns in the results.

Quantifying these outcomes using meta-analytic techniques (1)

provides a benchmark against which other community programs can be

measured, (2) identifies models of excellence that can be emulated, (3)

examines program characteristics that may be associated with positive

outcomes and (4) explores whether there have been changes over time in

the effectiveness of community intervention.

Methods

Search Procedures and Selection of Studies

Studies were included that met these criteria:

a) Published, written in English

b) Prospective, pre-test, post-test group design

c) Presented outcomes for children with ASD separately

d) Included more than 10 children with ASD receiving community-

based intervention

e) Child age at study intake was less than 73 months

f) Provided information on outcomes of educational or behavioral services available in the community or treatment as usual for some portion of participants. Groups that received intervention provided by researchers were excluded.

g) Outcome measures included at least one of the following, reported as standard scores or developmental quotients:

    a. Cognitive: Early Learning Composite from the Mullen Scales of Early Learning (MSEL, Mullen (1995)), or Full Scale IQ.

    b. Communication: Vineland Adaptive Behavior Scales (VABS) Communication domain (Sparrow, Balla, & Cicchetti, 1985; Sparrow, Cicchetti, & Balla, 2005)

    c. Social: VABS Socialization domain (Sparrow et al., 1985, 2005)

    d. Adaptive Behavior: VABS Composite (Sparrow et al., 1985, 2005)

h) Reported unadjusted pre- and post- intervention means and standard deviations for outcome measures (based on recommendation from the What Works Clearinghouse (2014)

Studies only reporting follow-up data were excluded. For studies with overlapping (or potentially overlapping) samples, the study with the largest sample for each outcome was used.

A systematic search of research databases was conducted through January 2018 to identify relevant studies. PsycINFO and Medline databases were searched for terms related to *autism* and *intervention* (see Appendix A for a sample search strategy). The reference list of retrieved articles, existing reviews, and meta-analyses were also examined for eligible studies.

Studies were first screened for eligibility based on title and abstract using these exclusion criteria: a) did not include children with ASD, b) n ≤ 10 children with ASD, c) not written in English, d) participants outside the age range, and e) did not include a behavioral intervention. The first author and reliable coders conducted screening and then full-text review for eligibility. The first author completed final review based on inclusion criteria (described above). See Figure 1 for the PRISMA flow diagram (Liberati et al., 2009).

INSERT FIGURE 1 HERE.

Study Coding

The first author extracted and coded data regarding participant, intervention, and study characteristics presented in Appendix B (Tables 1B and 2B). EI programs were categorized as: a) "Model" programs (MO): intervention in the community associated with universities and/or hospitals, b) "Treatment As Usual" (TAU): treatment from a local school/agency or standard educational provisions, and c) "Variable EI" (VAR): a wait-list group, services as usual in the community where participants received an undefined variety of services or where some participants may not have received any

services. Study design was coded based on the following criteria: a) "Single" (SI): reported outcomes from one community program, b) "Comparison to other community groups" (CC): compared community programs, c) "Comparison to experimental group" (CE): the community group was the control group for a researcher-implemented treatment, and d) "Other:" did not fit the other categories. Treatment group allocation was coded based on the following criteria: a) "Random assignment" (RA): participants assigned to groups utilizing random assignment, b) "Standard assignment" (SA): participants assigned to groups based on standard community practice, c) "Not applicable" (NA): included a single treatment group, and d) "Other:" did not fit the other categories.

Analyses

All outcome data were continuous. Changes between baseline and posttreatment assessments were evaluated using standardized mean gain scores. Effect sizes were calculated by dividing the mean change from baseline to post-treatment by the pooled standard deviation of the difference score, and transformed to Hedges's g estimates (Hedges, 1981) to correct potential bias from small sample sizes.

No study reported data needed to calculate pretest-posttest correlations among outcome measures. Test-retest reliabilities from test manuals and published papers were used as proxies (Lipsey and Wilson, (2001). Because test-retest reliability may overestimate pretest-posttest

correlations, sensitivity analyses with *r* values of 0.3 (low), 0.5 (medium), and 0.8 (high) were conducted. Effect sizes were similar, so the test-retest reliabilities was used.

Potential outliers were detected using the sample-adjusted meta-analytic deviancy (SAMD) statistic; including extreme studies may overestimate true variability (Huffcutt & Arthur, 1995). A conservative cutoff of |2.58| was used to exclude groups from analyses (Beal, Corey, & Dunlap, 2002). SAMDs were rank-ordered and scree plots were examined to confirm outlier status.

Weighted mean effect sizes, heterogeneity, moderators, and publication bias statistics were calculated using Comprehensive Meta-Analysis Version 3.3.070 (Borenstein, Hedges, Higgins, & Rothstein, 2014). Separate random effects models were conducted for cognitive, communication, social, and adaptive behavior outcomes, as recommended by Bornstein, Hedges, Higgins, and Rothstein (2009) and Lipsey and Wilson (2001). Effect sizes were weighted to account for its relative precision based on the standard error of the effect size and tau-squared using the reciprocal of the squared standard error plus tau-squared. Study quality was not used to weight effect sizes due to inconsistent reporting.

Heterogeneity of effect sizes was examined using the Q and I^2 statistics. Exploratory moderator analyses were conducted for models with a significant Q statistic or an $I^2 \geq 50$, indicating at least moderate

heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). Categorical moderators were examined using an analysis-of-variance (ANOVA) of mixed-effect models for each variable hypothesized to moderate the overall effect size. Meta-regression analyses were used to examine continuous moderators: age of the sample at intake, intervention duration, approximate hours of intervention, and year of publication. Year of publication was used as a proxy for recency of intervention, as <50% of studies reported when the intervention occurred. Adjusted meta-regression was used to examine differences by EI category controlling for other covariates. Due to the small number of studies, only statistically significant moderators were included in adjusted analysis.

To assess publication bias, funnel plots and Duval and Tweedie's (2000) trim-and-fill procedure were calculated. Model estimates were calculated using the trim-and-fill correction when this test indicated significant asymmetry in the funnel plot.

Results

Study Characteristics

Appendix B Table 1B displays sample characteristics of the 46 groups from 33 studies included in the analysis. Participants were predominantly male (81.1%); mean age was 37.4 months. Thirteen studies (40%) reported information on participant race and ethnicity. On average, studies had 32%

non-white participants (range: 14.0% - 72.6%). Seventeen studies (51.5%) reported parental education or income. Twenty-six groups (56.5%, 868 participants) reported cognitive outcomes, 26 groups (56.5%, 885 participants) reported communication outcomes, 26 groups (56.5%, 945 participants) reported social outcomes, and 27 groups (58.7%, 1,141 participants) reported adaptive behavior outcomes eligible for inclusion.

Appendix B Table 2B displays intervention characteristics for included groups. Studies took place in the United States (36.4%), Australia (21.2%), United Kingdom (18.2%), Italy (6.1%), Israel (6.1%), Canada (3.0%), Norway (3.0%), Sweden (3.0%), and Taiwan (3.0%). Only 23 groups (50.0%) reported the years over which the intervention occurred (range: 1995 to 2003 (Cohen, Amerine-Dickens, & Smith, 2006) to 2013 to 2014 (Whitehouse et al., 2017)). Mean intervention duration was 13.8 months (range: three - 36 months). Forty groups (82.5%) reported intervention intensity. Treatment groups included TAU (52.2%), Model programs (28.2%), or a mix of EI services varying in the amount and type of intervention (19.6%).

Uncontrolled Effect Sizes

Table 1 and Figure 2 present the uncontrolled effect sizes and the results of the random effects models for all outcomes. Studies excluded from specific analyses due to sample overlap or high SAMD value are noted in Appendix C. When funnel plots (Appendix D) indicated a need for corrected effect sizes those are reported.

INSERT TABLE 1 HERE

INSERT FIGURE 2 HERE

Cognitive. Hedges's g ranged from -0.23 to 1.50 for the 26 groups. The average effect size excluding one outlier was small (Table 1, 0.27, 95% CI 0.17 - 0.37). Trim-and-fill procedures suggested that three studies with effect sizes to the left of mean were missing; the corrected average effect size was 0.24 (95% CI 0.13-0.35).

Communication. Hedges's g ranged from -0.26 to 0.70 for the 26 groups. The average effect size was small (Table, 1, 0.31, 95% CI 0.23 - 0.39).

Social. Hedges's g ranged from -0.96 to 0.75 for the 26 groups. Thirteen groups (50.0%) demonstrated significant positive effects. The average effect size excluding one outlier was small (Table 1, 0.24, 95% CI 0.14 - 0.35, $p < .001$).

Adaptive Behavior. Hedges's g ranged from -1.25 to 0.95 for the 28 groups. The average effect size excluding one outlier was small (Table 1, 0.21, 95% CI 0.13 - 0.29, $p < .001$).

Moderator Analyses

The Q statistic and I^2 index indicated significant effect size heterogeneity for all outcomes (see Table 1); exploratory analyses of

potential moderators were conducted to assess whether effect sizes differed based on group and intervention characteristics (see Table 2). Only results significant at $p < .05$ are reported below.

INSERT TABLE 2

EI Category. Children in Model EI programs made moderate cognitive gains, and small communication, social, and adaptive behavior gains (see Table 2). Children receiving TAU and variable EI made small gains across all four outcomes. Differences among the three EI categories were statistically significant for cognitive and adaptive behavior outcomes ($p < .05$). Model programs had significantly higher cognitive scores than the other two program types and significantly higher adaptive behavior scores than TAU programs ($ps < .05$).

Out of concern that Model programs would only publish with positive results, a post hoc publication bias analysis was conducted. Publication bias was identified for communication and adaptive behavior outcomes. Duval and Tweedie's trim and fill adjusted values were 0.34 and 0.30 respectively.

Country. Differences in all four outcomes by country were statistically significant (Table 2). Interventions conducted in the United States had small to medium effects on all four outcomes. Interventions conducted in Italy had medium effects on communication, social, and adaptive behavior outcomes. Interventions conducted in Australia had small effects on communication and adaptive behavior outcomes. Interventions conducted in Israel had medium

effects on communication and social outcomes. Interventions conducted in Taiwan had medium effects on cognitive outcomes. Those conducted in Canada had small effects.

Study Design. Only adaptive behavior outcomes differed significantly by study design (Table 2). Studies using "Single" and "Other" designs had small effects on adaptive behavior.

Group Allocation. Only adaptive behavior outcomes differed significantly by group allocation method (Table 2). All four group allocation methods had small effects on adaptive behavior.

Age. Average age of the sample at intake was not associated with any outcome (Table 2).

Year. Year was significantly positively associated with communication outcomes (Table 2).

Intervention Duration. EI duration was significantly negatively associated with communication and adaptive behavior outcomes (Table 2).

Intervention Hours. Approximate EI hours were significantly negatively associated with communication outcomes (Table 2).

Adjusted EI category moderator analyses. For cognitive outcomes, when controlling for country, the effect size of Model programs remained significantly higher than variable programs ($p < .01$), but not TAU

programs ($p = .10$). For communication outcomes, when controlling for country, year, and intervention duration, Model programs had significantly higher effect sizes that variable programs ($p = .03$) but not TAU programs ($p = .21$). For social outcomes, when controlling for country, Model programs had higher effect sizes than treatment as usual programs at a marginally significantly different level (p < .08). For adaptive behavior outcomes, the difference in effect sizes between Model and treatment as usual programs was no longer significant when controlling for country, study design, and intervention duration. Group allocation method was dropped from that model due to collinearity.

Discussion

Effect sizes associated with community-based intervention for children with autism were small, ranging from 0.21 for adaptive behavior to 0.31 for communication. These starkly contrast with those observed in university-based clinical trials, which find effect sizes of 0.4 to 1.2 for these domains. It should be noted that the effect sizes from these trials represent the difference between the treatment and control groups, instead of the total effect size over time, which makes the difference even greater between clinical trials and community-based interventions.

Despite the low average effect sizes, several programs showed strong outcomes that approached those observed in clinical trials. These programs were developed in association with universities, hospitals, and researchers,

and offer potentially replicable and sustainable models (Stahmer & Aarons, 2009).

Intervention duration and total hours were negatively associated with communication and adaptive behavior outcomes. Children who are not progressing in intervention may receive more treatment hours. These results highlight the importance of ongoing treatment monitoring, so that treatment can be adapted or changed if benefit is not observed after a limited duration (National Research Council, 2001).

Communication results improved in more recent studies, but not cognitive, social, or adaptive behavior. Evidence-based practices may not be making their way into standard community care or are not being implemented well in community settings. Communication has long been an intervention target for children with ASD (National Research Council, 2001); programs may be better at addressing communication than other domains. This finding also may result from restricted range; most studies published prior to 2004 did not meet our inclusion criteria. Year of publication may also have been a poor proxy for the year that data were collected.

Programs associated with universities and hospitals had significantly better outcomes than other community programs, suggesting that academic involvement may bolster effectiveness. We were limited in our ability to investigate this question further, as we excluded studies that were research-funded replication, dissemination, or implementation studies in community

settings because they involved research support and don't reflect standard care. However, these types of studies reflect an important step in studying treatments in "progressively more genuine circumstances" (Chorpita, 2004; Southam-Gerow, Silverman, & Kendall, 2006; Weisz, 2004). Public-academic collaborations may offer an important step towards improving community practice. Another explanation is that these programs are more likely to publish results because they have positive findings. In support of this hypothesis, publication bias was identified for communication and adaptive behavior, but not cognitive or social, outcomes.

Several study limitations should be noted. We were limited in the characteristics of the intervention models and the participants that we could include in our analysis. Parent reported outcomes (i.e., VABS) may be biased towards programs that include parent training/model programs. We also required standardized scores, which may have resulted in important studies being excluded.

Despite these limitations, these findings have important implications. The smaller effects of community-based interventions could result from poor translation of research into practice. For example, community providers may lack high quality training and supervision. Differences also could result from fewer resources to implement complex, resource intensive programs. Differences in characteristics of children and families between community settings and research trials also may lead to different outcomes. Lord et al.

(2005) point out that in treatment studies that report demographic characteristics of participants, the overwhelming majority are white and of high socio-economic status. Families enrolling in studies may have more resources, fewer obstacles, and more motivation/skill. Unlike research trials, community sites often must accept all children without exclusion. Thus, community programs have children that differ from those in clinical trials in functioning, at-home support, family resources, native language, and complex comorbidities. We largely did not see differences in the results based on study design and group allocation method, which suggests that the small effect sizes for community programs are more likely due to intervention as opposed to participant characteristics.

Any of these reasons for the observed differences point to the need for closer and bidirectional partnerships between academic and community sites, and the urgency of moving from tests of efficacy, or even effectiveness, to testing strategies that increase the successful implementation of demonstrated-effective interventions for young children with autism in community settings.

Key points

- Children with Autism Spectrum Disorder can make moderate to large gains in cognitive, communication, social, and adaptive behavior domains when receiving effective early intervention (EI).
- Less is known about the overall effectiveness of EI delivered in community settings.
- Findings show that children with ASD make small gains when receiving community-based EI.

Acknowledgements

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Table 1

Random Effects Models

Outcome	Total	k	Hedges' s g	95% CI	$Q(df)$	I^2
Cognitive	All studies	26	0.37***	0.25-0.48	220.55(25)**	88.66
	Outlier excluded	25	0.32***	0.23-0.42	138.76(24)**	82.70
	Trim-and-fill correction		0.27	0.17-0.37	202.51	
Communication	All studies	26	0.31***	0.23-0.39	165.43(25)**	84.89
	Outlier excluded	NA				
	Trim-and-fill correction	NA				
Social	All studies	26	0.20***	0.08-0.32	255.38(25)**	90.21
	Outlier excluded	25	0.24***	0.14-0.35	198.95(24)**	87.94
	Trim-and-fill correction	NA				
Adaptive Behavior	All studies	28	0.17***	0.08-0.26	328.06(27)**	91.77
	Outlier excluded	27	0.21***	0.13-0.29	262.56(26)**	90.10
	Trim-and-fill correction	NA				

Note: CI = confidence interval; k = studies included, NA = Not applicable.

p < .05, ** *p* <.01, *** *p* < .001.

Table 2

Analyses of Moderation for Uncontrolled Effect Sizes

	Cognitive				Communication				Social				Adaptive Behavior			
	k	ES	CI	Q(*df*)	*k*	ES	CI	Q(*df*)	*k*	ES	CI	Q(*df*)	*k*	ES	CI	Q(*df*)
Categorical Moderator																
EI Category				**13.94 (2)**				3.06(2)				2.48(2)				**12.81(2)**
MO	6	**0.54**	±0.10		9	**0.38**	±0.14		9	**0.34**	±0.17		11	**0.37**	±0.12	
TAU	13	**0.25**	±0.12		11	**0.31**	±0.14		12	**0.22**	±0.17		13	0.08	±0.14	
VAR	6	**0.27**	±0.21		6	**0.20**	±0.15		4	0.11	±0.24		3	**0.15**	±0.07	
Country				**23.68 (7)**				**35.35 (5)**				**12.16 (5)**				**101.22 (6)**
AU	6	0.23	±0.24		8	**0.31**	±0.07		8	0.16	±0.17		5	**0.21**	±0.09	
CA	1	**0.32**	±0.11													
IS	1	0.03	- ±0.23		2	**0.48**	±0.19		2	**0.47**	±0.19		1	0.03	±0.10	
IT	2	0.23	±0.32		2	**0.62**	±0.08		2	**0.45**	±0.10		2	**0.55**	±0.08	
NO	2	0.29	±0.51		2	0.24	±0.45		2	0.15	±0.72		2	0.26	±0.37	
SW													2	0.06	±0.09	
TA	1	**0.62**	±0.25													

Moderator	n	Coeff	CI	Q(df)	n	Coeff	CI	Q(df)	n	Coeff	CI	Q(df)	n	Coeff	CI	Q(df)
UK	4	0.22	±0.22		4	0.04	±0.38		4	0.21	±0.30		7	-0.01	±0.22	
US	8	**0.49**	±0.11		8	**0.31**	±0.16		7	**0.24**	±0.22		8	**0.32**	±0.16	
Study Design				6.49(3)				4.35(3)				5.45(3)				**15.41(3)**
CC	10	**0.34**	±0.15		12	**0.27**	±0.11		12	**0.20**	±0.16		10	0.06	±0.11	
CE	8	**0.22**	±0.19		8	**0.29**	±0.17		6	0.21	±0.25		4	0.18	±0.19	
SI	6	**0.38**	±0.15		5	**0.39**	±0.19		6	**0.38**	±0.15		11	**0.37**	±0.14	
Other	1	**0.62**	±0.25		1	**0.67**	±0.41		1	0.00	±0.36		2	**0.09**	±0.07	
Group Allocation				5.95(3)				1.07(3)				6.76(3)				**9.66(3)**
RA	5	0.17	±0.25		7	**0.30**	±0.16		5	0.02	±0.24		2	**0.18**	±0.07	
SA	13	**0.37**	±0.15		12	**0.27**	±0.15		12	**0.24**	±0.16		14	**0.11**	±0.11	
NA	6	**0.36**	±0.12		5	**0.39**	±0.19		6	**0.38**	±0.15		10	**0.34**	±0.15	
Other	1	0.15	±0.17		2	**0.31**	±0.11		2	**0.36**	±0.32		1	**0.10**	±0.07	

	Coeff	CI	Q(df)	Coeff	CI	Q(df)	Coeff	CI	Q(df)	Coeff	CI	Q(df)
Continuous Moderator												
Age	-0.00	±0.01	0.51(1)	-0.00	±0.01	0.80(1)	-0.00	±0.01	0.05(1)	0.00	±0.01	0.13(1)
Year	-0.00	±0.03	0.03(1)	**0.03**	±0.03	4.69(1)	-0.01	±0.03	0.64(1)	-0.00	±0.02	0.00(1)
Duration	0.0	±0.0	0.09(1)	**-0.01**	±0.0	7.36(1)	-0.01	±0.0	3.07(1)	**-0.02**	±0.0	11.72(1

	0	1	)		01	)		01	)		01	)
Hours	0.00	±0.00	0.90(1)	**-0.00**	±0.00	4.24(1)	0.00	±0.00	0.73(1)	-0.00	±0.00	3.56(1)

Note: AU = Australia, CA = Canada, CC= group design comparing community EI programs, CE= group design comparing a community EI program to an experimental EI program, CI = 95% Confidence Interval, CO = Country, Coeff = Coefficient, ES = Hedges's *g*, IT = Italy, IS = Israel, MO = "model" EI program, NA = Not applicable (single treatment group), NO = Norway, RA = random assignment to treatment group, SA = assignment to treatment group using standard community practice, SI = study of one community program, SW = Sweden, TA = Taiwan, TAU: treatment as usual, UK = United Kingdom, US = United States, VAR = variable EI.

Bold text = significant at p < .05
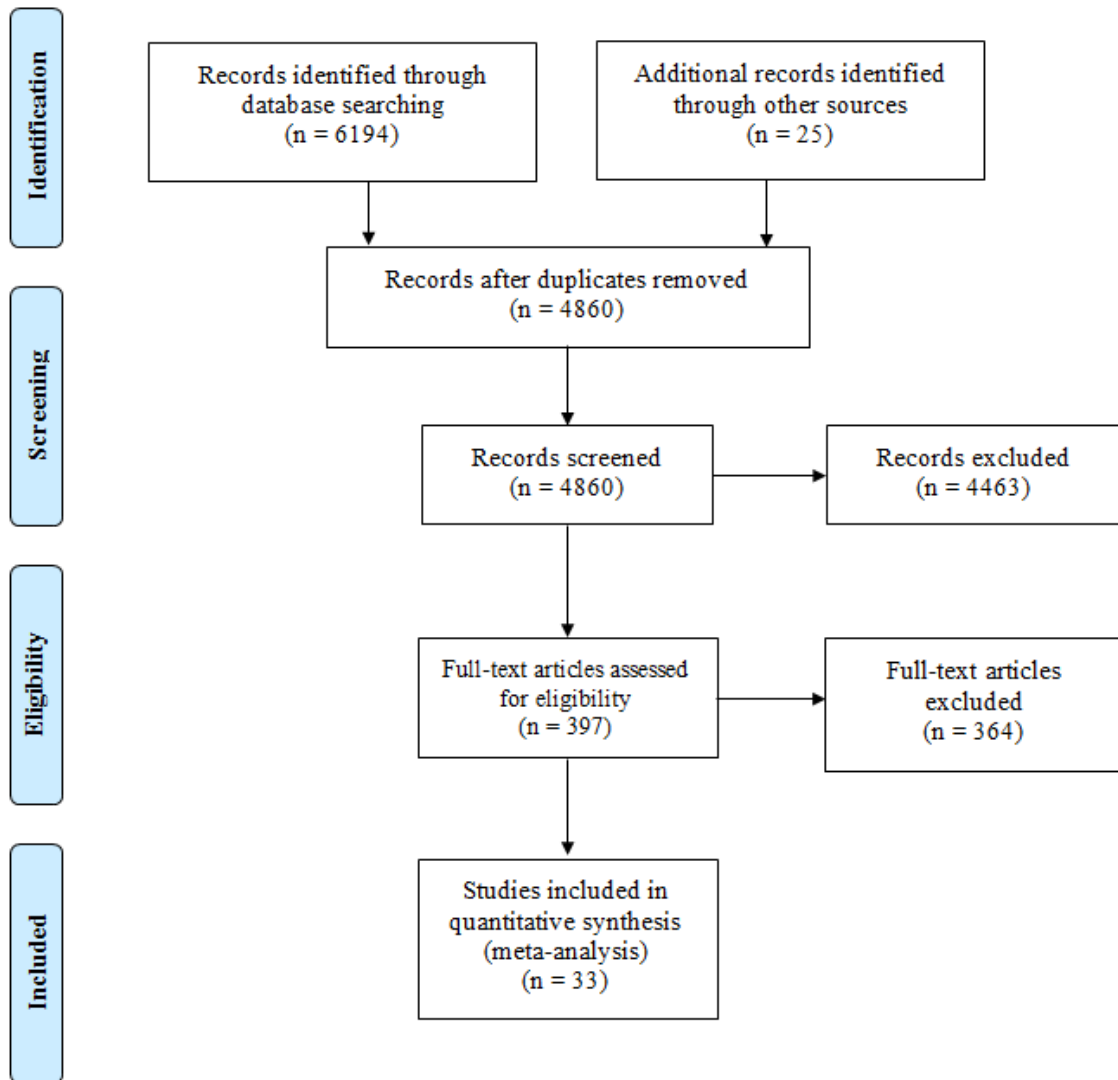
Figure 1. PRISMA Flow Diagram
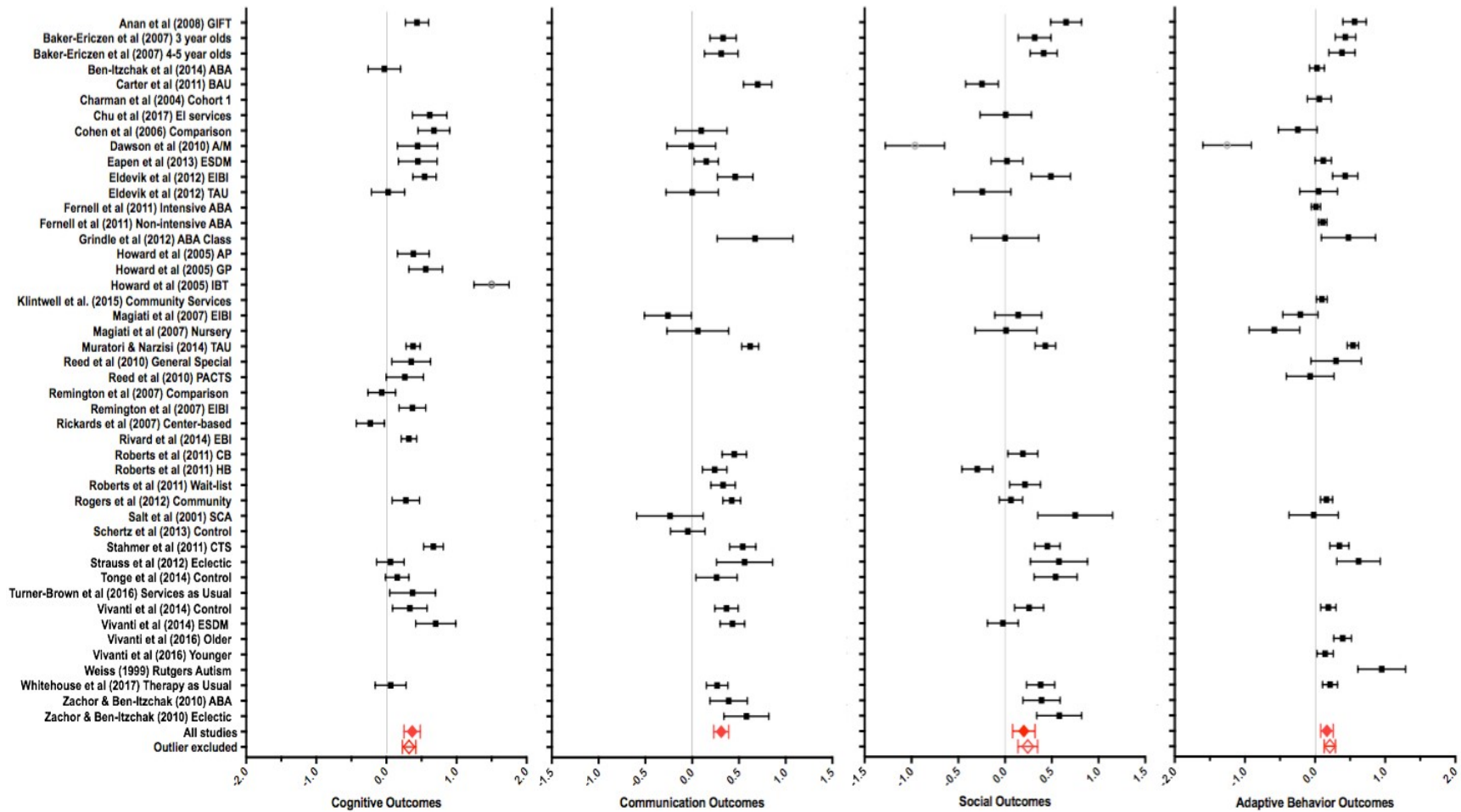
Figure 2. Forest plot of uncontrolled random effects sizes (Hedges's *g*) and 95% confidence intervals. Open circles indicate outliers. Group acronyms: ABA = Applied Behavior Analysis, A/M = Assess and Monitor, AP

= autism educational programming, BAU = Business as usual, CB = Center-based Building Blocks, CTS =

Children's Toddler School, EI = Early Intervention, EIBI= Early Intensive Behavioral Intervention, ESDM =

Early Start Denver Model, GIFT = Group Intensive Family Training Program, GP = generic educational

programming, HB = Home-based Building Blocks, IBT = early intensive behavior analytic treatment, PACTS

= Parents of Autistic Children Training and Support, SCA = Scottish Centre for Autism, TAU = Treatment as

Usual.

Appendix A

PsycINFO Search Strategy

((TI,AB(infant OR infancy OR toddler OR toddlers OR "young children" OR "early intervention" OR preschool* OR pre-schooler) OR SU(Infancy OR Preschool OR "early childhood education" OR "early intervention" OR "young children" OR toddlers OR "autistic young children" OR "infants and children")) AND (SU("treatment" OR "behavior modification" OR "behavior therapy" OR "contingency management" OR "token economy programs" OR "classroom behavior management" OR "fading conditioning" OR "omission conditioning" OR "omission training" OR "overcorrection" OR "bibliotherapy" OR "milieu therapy" OR "mulitmodal treatment approach" OR "early intervention") OR (TI,AB(mediated OR implemented) NEAR/3 (TI,AB(parent* OR caregiver* OR maternal* OR paternal* OR mother* OR father*)) AND (TI,AB(intervention OR treatment OR training OR program OR therapy))) OR TI,AB("behavio*r modification" OR "behavio*r* analysis" OR reinforcement OR prompting OR "time delay" OR "functional communication" OR "picture exchange communication system" OR "PECS" OR extinction OR "task analysis" OR "work system" OR "structured teaching" OR "environment* modification*" OR "natural language paradigm" OR "visual supports" OR "response interruption" OR "redirection" OR "Denver Model" OR "TEACCH" OR "ABA" OR "DTT" OR "PRT" OR "SCERTS" OR "Social Communication Emotional Regulation Transactional Support" OR "verbal behavio*r" OR "CABAS" OR

Hanen OR "More than words" OR "floortime" OR "floor-time" OR "RDI" OR "DIR" OR "developmental individual difference relationship-based") OR (TI,AB(intervention OR treatment OR program OR programme OR programs OR programmes OR training OR teaching OR therapy OR learning OR instruction) NEAR/3 (ti,ab(early OR individual OR intensive OR incidental OR reciprocal OR development* OR behavio*r* OR parent* OR caregiver* OR care-giver* OR mother* OR father* OR family OR families OR maternal* OR paternal* OR effectiveness OR efficacy OR milieu OR home OR clinic OR naturalistic OR antecedent OR "discrete trial" OR "pivotal response" OR "joint attention" OR "play" OR "communication" OR outcome)))) AND TI,AB(autis* OR "ASD" OR "

Appendix B

Table 1B: Sample Characteristics

Study Reference	Group	% Male	% Minority	*M* age in mo	*M* (*SD*) BL Cog	Study Design	Group Allocation	Analysis n Cog	Com	Soc	AB
(Anan, Warner, McGillivary, Chong, & Hines, 2008)	GIFT	85	NR	44.0	51.7 (6.3)	Single	NA	72		72	72
(Baker-Ericzén, Stahmer, & Burns, 2007)	3 year olds	FS: 83	FS: 73	NR	NR	SI	NA		90	90	86
(Baker-Ericzén et al., 2007)	4-5 year olds	FS: 83	FS: 73	NR	NR	SI	NA		55	55	52
(Ben-Itzchak et al., 2014)	ABA	85	NR	25.5	71.4 (20.2)	SI	NA	33			36
(Carter et al., 2011)	BAU	FS: 82	FS: 53	21.5	NR	CE	RA		24	24	
(Charman, Howlin, Berry, & Prince, 2004)	Cohort 1	NR	NR	56.6	NR	Other	NA				57
(Cohen et al., 2006)	Comparison	81	NR	NR	59.4 (14.7)	CE	SA	21	21	21	21
(Chu, Chiang, Wu, Hou, & Liu, 2017)	EI services	88.6	NR	29.5	55.6 (13.3)	Other	NA	35			
(Dawson et al., 2010)	A/M	FS: 78	FS: 27	23.1	59.4 (8.6)	CE	RA	24	24	24	24

Study Reference	Group	% Male	% Minority	*M* age in mo	*M* (*SD*) BL Cog	Study Design	Group Allocation	Analysis n			
								Cog	Com	Soc	AB
(Eapen, Črnčec, & Walter, 2013)	ESDM	81	NR	49.6	36.8 (19.7)	SI	NA	26	26	26	26
(Eldevik, Hastings, Jahr, & Hughes, 2012)	EIBI	81	NR	42.2	51.6 (16.9)	CC	SA	31	31	31	31
(Eldevik et al., 2012)	TAU	67	NR	46.2	51.7 (18.1)	CC	SA	12	12	12	12
(Fernell et al., 2011)	Intensive ABA	NR	NR	NR	NR	CC	SA				91
(Fernell et al., 2011)	Non-intensive ABA	NR	NR	NR	NR	CC	SA				101
(Grindle et al., 2012)	ABA class	82	NR	58.2	59.5 (13.2)	SI	SA		11	11	11
(Howard, Sparkman, Cohen, Green, & Stanislaw, 2005)	IBT	86	28	30.9	58.5 (18.2)	CC	SA	28			
(Howard et al., 2005)	AP	81	50	37.4	53.7 (13.5)	CC	SA	16			
(Howard et al., 2005)	GP	100	43	34.6	59.9 (14.9)	CC	SA	16			
(Klintwall, Macari, Eikeseth, & Chawarska, 2015)	Community services	89	26	21.9	V: 46.7 (26.7), NV: 76.8 (18.7)	Other	Other				70
(Magiati et al.,	EIBI	96	25	38.0	83.0	CC	SA		26	26	26

Study Reference	Group	% Male	% Minority	M age in mo	M (SD) BL Cog	Study Design	Group Allocation	Analysis n			
								Cog	Com	Soc	AB
2007)					(27.9)						
(Magiati et al., 2007)	Nursery	75	31	42.5	65.2 (26.9)	CC	SA		14	14	14
(Muratori & Narzisi, 2014)	TAU	81	NR	35.2	62.3 (13.4)	SI	NA	70	70	70	70
(Reed, Osborne, & Corness, 2010)	General special	92	NR	44.3	47.7 (22.3)	CC	SA	12			12
(Reed et al., 2010)	PACTS	92	NR	40.8	49.3 (13.2)	CC	SA	13			13
(Remington et al., 2007)	EIBI	NR	NR	35.7	61.4 (16.4)	CC	SA	23			
(Remington et al., 2007)	Comparison	NR	NR	38.4	62.3 (16.6)	CC	SA	21			
(Rickards, Walstab, Wright-Rossi, Simpson, & Reddihough, 2007)	Center-based	FS: 79	NR	FS: 43.1	55.7 (22.1)	CE	RA	21			
(Rivard, Terroux, & Mercier, 2014)	EBI	FS: 75	NR	FS: 46.0	60.1 (16.4)	SI	NA	85			
(Roberts et al., 2011)	CB	FS: 91	NR	43.7	66.5 (17.7)	CC	Other		29	29	
(Roberts et al., 2011)	HB	FS: 91	NR	41.5	57.0 (11.7)	CC	RA		28	28	
(Roberts et al., 2011)	Wait-list	FS: 91	NR	43.7	63.3 (15.5)	CC	RA		28	28	
(Rogers et al.,	Community	63	25	20.9	63.1	CE	RA	49	49	49	49

Study Reference	Group	% Male	% Minority	*M* age in mo	*M* (*SD*) BL Cog	Study Design	Group Allocation	Analysis n			
								Cog	Com	Soc	AB
2012)	services				(15.9)						
(Salt et al., 2002)	SCA	92	NR	42.4	39.4 (13.5)	CC	SA		12	12	12
(Schertz, Odom, Baggett, & Sideris, 2013)	Control	NR	NR	27.5	NR	CE	RA		12		
(Stahmer, Akshoomoff, & Cunningham, 2011)	CTS	85	38	28.1	63.9 (13.3)	SI	SA	100	98	98	98
(Strauss et al., 2012)	Eclectic	95	NR	41.9	74.3 (29.4)	CE	SA	15	20	20	20
(Tonge, Brereton, Kiomall, Mackinnon, & Rinehart, 2014)	Control	91	NR	50.1	63.3 (28.5)	CE	Other	35	35	35	
(Turner-Brown, Hume, Boyd, & Kainz, 2016)	Services as Usual	94	29	29.7	61.8 (17.8)	CE	RA	17			
(Vivanti et al., 2014)	Control	90	NR	42.0	49.0 (17.4)	CC	SA	30	30	30	30
(Vivanti et al., 2014)	ESDM	85	NR	40.3	53.5 (16.3)	CC	SA	27	27	27	
(Vivanti, Dissanayake, & The Victorian ASELCC Team,	Older	89.3	14	49.5	V: 45.9 (26.7), NV: 56.4 (22.7)	SI	NA				28

Study Reference	Group	% Male	% Minority	*M* age in mo	*M* (*SD*) BL Cog	Study Design	Group Allocation	Analysis n			
---	---	---	---	---	---	---	---	Cog	Com	Soc	AB
2016)											
(Vivanti et al., 2016)	Younger	81.3	18	33.3	V: 54.0 (28.6), NV: 69.5 (18.8)	SI	NA				26
(Weiss, 1999)	Rutgers Autism	NR	NR	41.5	NR	SI	NA				20
(Whitehouse et al., 2017)	Therapy as Usual	76.9	28.6	40.3	68.87 (22.7)	CE	RA	36	35	35	33
(Zachor & Ben-Itzchak, 2010)	ABA	FS: 91	NR	25.1	72.2 (19.2)	CC	SA		45	45	
(Zachor & Ben-Itzchak, 2010)	Eclectic	FS: 91	NR	26.0	73.3 (22.2)	CC	SA		33	33	

Note: AB= Adaptive Behavior outcome, ABA = Applied Behavior Analysis, , A/M = Assess and Monitor group, AP = autism educational programming, BAU = Business as usual, BL= Baseline, CB = Center-based Building Blocks, CC= Group design comparing community EI programs, CE= group design comparing a community EI program to an experimental EI program, Cog= Cognitive outcome, Com= Communication outcome, CTS = Children's Toddler School, EI = Early Intervention, EIBI= Early Intensive Behavioral Intervention, ESDM = Early Start Denver Model, FS= Full study sample, GIFT = Group Intensive Family Training Program, GP = Generic educational programming, HB = Home-based Building Blocks, IBT = early

intensive behavior analytic treatment, M= Mean, mo= months, NA= Not applicable, NR= Not reported,

NV= Nonverbal Developmental Quotient, PACTS = Parents of Autistic Children Training and Support, SD=

Standard Deviation, Single = Single group design, TAU= Treatment as usual group, V = Verbal

Developmental Quotient

Table 2

48
COMMUNITY-BASED EI FOR ASD

Table 2B: Intervention Characteristics

Study Reference	Group	O	Years of EI	EI duration (mo)	EI intensity (hr/wk)	EI category	EI description
(Anan et al., 2008)	GIFT	US	NR	3.0	15	MO	Group Intensive Family Training Program, parent training model
(Baker-Ericzén et al., 2007)	3 year olds	US	1999-2003	13.0	1	MO	PRT
(Baker-Ericzén et al., 2007)	4 -5 year olds	US	1999-2003	13.0	1	MO	PRT
(Ben-Itzchak et al., 2014)	ABA	IS	NR	12.0	20	TAU	Center-based ABA
(Carter et al., 2011)	BAU	US	NR	9	NR	VAR	Business as usual control group
(Charman et al., 2004)	Cohort 1	UK	2000-2001	21.1	NR	TAU	dedicated autism primary schools or specialist units
(Chu et al., 2017)	EI Services	TA	2005-2007	28.0	14	VAR	EI services categorized as center-based interventions, individual therapies, and preschool inclusion
(Cohen et al., 2006)	Comparison	US	1995-2003	16.0	NR	TAU	services from local public schools
(Daw	A/M	US	NR	2	18.4	V	Assess and monitor group

Table 2

Study Reference	Group	CO	Years of EI	EI duration (mo)	EI intensity (hr/wk)	EI category	EI description
son et al., 2010)		S	R	9.3		AR	
(Eapen et al., 2013)	M ESD	AU	NR	9.7	16-21	MO	Early Start Denver Model curriculum and teaching principles within a group setting
(Eldevik et al., 2012)	EIBI	NO	2000-2011	25.1	preschool = 20, EIBI = 13.6	MO	EIBI
(Eldevik et al., 2012)	TAU	NO	2000-2011	24.6	preschool = 20, TAU ≥ 5	TAU	Eclectic
(Fernell et al., 2011)	Intensive ABA	SW	NR	20.9	15-40	TAU	ABA
(Fernell et al., 2011)	Non-intensive ABA	SW	NR	20.9	<15	TAU	ABA
(Grindle et al., 2012)	ABA class	UK	2005-2009	22.0	ABA= 15, max school= 30	MO	The Westwood ABA Class
(Howard et al., 2005)	IBT	US	1996-2003	14.2	< 3y: 25-30, > 3y 35-40	MO	Intensive behavior analytic treatment
(Howard et al., 2005)	AP	US	1996-2003	13.3	25-30	TAU	Autism educational programming, eclectic approaches
(Howard et al.,	GP	US	1996-	14.8	15	TAU	Generic educational programming serving children with a

Table 2

Study Reference	Group	COS	Years of EI	YI duration (mo)	EI intensity (hr/wk)	EI category	EI description
2005)			2003				variety of disabilities
(Klintwall et al., 2015)	Community	US	NR	16.3	13.9	VAR	Community based treatment, variety of interventions
(Magiati et al., 2007)	EIBI	UK	1998-2002	15.5	T1: 32.4, T2: 33.2	TAU	EIBI
(Magiati et al., 2007)	Nursery	UK	1998-2002	16.0	T1: 25.6, T2: 27.4	TAU	Nursey programs utilizing eclectic intervention practices
(Muratori & Narzisi, 2014)	TAU	IT	NR	6.0	11.2	TAU	centers with specific treatments performed by child neuropsychiatric services and school inclusion with individual support teacher
(Reed et al., 2010)	General special	UK	NR	9.0	11.5	TAU	nursey schools that catered for children with all special needs, including autism, interventions used were eclectic
(Reed et al., 2010)	PACTS	UK	NR	9.0	12.6	TAU	Parents of Autistic Children Training and Support (PACTS), developed by Bexley Local Education Authority, home-based + parent-training
(Remington et al., 2007)	EIBI	UK	NR	24.0	25.6	TAU	home-based EIBI
(Remington et al., 2007)	Community	UK	NR	2	NR	V	local education authorities'

Table 2

Study Reference	Group	CO	Years of EI	EI duration (mo)	EI intensity (hr/wk)	EI category	EI description
(...ngton et al., 2007)	parison	UK	NR	4		VAR	standard provision for young children with autism, variety of interventions
(Rickards et al., 2007)	Center-based	AU	2000-2003	3.0[1]	5	TAU	center-based programs utilizing eclectic intervention practices
(Rivard et al., 2014)	EBI	CA	2009-2012	2.0[1]	16-20	TAU	Early behavioral intervention at a rehabilitation center providing developmental services to persons with intellectual disabilities and ASD, ABA program
(Roberts et al., 2011)	Wait-list	AU	2006-2008	2[1]	NR	VAR	Wait-list
(Roberts et al., 2011)	HB	AU	2006-2008	2.0[1]	2-3/fortnight	TAU	Building Blocks home-based program
(Roberts et al., 2011)	CB	AU	2006-2008	2.0[1]	2-3	TAU	Building Blocks center-based program
(Rogers et al., 2012)	Community	US	NR	3.0	3.68	VAR	Community-based services
(Salt et al., 2002)	SCA	UK	NR	10.0	SCA: 4, total 30.38h non-SCA	MO	Scottish Centre for Autism: comprehensive treatment program, includes 1:1 intensive treatment and parent training, designed to

Table 2

Study Reference	Group	OCS	Years of EI	YI duration (mo)	EI intensity (hr/wk)	EI category	EI description
							complement child's nursery placement
(Schertz et al., 2013)	Control	US	NR	7.0	India na: 12.82, Kansas: 21.35, NC: 6.25	VAR	services commonly available in the community
(Stahmer et al., 2011)	CTS	US	1998-2008	18.3	21	MO	Children's Toddler School
(Strauss et al., 2012)	Eclectic	IT	NR	6.0	12	TAU	eclectic intervention group: in-home developmental intervention and cognitive behavioral treatment
(Tonge et al., 2014)	Control	AU	NR	12.0	7.9	TAU	business as usual control group: weekly intervention comprised attendance at the local preschool, a child-focused early intervention therapy group, and individual speech and/or occupational therapy
(Turner-Brown et al., 2016)	Services as Usual	US	2012-2014	6.5	8.6	VAR	Services as usual: variety of community interventions, including speech, occupational, developmental, and behavioral therapy
(Vivanti et al., 2014)	Control	AU	NR	12.0	≥ 15	TAU	''generic'' intervention program for ASD: does not subscribe to a single method, philosophy, or

Table 2

Study Reference	Group		OC	Years of EI	EI duration (mo)	EI	EI intensity (hr/wk)	EI category	EI description
(Vivanti et al., 2014)	M	ESDM	AU	NR	1.9	1	≥ 15	MO	theoretical approach, but instead aims to be comprehensive and offer a range of teaching strategies derived from best practice guidelines. ESDM implemented in a group environment, educational strategies based on developmental and behavioral principles delivered within a relationship-based framework
(Vivanti et al., 2016)	Older		AU	2010-2014	2.0	1	15-25	MO	ESDM implemented in a group environment, educational strategies based on developmental and behavioral principles delivered within a relationship-based framework
(Vivanti et al., 2016)	Younger		AU	2010-2014	2.0	1	15-25	MO	ESDM implemented in a group environment, educational strategies based on developmental and behavioral principles delivered within a relationship-based framework
(Weiss, 1999)	Rutgers Autism Program		US	NR	4.0	2	NR	MO	Rutgers Autism Program at the Center for Applied Psychology, ABA
(Whitehouse et	Therapy as		AU	2013-	2.0	6	4.7	VAR	community based therapy, types of therapy included individual

Table 2

Study Reference	Group	O	C	Years of EI	YI duration (mo)	EI intensity (hr/wk)	EI category	EI description
al., 2017)	Usual			2014				or group-based therapies (ABA, speech therapy, OT, social skills groups, and a range of other early behavioral or play-based interventions)
(Zachor & Ben-Itzchak, 2010)	Eclectic	IS	ECle	2.0	NR 1	19	TAU	eclectic approach: integrated developmental, DIR, TEACCH, speech therapy, OT
(Zachor & Ben-Itzchak, 2010)	ABA	IS		2.0	NR 1	20	TAU	ABA

Note: ABA = Applied Behavior Analysis, A/M = Assess and Monitor group, AP = Autism Programming, AU = Australia, BAU = Business as usual, CA = Canada, CB = Center-based Building Blocks, CO = Country, CTS = Children's Toddler School, EI= Early intervention, EIBI = Early Intensive Behavioral Intervention, ESDM = Early Start Denver Model, GIFT = Group Intensive Family Training Program, GP = generic educational programming, HB = Home-based Building Blocks, IBT = early intensive behavior analytic treatment, IT = Italy, IS = Israel, MO = "Model" EI program, NC = North Carolina, NO = Norway, NR = Not reported, OT = Occupational therapy, PACTS = Parents of Autistic Children Training and Support, PRT = Pivotal Response

Training, SCA = Scottish Centre for Autism, Soc = Social, SW = Sweden, TAU = Treatment as usual, UK =

United Kingdom, US = United States, VAR = variable EI services.

Appendix C

Table 1C: *Random Weighted Uncontrolled Effect Sizes and SAMDs*

Study	Group	Cognitive Hedges' g	Cognitive SAMD	Communication Hedges's g	Communication SAMD	Social Hedges's g	Social SAMD	Adaptive Behavior Hedges's g	Adaptive Behavior SAMD
(Anan et al., 2008)	GIFT	0.44***	0.29			0.65***	1.83	0.56***	1.61
(Baker-Ericzén et al., 2007)	3 year olds			0.33***	0.10	0.41***	0.95	0.43***	1.16
(Baker-Ericzén et al., 2007)	4-5 year olds			0.31***	0.01	0.32***	0.41	0.38***	0.75
(Ben-Itzchak et al., 2014)	ABA	-0.03	-1.11	NR		NR		0.03	-0.42
(Carter et al., 2011)	BAU			0.70***	0.93	0.25**	-1.06		
(Charman et al., 2004)	Cohort 1							-0.06	0.40
(Chu et al., 2017)	EI Services	0.62***	0.73						
(Cohen et al., 2006)	Comparison	0.68***	0.69	0.10	-0.47	-0.01	-0.43	-0.25	-0.91
(Dawson et al., 2010)	A/M	0.44**	0.19	-0.01	-0.76	0.96***	**-2.74**	1.25***	**-3.34**
(Eapen, Črnčec, & Walter, 2013)	ESDM	0.45**	0.20	0.15*	-0.40	0.02	-0.45	0.12	-0.13
(Eldevik et al., 2012)	EIBI	0.02***	0.48	0.46***	0.40	0.49***	0.78	0.43***	0.68
(Eldevik et al.,	TAU	-		-		-		-	-

Study	Group	Cognitive Hedges' s g	Cognitive SAMD	Communication Hedges's g	Communication SAMD	Social Hedges's g	Social SAMD	Adaptive Behavior Hedges's g	Adaptive Behavior SAMD
2012)		0.54	0.55	0.00	0.49	0.24	0.71	0.05	0.16
(Fernell et al., 2011)	Intensive ABA							0.01	-0.70
(Fernell et al., 2011)	Non-intensive ABA							0.11***	-0.28
(Grindle et al., 2012)	ABA class			0.67**	0.54	0.00	0.30	-0.48	0.47
(Howard et al., 2005)	AP	0.38***	0.03						
(Howard et al., 2005)	GP	0.56***	0.37						
(Howard et al., 2005)	IBT	1.50***	**2.93**						
(Klintwall et al., 2015)	Community							0.10	-0.29
(Magiati et al., 2007)	EIBI			-0.26*	-1.40	0.14	-0.15	-0.21	-0.93
(Magiati et al., 2007)	Nursery			0.06	-0.44	0.01	-0.34	-0.58*	-1.31
(Muratori & Narzisi, 2014)	TAU	0.38***	0.06	0.62***	1.24	0.43***	0.91	0.54***	1.50
(Reed et al., 2010)	General special	0.26*	-0.02					0.30	0.20
(Reed et al., 2010)	PACTS	0.35	0.17					-0.07	-0.40
(Remington et	EIBI		0						

Study	Group	Cognitive		Communication		Social		Adaptive Behavior	
		Hedges's g	SAMD	Hedges's g	SAMD	Hedges's g	SAMD	Hedges's g	SAMD
al., 2007)		0.37***	.01						
(Remington et al., 2007)	TAU	-0.07	-0.96						
(Rickards et al., 2007)	Center-based	-0.23*	-1.32						
(Rivard et al., 2014)	EBI	0.32***	-0.21						
(Roberts et al., 2011)	CB			0.45***	0.38	0.19*	-0.02		
(Roberts et al., 2011)	HB			0.24***	-0.18	-0.30***	-1.28		
(Roberts et al., 2011)	Wait-list			0.33***	0.05	0.21*	0.03		
(Rogers et al., 2012)	Community	0.28**	-0.30	0.42***	0.39	0.06	-0.47	0.16***	-0.01
(Salt et al., 2002)	SCA			0.24	-0.87	0.75***	-0.87	0.02	-0.30
(Schertz et al., 2013)	Control			0.05	-0.57				
(Stahmer et al., 2011)	CTS	0.67***	1.46	0.54***	1.05	0.45***	1.17	0.35***	0.84
(Strauss et al., 2012)	Eclectic	0.06	0.57	0.56***	0.53	0.58***	0.80	0.62***	0.96
(Tonge et al., 2014)	Control	0.15	0.62	0.26*	-0.14	0.54***	0.96		
(Turner-Brown et al., 2016)	SAU	0.37*	0.01						

Study	Group	Cognitive		Communication		Social		Adaptive Behavior	
		Hedges's g	SAMD	Hedges's g	SAMD	Hedges's g	SAMD	Hedges's g	SAMD
(Vivanti et al., 2014)	Control	0.33**	-0.09	0.37***	0.16	0.26**	0.15	0.19***	0.06
(Vivanti et al., 2014)	ESDM	0.70***	0.85	0.43***	0.31	0.02	-0.57	NR	
(Vivanti et al., 2016)	Older							0.39***	0.56
(Vivanti et al., 2016)	Younger							0.14*	0.06
(Weiss, 1999)	Rutgers Autism							0.95***	1.66
(Whitehouse et al., 2017)	Therapy as Usual	0.06	-0.91	0.27***	-0.12	0.38***	0.53	0.17***	0.13
(Zachor & Ben-Itzchak, 2010)	ABA			0.39***	0.25	0.39	0.61		
(Zachor & Ben-Itzchak, 2010)	Eclectic			0.58***	0.76	0.58	1.07		

Note: Bolded text indicates outlier excluded from subsequent analyses. NR = Not reported due sample overlap

* $p < .05$, ** $p < .01$, *** $p < .001$.
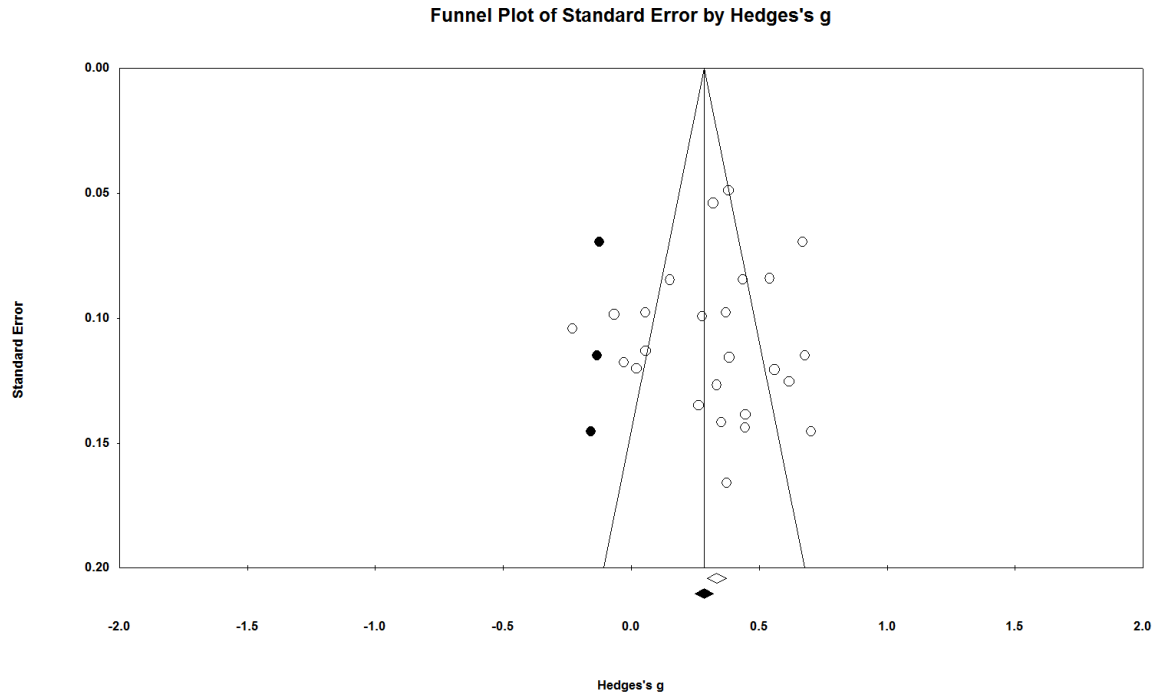
Appendix D

Funnel Plot of Standard Error by Hedges's g

Figure 1D. Funnel plot of standard error by Hedges's *g* for cognitive results. White circles indicate observed groups, the white diamond indicates the overall random weight effect size for the observed groups. Black circles indicate missing studies suggested by trim-and-fill procedures, the black diamond indicates the corrected average effect size including these studies.
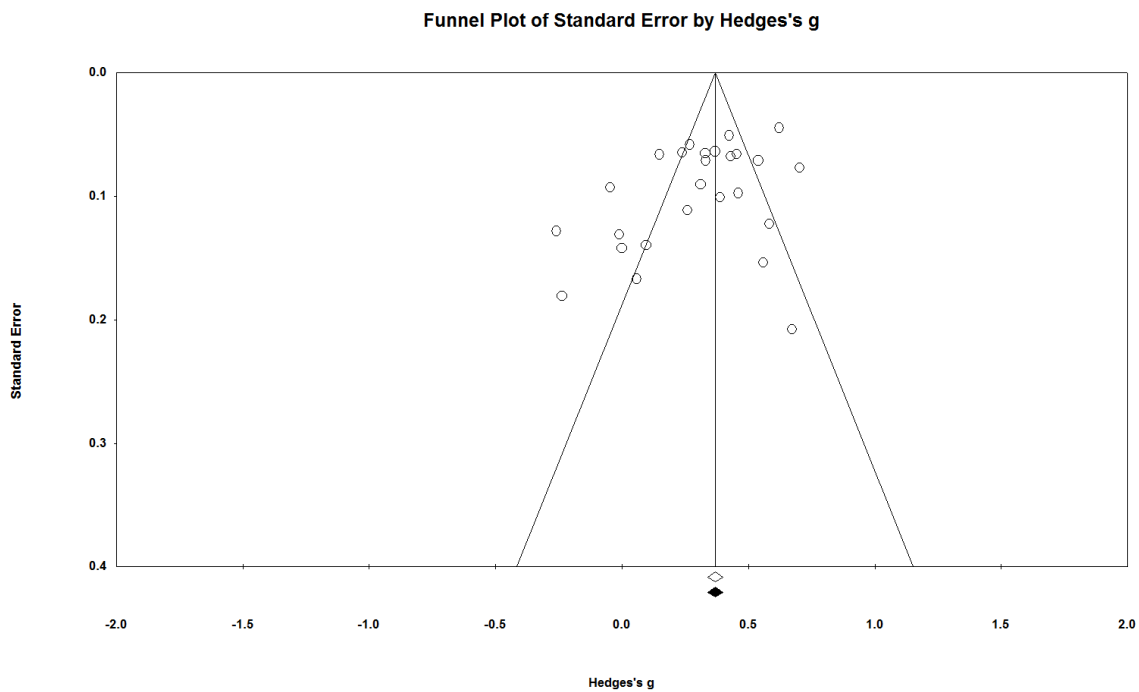
Funnel Plot of Standard Error by Hedges's g

Figure 2D. Funnel plot of standard error by Hedges's *g* for communication results. White circles indicate observed groups, the white diamond indicates the overall random weighted effect size for the observed groups. The black diamond indicates the overall random weighted effect size adjusted for any missing studies.
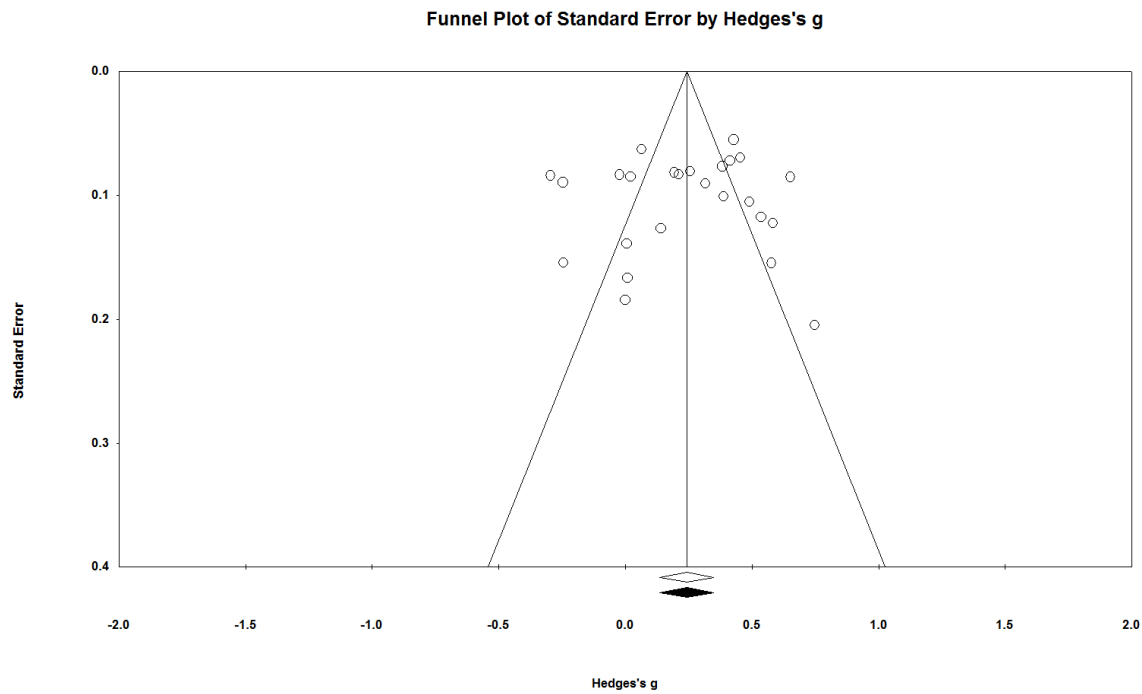
Funnel Plot of Standard Error by Hedges's g

Figure 3D. Funnel plot of standard error by Hedges's *g* for social results. White circles indicate observed groups, the white diamond indicates the overall random weighted effect size for the observed groups. The black diamond indicates the overall random weighted effect size adjusted for any missing studies.
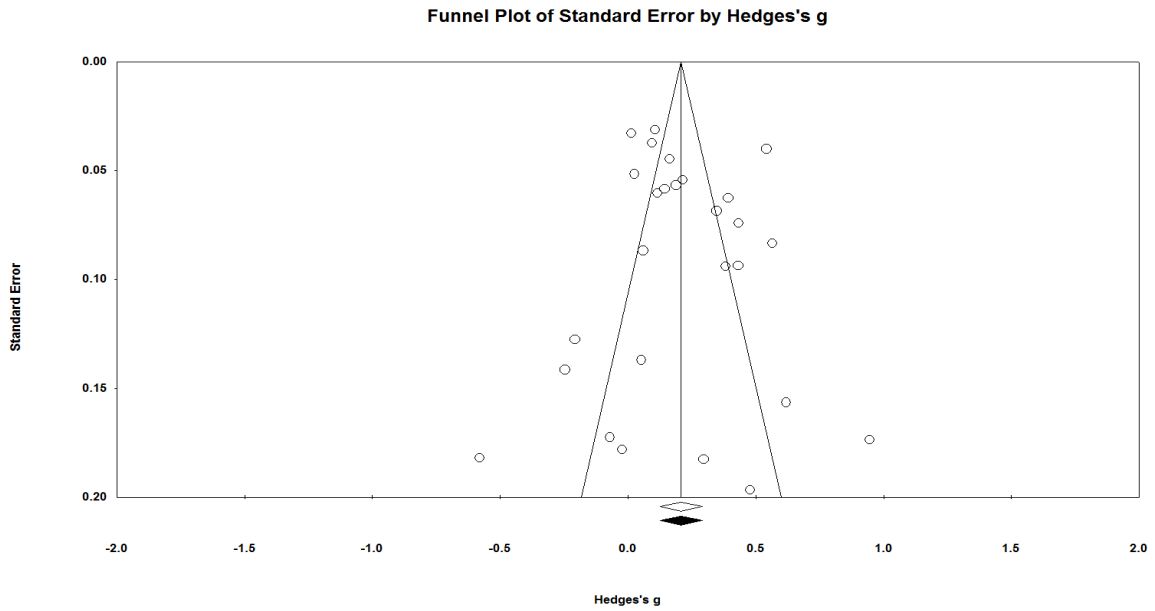
Figure 4D. Funnel plot of standard error by Hedges's *g* for adaptive behavior results. White circles indicate observed groups, the white diamond indicates the overall random weighted effect size for the observed groups. The black diamond indicates the overall random weighted effect size adjusted for any missing studies.