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Research Article

The Effectiveness of Parent-Implemented Language Interventions: A Meta-Analysis

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Purpose: The purpose of this meta-analysis was to systematically evaluate the effects of parent-implemented language interventions on the language skills of children between 18 and 60 months of age with primary and secondary language impairments.
Method: A systematic literature search yielded 18 studies that met the predetermined inclusion and exclusion criteria. Effect sizes for each study were calculated for 7 language outcome variables and analyzed using a random effects model. Separate analyses were conducted for each language outcome and for each comparison group. Outcomes were compared for children with and without intellectual disabilities and for parent report and direct observational language measures.
Results: The results indicate that parent-implemented language interventions have a significant, positive impact on receptive and expressive language skills of children with and without intellectual disabilities. Effect sizes (*g*) for child measures ranged from –0.15 to 0.82 depending on the outcome measure and comparison group.
Conclusion: The results of this review indicate that parent-implemented language interventions are an effective approach to early language intervention for young children with language impairments. Critical features of parent-implemented interventions are discussed in terms of implications for practice and future research.

Key Words: language delays, parent training, language intervention

Parents play a prominent role in their children's language development (Hart & Risley, 1995; Smith, Landry, & Swank, 2000; Tamis-LeMonda, Bornstein, & Baumwell, 2001). Parents are commonly acknowledged as children's first language teachers; however, their role in the development of language is multifaceted. Four aspects of parent–child interaction are associated with child language development: (a) amount of parent–child interaction, (b) responsiveness to child communication, (c) amount and quality of linguistic input, and (d) use of language learning support strategies. Variations in these features are associated with differences in children's language development both within the population of typically developing children and between children with and without language impairments.

Amount of parent–child interaction. Differences in the amount of parent–child interaction are associated with differences in language development from a very young age. For example, Tomasello and Todd (1983) found that typically developing children whose mothers engaged in greater amounts of joint interaction had larger productive vocabularies between 12 and 18 months of age than children whose mothers engaged in less joint interaction. In a study of 60 infants between 8 and 10 months of age, Alston and St. James-Roberts (2005) found that mothers of infants showing early signs of communication difficulties spent half as much time interacting with their infants as compared to mothers of normally developing infants. Hammer, Tomblin, Zhang, and Weiss (2001) reported that parents of children with normal language engaged in more conversational activities with their children than parents of children with specific language impairment (SLI).

Responsiveness. Generally, responsiveness refers to parents' verbal and nonverbal responses to the child's communication attempts, play actions, and social eye contact; however, definitions vary by study and age of child. Tamis-LeMonda et al. (2001) examined the relationship between maternal responsiveness and the occurrence of expressive language milestones in typically developing children. Maternal responsiveness to child vocalizations at 13 months predicted the timing of several expressive language milestones (e.g., first 50 words, combinatorial speech, or first use of language to talk about the past). This relationship between parent responsiveness and child language growth also exists for children with language impairments. Girolametto, Weitzman, Wiigs, and Pearce (1999) reported a significant relationship between maternal contingent responsiveness (e.g., imitation or expansion of the child's communication) and child language development (e.g., number of words or

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word combinations) in 12 children with expressive language delays observed before and after intervention. Yoder, McCathren, Warren, and Watson (2001), in a descriptive study of 58 children between 17 and 33 months of age with developmental disabilities, found that maternal responsiveness to child intentional communication acts at the start of the study was positively related to expressive and receptive language 12 months later. Wulbert, Inglis, Kriegsmann, and Mills (1975) compared maternal responsiveness between mothers of children with and without language impairments and found that mothers of children with language impairments were less responsive than mothers of children with typical language.

Language input. The relationship between amount of language exposure during parent–child interactions and vocabulary growth has been studied extensively. In a study of 22 children between 14 and 26 months of age, Huttenlocher, Haight, Bryk, Seltzer, and Lyons (1991) found a significant positive relationship between the amount of maternal linguistic input and children's vocabulary growth. Hart and Risley (1995) also observed a positive relationship between the amount of parent talk and the children's vocabulary size across families from different demographic backgrounds. Rowe (2008) found a similar relation between the amount of child-directed speech and typical children's receptive vocabulary at 30 and 42 months.

In addition to the quantity of language input, the content and quality of language input also affect child language development. The diversity of words that parents use is associated with the size of children's expressive vocabulary. Hoff and Naigles (2002), in a study of 63 typically developing 2-year-olds, found that lexical richness (i.e., number of different words and mean length of utterance) and syntactic complexity of maternal speech predicted children's productive vocabulary. Weizman and Snow (2001), in a study of 316 children, found that both the number of sophisticated words and the density of sophisticated words in parents' talk to children predicted the children's receptive vocabulary in kindergarten and second grade. Furthermore, parental linguistic input may also vary depending on the child's language ability. Harris, Jones, Brookes, and Grant (1986) found that mothers of typically developing children labeled objects in their child's focus of attention more frequently than did mothers of children with slower language development.

Language support strategies. Parents naturally use a number of language support strategies (e.g., specifying relations between objects and actions, and expanding and recasting child utterances to add words and syntactic structures) that play an important role in child language development. Smith et al. (2000) reported that support strategies occurred in 18% of parent–child interactions, and frequency of parental use of strategies predicted verbal skills of children in a sample of 312 children 3 years of age.

Parents of children with language impairments may not use language support strategies in the same manner or at the same rate as parents of children with typical language. In a study of 18 children between 2 and 6 years of age, Conti-Ramsden, Hutcheson, and Grove (1995) found that parents of children with SLI used fewer simple recasts (i.e., the parent repeated the child's previous sentence and added words) than parents of children with typically developing language. Vigil, Hodges, and Klee (2005) also found that parents of toddlers with typical language used more expansions than parents of toddlers with language impairments.

While these studies support the premise that differences in parent interaction, amount of talk, linguistic input, and use of language support strategies are associated with children's language development, it is important to consider the transactional nature of interactions and the bidirectional influences of children on parents and parents on children. Children with language impairments may differ from typical children in rate of communication, development of joint attention (Mundy, Kasari, Sigman, & Ruskin, 1995), clarity of communicative intention, intelligibility (Rice, Sell, & Hadley, 1991), and responsiveness to language (Wetherby, Prizant, & Hutchinson, 1998). These child differences may contribute to differences in parents. Teaching parents to modify their interaction styles and linguistic input may be an important element of early language intervention for young children with language impairments.

The Need for Parent-Implemented Interventions

Given the critical role that parents play in their children's language development and the observed differences in parent interaction strategies with children who have language impairments, teaching parents to support language development is an important component of effective early language intervention. The need for interventions that include typical communication partners and are delivered in children's natural environments is widely recognized. The Individuals with Disabilities Education Improvement Act of 2004 highlighted the importance of parent–child interactions in the home environment by mandating that interventions for young children with disabilities be implemented within typical and authentic learning experiences.

Triadic intervention. Teaching parents to implement specific language intervention strategies to improve language development in their children is a triadic intervention model; that is, a skilled interventionist teaches parents to use specific language intervention strategies with their children. The success of this approach depends on parents learning and using the strategies with sufficient frequency and accuracy to influence their child's development. The content of these language support strategies varies. Generally, the strategies have been derived from (a) descriptions of the normative parent–child interactions discussed previously (e.g., Girolametto et al., 1999; Tamis-LeMonda et al., 2001, Tomasello & Todd, 1983; Vigil et al., 2005; Weizman & Snow, 2001), (b) behavioral learning principles (Schreibman & Koegel, 2005), or (c) a hybrid of these (Dawson et al., 2010; Kaiser, 1993).

Studying triadic interventions requires a multimethod approach for monitoring and measuring (a) parent training, (b) parent implementation of intervention strategies, and (c) child language outcomes. Methodologically strong studies measure the procedures for teaching parents specific strategies, parents' implementation of these strategies, and the effects of the intervention on child language development. Parent generalization of language teaching strategies to home interactions and maintenance of these strategies for periods

sufficient to affect children's development require measurement across settings and time. Thus, quantifying the dosage of intervention received by the children is a considerable challenge. Few studies measure all aspects of the triadic intervention and both immediate and long-term child outcomes. However, there has been a sufficient body of single-subject and group design research to build a case for the efficacy of parent-implemented interventions over the last 3 decades.

Effects of Parent-Implemented Interventions

Beginning in the 1970s, studies demonstrated that parents could be taught specific strategies to support their children's language learning (Fey, Cleave, Long, & Hughes, 1993; Girolametto, 1988; Tannock, Girolametto, & Siegel, 1992; Weistuch & Lewis, 1985). Although there was early evidence to suggest that parent behavior could be altered to create a more supportive interactional context for children (Cheseldine & McConkey, 1979; Mahoney & Powell, 1988; Price, 1984), only more recent studies have included evidence that changes in children's communication are associated with specific changes in parent behavior (Alpert & Kaiser, 1992; Delaney & Kaiser, 2001; Fey et al., 1993; Hancock, Kaiser, & Delaney, 2002; Kaiser, Hancock, & Hester, 1998).

Findings from single-subject research. Numerous single-subject studies have investigated the effects of teaching parents to use specific language intervention strategies with their young children with language impairments. However, there are no comprehensive reviews of these single-subject studies across populations and interventions. Meadan, Ostrosky, Zaghlawan, and Yu (2009) systematically reviewed single-subject studies of parent-implemented language interventions for children with autism. They found that all studies reported positive outcomes for children but that interventions varied among studies. Interventions included modified incidental teaching, reciprocal imitation training, routines-based instruction, enhanced milieu teaching, functional communication training, and the Denver Model.

Single-subject design studies typically pose two related research questions: (a) Does parent training increase parents' use of specific language intervention strategies, and (b) does parent use of specific language support strategies increase child language skills? When parents are successfully taught to use systematic language intervention strategies, children show increases in their immediate use of new target forms (Kashinath, Woods, & Goldstein, 2006). Common skills taught to parents include (a) responding to communication, (b) adjusting the balance of adult to child communication turns, (c) using language models, and (d) using incidental teaching strategies. More than 20 single-subject design studies have investigated parent-implemented language intervention across populations of children with intellectual disabilities (ID; Hemmeter & Kaiser, 1994), children with autism (Gillet & LeBlanc, 2007), and children at risk for language impairments (Hancock et al., 2002). Examples of methodologically strong studies described below highlight the contributions of these studies.

Delaney and Kaiser (2001) used a multiple-probe design across parents and replicated across behaviors to study the effects of a parent-implemented language intervention with four children between 41 and 47 months of age with language impairments and problem behaviors. In this study, parents were trained to use three language intervention strategies: (a) reducing amount of adult verbal turns, (b) responding to child communication, and (c) expanding child communication. Training included reviewing the target strategy, coaching by a therapist, and feedback at the end of the session. All four parents successfully learned each of these strategies. Although positive changes in child language and behavior were observed, the design of the study limited interpretation of child effects associated with parent use of the intervention components. Specifically, changes in study conditions were based on parent behavior only, not on changes in child language.

Hemmeter and Kaiser (1994) taught four parents to use four language intervention strategies—(a) environmental arrangement, (b) responsive feedback, (c) language targets, and (d) incidental teaching—with their children with developmental delays between 25 and 49 months of age. In this study, parent training on a new strategy was introduced when the parent showed mastery of the previous strategy. Parent training resulted in positive changes in parental use of all language intervention strategies within and across parents.

Kashinath et al. (2006) used a similar design and taught language intervention strategies (i.e., arranging the environment, using natural reinforcement, using time delay, imitating contingently, modeling, and gestural/visual cuing) to four parents of children with autism. All parents increased their use of language intervention strategies and generalized some skills to other routines. Like the previous studies, conclusions about the effects of parent training on child outcomes are difficult to interpret because the independent variable (i.e., teaching parents to use intervention strategies) was manipulated based on changes in parent behavior rather than on changes in child language. However in the Kashinath et al. study, the frequency of single words was graphed for each child in relation to the different skills parents were taught. Across all four children, children increased their use of single words following intervention.

Gillet and LeBlanc (2007) examined changes in child communication following parent training. In a study of three children with autism, they taught parents to implement the natural language paradigm (NLP). Only after the previous child showed changes in vocalizations was parent training introduced to the next parent. Vocalizations per minute increased for each child following parents' implementation of these NLP procedures.

The results from the single-subject studies discussed here indicate that parents can learn several language intervention strategies. These results also suggest that when parents use these strategies, their children's language skills appear to increase. An important contribution of single-subject studies is the precise descriptions of parent behaviors and strategies for parent training. Measurement of parents' use of language strategies is detailed in single-subject studies because these strategies are the dependent variable that is measured continuously over time. It is also important to note that not all parent-implemented language interventions have been

studied using single-subject designs. For example, the Hanen Parent Program (Manolson, 1992) is delivered in groups of six to eight parents, making single-subject methodology more difficult to implement.

Previous reviews of group design studies of parent-implemented interventions. Few reviews of parent-implemented language interventions using group designs have been published. McConachie and Diggle (2007) conducted a systematic review of parent-implemented early interventions for young children with autism spectrum disorder, but the focus of the review included a range of developmental outcomes (e.g., behavioral, cognitive, and linguistic). Only three studies in the review included language outcomes. In these three studies, the effects of parent-implemented intervention were nonsignificant for parent report of child vocabulary and sentence length. The authors noted that the limited number of studies with varying degrees of methodological rigor and small sample sizes made drawing definitive conclusions difficult.

Law, Garrett, and Nye (2004) completed a meta-analysis on the efficacy of all types of speech and language intervention (e.g., parent-implemented and therapist-implemented) for children with language impairments and no other concomitant disorders. They found no statistically significant differences between the outcomes for parent-implemented and therapist-implemented interventions. When comparing parent-implemented language intervention to nontreatment control groups on standardized measures of language development (e.g., expressive syntax, receptive syntax, and expressive vocabulary), they found overall nonsignificant effect sizes for all outcome measures. Effect sizes (d) for individual language constructs ranged from –0.53 for receptive syntax to 0.83 for expressive syntax and 1.06 for expressive vocabulary. These results suggest that parent-implemented language interventions may have a larger effect on vocabulary than receptive syntax. It may be easier for parents to facilitate expressive vocabulary growth than receptive syntactic growth and easier to facilitate expressive language than receptive language. It is important to note that the Law et al. (2004) review only included three parent-implemented intervention studies. In addition, the focus of this review was children with only language impairments and excluded children with ID.

Both the McConachie and Diggle (2007) and the Law et al. (2004) reviews focused on populations of children who are a subset of young children with language impairments: children with autism and children with language impairments and no ID. As a result of the population-specific focus, both reviews included small numbers of studies of parent-implemented language interventions. Because the population of children with language impairments is broader than the specific populations examined in these previous reviews, there is a need for a meta-analysis that includes all children with language impairments, including ID, autism spectrum disorders, and primary language impairments. Such a review would allow for comparative analyses of the effects of parent-implemented language intervention on subgroups as well as identification of common outcomes of parent-implemented language interventions across children with different types of language impairments.

Rationale for Meta-Analysis

Meta-analysis methodology was chosen for this review for several reasons. First, meta-analysis is a structured research technique with documentation at each step (e.g., search strategy, coding, and analysis) which insures that replication of the search and analysis process is possible (Cooper & Hedges, 2009). Second, in meta-analysis, the magnitude and direction of results are coded for each study, rather than only counting significant and nonsignificant results. Because statistical significance reflects a combination of strength of effects and sampling error, which is highly dependent on sample size, simply examining statistical significance across a group of studies can be misleading (Hedges, 2009). Third, through detailed, systematic coding of study characteristics, meta-analysis allows quantitative examination of the relationship between study characteristics and study results (e.g., cognitive ability of participants and language outcomes; Wilson, 2009). Fourth, because all studies of parent-implemented interventions have relatively small samples, meta-analysis is an effective synthesis technique. In meta-analysis, the results of the small studies are pooled, thereby increasing the statistical power to detect differences between experimental conditions (Lipsey & Wilson, 2001). A complete description of the meta-analytic procedures used can be found in Cooper, Hedges, and Valentine (2009).

Objectives

Although there are theoretical and policy-driven bases for parent-implemented language interventions, the empirical evidence across populations of children with language impairments has not been systematically reviewed. Systematic evaluation of parent-implemented language interventions is complicated by the use of various terminologies. Many early interventions are labeled as "family-centered," which is defined as (a) treating families with respect; (b) providing flexible and individualized services; (c) sharing information with parents; and (d) including parents in the assessment, planning, and intervention process (Dunst, 2002). Family-centered interventions do not necessarily include the parent as the agent delivering the intervention. Parents may play a number of roles in the intervention process that do not include acting as the primary interventionist. In this review, only interventions in which the parent was the primary interventionist who implemented the language intervention strategies were included (i.e., parent-implemented language interventions). Because previous systematic reviews of parent-implemented language interventions have focused on specific target populations (e.g., autism or SLI), this review focused on determining the effects of parent-implemented interventions on language development for young children with all types of language impairments. The purpose of this meta-analysis was to evaluate the effects of parent-implemented language interventions on the language skills of children between 18 and 60 months of age with primary and secondary language impairments. The following questions guided this meta-analysis:

1. Do parent-implemented interventions positively affect language outcomes of young children with language impairments?

2. Is early language intervention more effective when delivered by a parent than when delivered by a therapist?
3. On which aspects of child language outcomes (e.g., vocabulary or syntax) do parent-implemented language interventions have the largest effects?
4. Do the effects of parent-implemented interventions differ for children with and without ID?
5. Does type of language measure (i.e., parent report or direct observation) affect the magnitude of the effects?
6. Do parent-implemented interventions positively affect parent use of language intervention strategies?

Method

Identification of Studies

Prior to the identification of studies, inclusion criteria were selected based on study design, type of intervention, participant characteristics, and outcome measures (see Table 1). Using these criteria, several methods were used to identify studies of parent-implemented language interventions. First, a database search of CSA Illumina was conducted using the following databases: ERIC, PsycArticles, PsycInfo, and CSA Linguistics and Language Behavior Abstracts. The key words used in these searches are listed in Table 2. Second, the reference lists of previous meta-analyses and literature reviews (Law et al., 2004; McConachie & Diggle, 2007) were reviewed for studies that met the inclusion criteria. The reference lists of all retrieved studies were also examined. Third, follow-up searches using the names of the first and second authors of all included studies were conducted. Fourth, abstracts of conference presentations were reviewed for papers reporting effects of parent-implemented language interventions, and authors were contacted to retrieve additional papers or unpublished data.

As shown in Table 2, the search yielded 951 unique abstracts for review. During the first selection phase, abstracts were screened for inclusion criteria by the first author. For a study to be definitively excluded, the abstract had to clearly indicate that the study failed to meet one of the specified inclusion criteria. When inclusion could not be determined from the abstract, full text documents were retrieved for the second selection phase. In the first phase, the majority of studies were excluded for the following reasons: The studies did not employ a group design, participants did not have language impairments, and the focus of the intervention was not language skills. During this screening phase, the number of studies was reduced from 951 to 59.

TABLE 1. Inclusion criteria.

Aspect	Criteria
Design	Nontreatment, "business as usual," or therapist-implemented comparison group
	Random or nonrandom assignment
	Pre/post comparison
	Published, unpublished, or dissertations
Intervention	Implemented only by parents
	Included a component that directly affected child communication
	Excluded dialogic reading
Participants	Between 18 and 60 months
	Any type of language impairment (i.e., 1 *SD* below the mean on standardized assessments or less than 50 expressive words at age 2)
Outcomes	At least one language outcome measure (e.g., receptive, expressive, vocabulary, syntax, or rate)
	Any type of measure (e.g., parent report, observational, or standardized)

Next, the first author retrieved full text study reports for all 59 studies that passed the initial screening. These studies were retrieved from the Vanderbilt Library System, interlibrary loan, University Microfilms, and the databases listed above. The method and results sections of the full study reports were examined in detail to determine whether each study met the inclusion criteria. The purpose of this screening step was to obtain a fuller understanding of each article by reviewing information that might not have been provided in the abstract. During this second screening phase, the number of studies was reduced from 59 to 26. Last, during the final full coding of the 26 retained articles, an additional eight studies were excluded. These studies and the reason for their exclusion are presented in Table 3. A summary of the 18 included studies is presented in Table 4. One study report (Gibbard, 1994) included data from two separate studies.

A second reviewer independently determined eligibility for the 59 studies for which the full text report was obtained. Agreement about eligibility for inclusion between the two reviewers was calculated using an intraclass correlation (ICC). The results indicate high agreement between the two reviewers (ICC = .95). Disagreements were resolved through discussion and review of the inclusion criteria.

Data Management and Extraction

All study titles and inclusion decisions were documented and managed using SPSS Version 16 software. When possible, PDF files were saved and organized by author and publication year. Hard copies of print-only articles were kept on file. After collecting the full study report, information was extracted from each article using a detailed coding protocol (this protocol may be obtained by contacting the first author). Two reviewers independently coded each full article for the variables listed in Table 4. Agreement for variables between the two reviewers was calculated using ICCs for continuous variables and Cohen's kappa for dichotomous variables. The results indicate high agreement between the two reviewers on all key variables presented in Table 4. Mean kappa was .90 with a range of .25–1.0. Mean ICC was .94 with a range of .89–1.0. Coding disagreements were discussed and resolved such that only data with perfect agreement were included in the analysis. All study coding, data management, and data analysis were done using SPSS Version 16 software.

Description of Included Studies

Characteristics of the 18 included studies are summarized in Tables 5 and 6. All studies except for three (Baxendale

TABLE 2. Search terms and respective yields.

Search source	Search terms	Number of abstracts
CSA Illumina (using ERIC, PsycInfo, PsycArticles, and CSA Linguistics and Language Behavior Abstracts)	(Descriptors) ("parent training" OR "parent education" OR "parents as teachers") AND ("language" OR "communication" OR "vocabulary") AND ("intervention" OR "effectiveness" OR "efficacy")	936
Review of reviews	References from Law et al. (2004) and McConachie & Diggle (2007)	7
Ancestral search	References from identified studies	5
Conference abstracts	Parent-implemented interventions	3
Total number of abstracts reviewed		951

& Hesketh, 2003; Gibbard, Coglan, & McDonald, 2004; McDade & McCartan, 1998) were randomized group experiments. The effect sizes from these three studies were compared to the range of effect sizes in the experimental studies. Because the effect sizes and sample size were within the ranges of the effect sizes in the randomized group experiments, they were included in the meta-analysis.

Sample characteristics. The average sample size across all studies was 38, with a range of 12 to 152 participants. Seven of the identified studies included children with developmental delays (including children with autism), and 11 studies included children with language impairments only. The majority of studies (n = 10) included children between 24 and 36 months of age. However, age of participants ranged from 15 to 77 months across studies.

Intervention characteristics. The general characteristics of the interventions and skills taught to parents are summarized in Table 6. The Hanen Parent Program was the most frequently studied parent-implemented language intervention (n = 8). Strategies taught to parents across studies included responding to child communication, balancing adult–child turns, and using language models. Interventions were primarily short in duration, lasted between

TABLE 3. Excluded studies and reasons for exclusion.

Study name	Reasons for exclusion
Howlin, P. (1981). The results of a home-based language training programme with autistic children. *British Journal of Disorders of Communication, 16,* 73–88.	Participants' average age was greater than 60 months.
Jocelyn, L., Casiro, O., Beattie, D., Baw, J., & Kneiz, 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 and Behavioral Pediatrics, 19,* 326–334.	Intervention was delivered simultaneously by parent and classroom teacher.
Kot, A., & Law, J. (1995). Intervention with preschool children with specific language impairments: A comparison of two different approaches to treatment. *Child Language Teaching and Therapy, 11,* 144–162.	Intervention was delivered simultaneously by parent and therapist.
Littleton, R. (2004). The modifiability of language input with toddlers with expressive language delay: A study of a team approach to parent training. *Dissertation Abstracts International: Section A. The Humanities and Social Sciences, 65,* 115.	Each experimental condition had fewer than 5 participants.
Smith, T., Groen, A., & Wynn, J. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation, 105,* 269–285.	Both experimental and control conditions included parent training.
Ward, S. (1999). An investigation into the effectiveness of an early intervention method for delayed language development in young children. *International Journal of Language & Communication Disorders, 34,* 243–264.	Average age of participants was less than 18 months.
Wetherby, Q., & Woods, J. (2006). Early social interaction project for children with autism spectrum disorders beginning in the second year of life: A preliminary study. *Topics in Early Childhood Special Education, 26,* 67–82.	Dependent variable was not measured prior to intervention for the control group.
Yoder, P., & Warren, S. (2002). Effects of prelinguistic milieu teaching and parent responsivity education on dyads involving children with intellectual disabilities. *Journal of Speech, Language, and Hearing Research, 45,* 1158–1174.	Intervention was delivered simultaneously by parent and therapist.

TABLE 4. Characteristics of parent-implemented language intervention studies.

Characteristics	*N*	%	Characteristics	*N*	%
Study characteristics					
Publication type			Year of publication		
Journal	16	89	1980–1990	1	6
Technical report	1	5	1991–2000	10	55
Unpublished data	1	5	2000–2010	7	39
Country			Design		
United States	2	11	Random	15	83
Canada	4	22	Nonrandom	3	17
United Kingdom	10	56	Design problems		
Other European country	2	11	Yes, favors control	1	5
Type of control group			No or not stated	15	83
Nontreatment control	10	46	Yes, favors treatment	2	11
Business as usual	5	23	Attrition from posttest		
Therapist	7	32	0%	11	61
Treatment fidelity			1–10%	3	17
Reported fidelity	5	28	11–20%	3	17
None reported	13	72	>20%	1	5
Sample characteristics					
Sample size			Percentage male		
10–20	2	11	50–74	8	44
21–30	9	50	75–100	8	44
31–40	4	22	Not reported	2	11
41–50	3	17	Percentage minority		
Average age of child participants (months)			1–50	3	17
22	1	5	51–99	1	5
24–35	10	56	Not reported	14	78
36–47	5	28	Disability type		
48–59	2	11	Autism	3	17
Socioeconomic status			Language impairment	11	61
Primarily middle class	9	50	Developmental delay	4	22
Mixed lower and middle class	2	11	Intellectual disability		
Not reported	7	39	No	11	61
Average parent education			Yes	7	39
High school	1	5	Average parent age (years)		
More than high school	6	33	20–30	3	17
Not reported	11	61	30–40	9	50
			Not reported	6	33
Intervention characteristics					
Duration of intervention (weeks)			Home training		
10–13	11	61	No home training	7	39
20	1	5	Some home training	9	50
26	3	17	All home training	2	11
52	3	17	Described parent training strategies		
Total number of training hours			No	9	50
13–20	7	39	Yes	9	50
22–26	7	39	Use of specific language targets		
32–36	2	11	No	9	50
Not reported	2	11	Yes	8	45
			Not reported	1	5
Measure characteristics					
Type of measure			Construct measured		
Only parent report	1	5	Overall language ability	9	50
Only observational	2	11	General receptive language	9	50
Only norm-referenced	0	0	General expressive language	8	44
Mixed measures	15	83	Expressive vocabulary	15	83
Measured parent use of strategies			Receptive vocabulary	5	28
Yes	10	56	Expressive morphosyntax	10	56
No	8	44	Rate	9	50

10 and 13 weeks, and included less than 26 total hr of parent training. Eleven of the interventions included at least some training at home.

Outcome measures. The most common language construct measured as an outcome of intervention was expressive vocabulary ($n = 15$). Expressive morphosyntax was measured in 10 studies, and general receptive and expressive language skills were each measured in nine studies. A summary of the measures used in each language construct for individual studies is provided in Table 7.

TABLE 5. Summary of included parent-implemented language intervention studies.

Study	*n*	Assignment	Attrition	Mean age in months (range)	Comparison group	Diagnosis	Intervention	Fidelity	Parent measures
Aldred et al. (2004)	28	Random	0.00	45 (24–71)	Community services	ASD	Child Talk	No	Responsiveness
Baxendale & Hesketh (2003)	37	Nonrandom	0.11	33 (29–41)	Therapist, 12 sessions, 12 weeks	LI	Hanen Parent Program	No	Responsiveness, rate
Buschmann et al. (2008)	58	Random	0.19	25 (24–27)	Nontreatment	LI	Heidelberg Parent-Based Language Intervention	No	None
Drew et al. (2002)	24	Random	0.00	23	Community services	ASD	Social pragmatic joint attention	No	None
Fey et al. (1993)	30	Random	0.00	56 (44–70)	Nontreatment; therapist, 22 sessions, 20 weeks, 22 total hr	LI	Focused stimulation	No	None
Gibbard (1994) 1	36	Random	0.00	34 (20–42)	Nontreatment	LI	Parent-based intervention	No	None
Gibbard (1994) 2	25	Random	0.00	32 (29–36)	Nontreatment; therapist, 26 sessions, 26 weeks, 13 total hr	LI	Parent-based intervention	No	None
Gibbard et al. (2004)	28	Nonrandom	0.21	27 (22–32)	Therapist, 26 weeks	LI	Parent-based intervention	No	None
Girolametto (1988)	22	Random	0.09	37 (15–62)	Nontreatment	DD	Hanen Parent Program	No	Responsiveness, rate
Girolametto et al. (1996a)	16	Random	0.00	29 (22–38)	Nontreatment	LI	Hanen Parent Program and focused stimulation	Yes	Responsiveness, rate, language models
Girolametto et al. (1996b)	25	Random	0.00	29 (23–35)	Nontreatment	LI	Hanen Parent Program and focused stimulation	Yes	Rate, language models
Girolametto et al. (1998)	12	Random	0.00	38 (29–46)	Community services	DS	Hanen Parent Program plus focused stimulation	Yes	Rate, language models
Green et al. (2010)	152	Random	0.04	45 (29–60)	Community services	ASD	Parental sensitivity and responsiveness	Yes	Responsiveness
Kaiser & Hancock (1998)	73	Random	0.05	45 (30–77)	Community services and therapist, 24 sessions, 12 weeks, 24 total hr	DD	Enhanced milieu teaching	Yes	Responsiveness
Law et al. (1999)	38	Random	0.00	37 (33–39)	Nontreatment; therapist, 18 sessions, 6 weeks, 27 total hr	LI	Hanen Parent Program	No	Responsiveness, language models
McDade & McCartan (1998)	22	Nonrandom	0.14	24	Nontreatment	LI	Hanen Parent Program	No	None
Tannock et al. (1992)	32	Random	0.00	30	Nontreatment	DD	Hanen Parent Program	No	Language models
Van Balkom et al. (2010)	22	Random	0.05	34 (26–37)	Therapist, 12 sessions, 12 weeks, 9 total hr	LI	Parent video home training	No	None

Note. ASD = autism spectrum disorders; LI = language impairment; DD = developmental delay; DS = Down syndrome.

Study quality. Study quality characteristics, such as attrition, treatment fidelity, assignment of participants to conditions, and differences between groups at pretest, are summarized in Table 5. The majority of studies ($n = 11$) reported low levels of attrition, equivalence of groups at pretest ($n = 15$), and random assignment of participants ($n = 15$). The majority of studies did not report a measure of treatment fidelity ($n = 13$). Moderator analyses indicated that none of these study quality variables were significantly associated with effect sizes.

Data Synthesis

Effect size calculations and adjustments. Because sample sizes were small in the majority of studies, and pretest and posttest scores were available for all studies, effect sizes were

TABLE 6. Summary of parent-implemented intervention characteristics.

Study	Intervention	Amount of parent training	Home sessions	Quantity of linguistic input	Quality of linguistic input	Responsiveness	Support strategies	Other strategies
Aldred et al. (2004)	Child talk	9 sessions and maintenance, 52 weeks	0		General language models			Joint attention, routines, expanding play, communication teasers
Baxendale & Hesketh (2003)	Hanen Parent Program	11 sessions, 11 weeks	3	Adult–child turn ratio		Imitations	Expansions, recasts	
Buschmann et al. (2008)	Heidelberg Parent-Based Language Intervention	8 sessions, 13 weeks, 17 total hr	0		General language models			Child-oriented interactions
Drew et al. (2002)	Social pragmatic joint attention	9 sessions, 52 weeks, 26 total hr	9					Behavioral management, joint attention, turn-taking games, gestures, routines
Fey et al. (1993)	Focused stimulation	19 sessions, 20 weeks, 36 total hr	3	Increased opportunities to hear targets	Specific language models		Recasting	Contingent queries
Gibbard (1994) 1	Parent-based intervention	11 sessions, 26 weeks, 14 total hr	0		Specific language models			
Gibbard (1994) 2	Parent-based intervention	11 sessions, 26 weeks, 14 total hr	0		Specific language models			
Gibbard et al. (2004)	Parent-based intervention	11 sessions, 26 weeks, 16.5 total hr	0		Specific language models			
Girolametto (1988)	Hanen Parent Program	12 sessions, 11 weeks, 32 total hr	3	Turn taking	General language models	Responding to child communication	Expansions	Following the child's lead, play and music, sharing books
Girolametto et al. (1996a)	Hanen Parent Program and focused stimulation	13 sessions, 13 weeks, 20 total hr	3	Turn taking	Specific language models	Responding to child communication	Expansions	
Girolametto et al. (1996b)	Hanen Parent Program and focused stimulation	11 sessions, 11 weeks, 22 total hr	3	Turn taking	Specific language models	Responding to child communication	Expansions	
Girolametto et al. (1998)	Hanen Parent Program and focused stimulation	13 sessions, 13 weeks, 26 total hr	4	Turn taking	Specific language models	Responding to child communication	Expansions	

(table continues)

TABLE 6 (*continued*).

Study	Intervention	Amount of parent training	Home sessions	Quantity of linguistic input	Quality of linguistic input	Responsiveness	Support strategies	Other strategies
Green et al. (2010)	Parental sensitivity and responsiveness	18 sessions, 52 weeks, 36 total hr	0		General language models	Responding to child communication	Expansions	Action routines, pauses
Kaiser & Hancock (1998)	Enhanced milieu teaching	24 sessions, 12 weeks, 24 total hr	0	Turn taking	Specific language models	Responding to child communication	Expansions, prompting	
Law et al. (1999)	Hanen Parent Program	10 sessions, 10 weeks, 25 total hr	3	Turn taking	General language models	Respond to child communication	Expansions	
McDade & McCartan (1998)	Hanen Parent Program	12 sessions, 12 weeks	3	Turn taking	General language models	Respond to child communication	Expansions	
Tannock et al. (1992)	Hanen Parent Program	12 sessions, 12 weeks, 25 total hr	3	Turn taking	General language models	Respond to child communication	Expansions	
Van Balkom et al. (2010)	Parent video home training	3 sessions, 12 weeks, 9 total hr	6					Involvement in child activities, conversational coherence, reciprocity of communication, conversational interactions, attachment, referencing, relevance, connectivity

TABLE 7. Included measures by construct for each study.

Study	Overall language	Receptive language	Expressive language	Expressive vocabulary	Receptive vocabulary	Expressive morphosyntax	Rate
Aldred et al. (2004)	Vineland Communication Subscale[a]			CDI words said	CDI words understood		Communication acts
Baxendale & Hesketh (2003)	PLS total score					MLU	
Buschmann et al. (2008)			SETK[b] word production, SETK sentence production	CDI words said		CDI syntax, CDI morphology	
Drew et al. (2002)				CDI words said	CDI words understood		
Fey et al. (1993)						Developmental sentence score	
Gibbard (1994) 1	Reynell Receptive and Expressive Subscales[c]	Reynell Receptive Subscale	Reynell Expressive Subscale	Mother reported total words		Mother reported phrase length, MLU	Total number of utterances
Gibbard (1994) 2	Reynell Receptive and Expressive Subscales	Reynell Receptive Subscale	Reynell Expressive Subscale	Mother reported total words		Mother reported phrase length, MLU	Total number of utterances
Gibbard et al. (2004)	Reynell total score	PLS Receptive Subscale	PLS Expressive Subscale	Mother reported total words		Mother reported phrase length, MLU	
Girolametto (1988)	SICD Expressive and Receptive Subscales	SICD Expressive Subscale	SICD Receptive Subscale	NDW			Percentage of verbal turns
Girolametto et al. (1996a)				CDI words said			
Girolametto et al. (1996b)				CDI words said, NDW		CDI sentence complexity, multiword combinations	WPM, total number of utterances
Girolametto et al. (1998)				CDI words said			
Green et al. (2010)	PLS Expressive and Auditory Subscales	PLS Receptive Subscale	PLS Expressive Subscale	CDI words said			Child initiations
Kaiser & Hancock (1998)	SICD Expressive and Receptive Subscales	SICD Receptive Subscale	SICD Expressive Subscale	CDI words said, NDW	PPVT	MLU	Total number of utterances
Law et al. (1999)	PLS Expressive and Receptive Subscales	Reynell Receptive Subscale, PLS Receptive Subscale	PLS Expressive Subscale	CDI words said, use of nouns	PPVT	MLU, CDI sentence complexity	Communication acts
McDade & McCartan (1998)				Information carrying words	CDI words understood		
Tannock et al. (1992)		SICD Receptive Subscale		CDI words said, NDW			Verbal turns
Van Balkom et al. (2010)		Reynell Receptive Subscale				MLU, grammaticality	

Note. CDI = MacArthur–Bates Communicative Development Inventories (Fenson et al., 1993); PLS = Preschool Language Scale (Zimmerman et al., 1992); MLU = mean length of utterance; SICD = Sequenced Inventory of Communication Development (Hedrick et al., 1984); NDW = number of different words obtained through a language sample; WPM = words per minute obtained through a language sample; PPVT = Peabody Picture Vocabulary Test (Dunn & Dunn, 1997).

[a]From Vineland Adaptive Behavior Scales (Sparrow et al., 1984).
[b]German norm-referenced test (Grimm, 2000).
[c]From Reynell Developmental Language Scales (Reynell & Gruber, 1990).

calculated by subtracting pretest group differences from the posttest. This method was used to control for differences in the outcome variables between groups at the pretest (Morris, 2008):

$$ES_{sm} = \frac{(\overline{X}_{G1post} - \overline{X}_{G1pre}) - (\overline{X}_{G2post} - \overline{X}_{G2post})}{S_p}.$$

In this formula, $\overline{X}_{G1}$ is the mean of the outcome measure for the intervention group, $\overline{X}_{G2}$ is the mean of the outcome measure for the comparison group, and S_p is the pooled standard deviation of both the intervention and comparison groups at posttest. Applying this method yielded a more conservative estimate of the effects of the parent-implemented intervention. For example, the pretest effect size for the overall language construct was $g = 0.31$, $p = .06$, 95% CI [–0.01, 0.63] and approached significance, indicating that children in the parent-implemented experimental condition had substantially higher overall language skills than children in the therapist-implemented condition prior to intervention. Failing to account for these differences would have inflated the effect size in favor of the parent-implemented group. Using only the posttest to compute the effect size yielded an overall effect size of $g = 0.53$, $p = .08$, 95% CI [–0.07, 1.12], which approached significance. However, adjusting for pretest differences yielded an effect size of $g = 0.24$, $p = .35$, 95% CI [–0.25, 0.73], which was not significant.

In addition to the main analyses, raw mean difference effect sizes were calculated for the most commonly used measure across studies (i.e., parent report of child number of expressive vocabulary words) in order to quantify intervention effects in a clinically meaningful metric. The raw mean difference was calculated by subtracting the means of the raw score of the comparison group from the mean of the parent-implemented intervention group. The raw mean difference was only calculated for those studies that used this common measure.

All effect size computations were adjusted using Hedges's (1981) small sample correction (g), such that the unbiased effect size estimate was:

$$ES'_{sm} = \left[1 - \frac{3}{4N - 9}\right] ES_{sm}.$$

Effect sizes were not weighted by an index of methodological quality, as current meta-analytic standards recommend using study quality characteristics as control or moderator variables, rather than weighting each effect size, which hides the relationship between study quality and observed effect sizes (Lipsey & Wilson, 2001).

Effect sizes and sample sizes that were greater than 1.5 times the interquartile range were Winsorized. To assess the possibility of publication bias, the "trim and fill" procedure was conducted using Comprehensive Meta-Analysis software (Version 2). This procedure trims excessively large studies by reducing the influence of such studies and imputes small studies that may be missing. Visual inspection of the funnel plot for each outcome variable and examination of Egger's regression intercept p values indicated that the observed effect sizes for all outcome variables were likely based on an unbiased set of studies.

Many studies included multiple comparison groups, reported results of multiple outcome measures (e.g., vocabulary or syntax), and measured outcomes for the same participants over time. To limit the impact of a single study on the aggregated outcome analysis, several steps were taken to ensure that each study only contributed one effect size in each analysis. First, two separate analyses were conducted based on the comparison condition: (a) "business as usual" or nontreatment control (parent-implemented vs. control) and (b) therapist-implemented intervention (parent-implemented intervention vs. therapist-implemented intervention). Four studies included three comparison conditions (i.e., parent-implemented, therapist-implemented, and control). Only one comparison was used in each analysis. If two parent-implemented interventions were compared to a control group, the effect sizes for the two parent-implemented interventions were averaged. If a parent-implemented intervention was compared to two control groups, the group that most closely resembled business as usual was included. Second, when participants were measured at multiple time points, only the first time point after the intervention was included in the analysis, as this was the most common point of measurement across studies. Third, effect sizes for different language constructs (e.g., expressive vocabulary and receptive language) were analyzed separately. When different measures for the same language construct were reported within the same study, the most commonly used measure across studies for a given construct was chosen. If multiple common measures of a language construct were used in a given study, these effect sizes were averaged together for that study. Table 7 lists the measures included for each language construct for individual studies.

Statistical model for analysis. A random effects model was used to analyze effect sizes. The standard error for each effect size was calculated as follows:

$$SE = \sqrt{v_\theta + v_i}.$$

In this equation, v_i is the estimate of the variance associated with subject level sampling error:

$$v_i = \frac{n_{G1} + n_{G2}}{n_{G1} n_{G2}} + \frac{(ES'_{sm})^2}{2(n_{G1} + n_{G2})},$$

and v_θ is the estimate of the random or between-studies variance component; v_θ was estimated through SPSS meta-analysis macros (Lipsey & Wilson, 2001). The mean effect size for the random effects model was calculated by weighting each adjusted effect size (ES_i) by the inverse of its variance (w_i):

$$w_i^* = \frac{1}{v_\theta + v_i},$$

where v_i is the estimate of the variance associated with subject-level sampling error, and v_θ is the estimate of the random or

between-studies variance component. Analysis of the effect sizes was conducted separately for each outcome construct, and effects are summarized in Table 7. Moderator analyses were also conducted for disability type (i.e., ID vs. no ID) and measure type (i.e., direct observation vs. parent report) using a random effects model. A moderator analysis for disability type was only conducted for those constructs for which there were at least two studies enrolling children with ID and two studies enrolling children without ID (i.e., overall language, expressive language, receptive language, expressive vocabulary, and rate). A moderator analysis for disability type was not conducted for studies that included a therapist-implemented intervention group because only one study included children with ID. A moderator analysis for measure type (i.e., direct observation vs. parent reported) was conducted for only expressive vocabulary and expressive syntax, as these were the only two constructs for which there was a sufficient number of studies in each group.

Results

Do Parent-Implemented Interventions Positively Affect Child Language Outcomes?

This question was answered by examining the effect sizes for each of the seven language constructs when parent-implemented language intervention was compared with a control group. The effect sizes ranged from $g = 0.35$, 95% CI [0.05, 0.65] for receptive language to $g = 0.82$, 95% CI [0.37, 1.38] for expressive syntax. Effect sizes for six of the seven language constructs were positive and statistically significant. Overall effect sizes for each outcome are presented in Table 8. These results indicate that parent-implemented intervention had positive, significant effects on receptive and expressive language skills, receptive and expressive vocabulary, expressive morphosyntax, and rate of communication when compared to a control group.

In addition to these standardized mean difference results, a raw mean difference analysis was also calculated for parent report of expressive vocabulary. A forest plot summarizing weighted effect sizes for the raw mean difference for each study is provided in Figure 1. Forest plots illustrate the effect size, significance level, and confidence interval for each study as well as showing the overall aggregated effect size. The size of the markers representing individual effect sizes displays the individual weight of each study in the analysis, with larger studies receiving a greater weight and a larger marker. Parents in the parent-implemented intervention group reported that their children said 52 more words, $p = .01$, 95% CI [12.03, 93.12], than parents in the control group.

Is Intervention More Effective When Delivered by a Parent or by a Therapist?

When parent-implemented intervention was compared to a therapist-implemented intervention, effect sizes were smaller and mostly nonsignificant. Effect sizes ranged from $g = –0.15$, $p = .48$, 95% CI [–0.56, 0.27] for rate of communication to $g = 0.42$, $p = .02$, 95% CI [0.08, 0.76] for expressive morphosyntax. There was no difference between parent- and therapist-implemented intervention for five of the seven language constructs. Significant positive effects were only present for receptive language, $g = 0.41$, $p = .02$, 95% CI [0.08, 0.76], and expressive syntax, $g = 0.42$, $p = .02$, 95% CI [0.08, 0.76]. These results indicate that differences between parent- and therapist-implemented interventions are variable depending on the language construct.

In addition to these standardized mean difference results, a raw mean difference analysis was calculated for parent report of child vocabulary. A forest plot summarizing weighted effect sizes for the raw mean difference for each study is provided in Figure 2. Parents in the parent-implemented intervention group reported that their children said 22 more words, $p = .42$, 95% CI [–3.87, 74.25], than parents in the therapist-implemented intervention group.

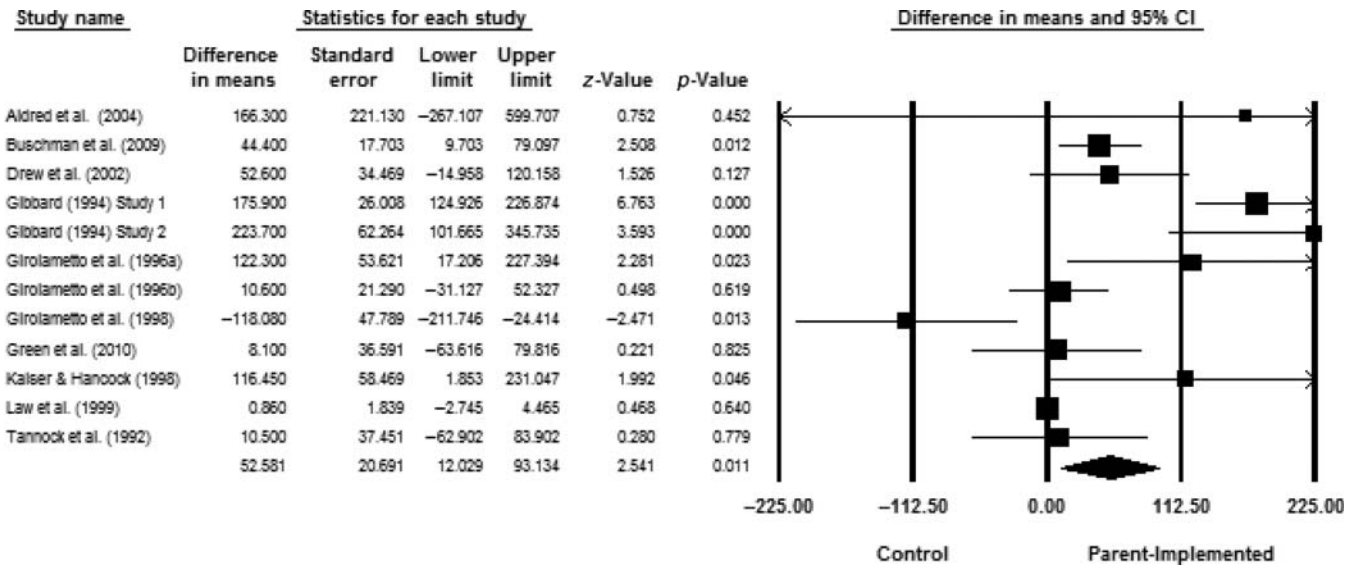
Which Child Language Outcomes Have the Largest Effects?

Examination of the effect sizes and confidence intervals in Table 8 reveals that expressive morphosyntax had the largest effects for both the control comparison, $g = 0.82$, $p = .00$, 95% CI [0.37, 1.38], and the therapist-implemented comparison, $g = 0.42$, $p = .92$, 95% CI [0.06, 0.79]. However,

TABLE 8. Mean effect sizes, confidence intervals, significance levels, and sample sizes for all language outcome constructs.

	Parent versus control				Parent versus therapist			
	g	95% CI	*p*	*n*	*g*	95% CI	*p*	*n*
Child measures								
Overall language	0.45	[–0.02, 0.92]	.06	7	0.24	[–0.26, 0.73]	.35	5
Expressive language	0.61	[0.00, 1.21]	.05	7	0.25	[–0.43, 0.93]	.47	4
Receptive language	0.35	[0.05, 0.65]	.02	7	0.41	[0.08, 0.76]	.02	5
Expressive vocabulary	0.48	[0.24, 0.73]	.00	14	0.14	[–0.25, 0.54]	.69	4
Receptive vocabulary	0.38	[0.10, 0.66]	.01	5	0.19	[–0.26, 0.64]	.41	2
Expressive morphosyntax	0.82	[0.37, 1.38]	.00	7	0.42	[0.06, 0.79]	.02	7
Rate	0.51	[0.18, 0.84]	.00	9	–0.15	[–0.56, 0.27]	.48	3
Adult measures								
Parent responsiveness	0.73	[0.26, 1.20]	.00	7				
Rate	0.26	[–0.13, 0.64]	.19	5				
Use of language models	0.38	[–0.03, 0.80]	.07	5				

FIGURE 1. Forest plot for raw mean difference in vocabulary for the parent-implemented intervention versus control comparison.



no single language construct was significantly larger than another, as indicated by nonoverlapping confidence intervals. In addition, the magnitude of effects by language construct varied substantially by comparison group. For example, receptive language had the smallest effect, $g = 0.35$, $p = .02$, 95% CI [0.05, 0.65], in the control comparison but the largest effect for the therapist-implemented comparison, $g = 0.42$, $p = .02$, 95% CI [0.06, 0.79].

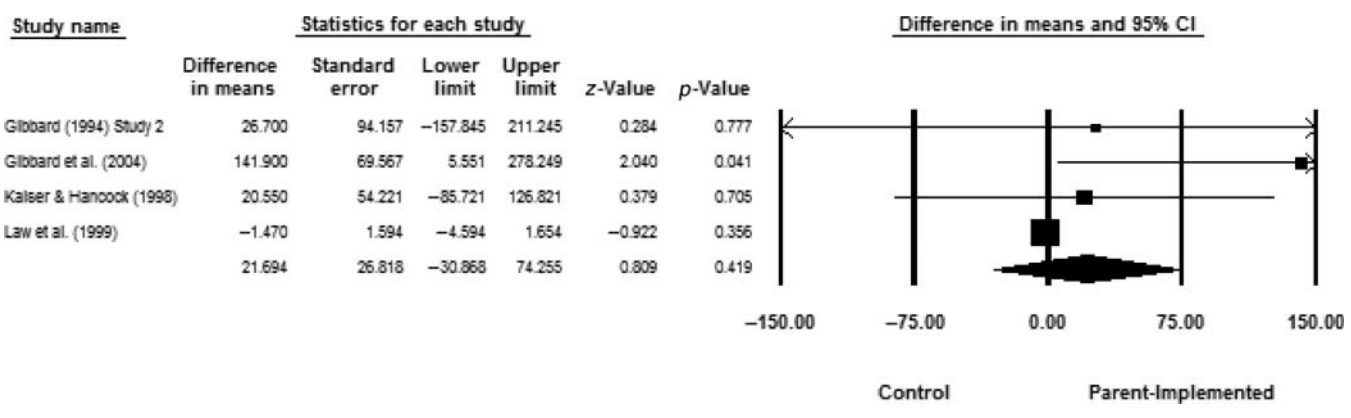
Do the Effects Differ for Children With and Without ID?

A moderator analysis between children with and without ID was only conducted for the control comparison group, as there was an insufficient number of studies enrolling children with ID in the therapist-implemented comparison. Analyses were conducted for overall language, expressive language, receptive language, expressive vocabulary, and rate of communication. Effect sizes were only significantly different between children with and without ID for expressive vocabulary, $Q_b = 7.62$, $p = .01$. The effect for children without ID was $g = 0.80$, $p = .00$, 95% CI [0.50, 1.1], and the effect for children with ID was $g = 0.23$, $p = .10$, 95% CI [–0.04, 0.50]. These results indicate that for the majority of language constructs (i.e., overall language, expressive language, receptive language, and rate of communication), there were no significant differences between children with and without ID.

Does Type of Language Measure Affect the Magnitude of the Effects?

Moderator analyses examining the difference between parent report and observational measures of expressive

FIGURE 2. Forest plot for raw mean difference in vocabulary for the parent-implemented intervention versus therapist-implemented intervention comparison.



vocabulary and morphosyntax were conducted for both comparison groups. There were no significant differences in effect sizes for parent-reported measures and observational measures of expressive vocabulary for control (Q_b = 0.08, p = .78) or therapist-implemented comparisons (Q_b = 0.66, p = .42). There were also no significant differences for expressive morphosyntax for control (Q_b = 0.25, p = .61) or therapist-implemented comparisons (Q_b = 1.0, p = .76). These results indicate that measurement type of expressive vocabulary and morphosyntax did not significantly affect the magnitude of the effects in either comparison (i.e., control or therapist-implemented).

Do Parent-Implemented Interventions Positively Affect Parent Outcomes?

Ten of the 18 studies reported the effects of parent training on parents' use of specific language support strategies. The three most commonly measured parent strategies were (a) parent responsiveness (n = 7), (b) use of language models (n = 5), and (c) adult rate of communication (n = 5). These constructs were measured only in studies that compared a parent-implemented intervention group to a control group.

In general, parent training had a positive impact on parent–child interaction style in terms of responsiveness, use of language models, and rate of communication. Parents who received parent training were significantly more responsive than parents who were not trained, g = 0.73, p = .00, 95% CI [0.26, 1.20]. A forest plot summarizing weighted effect sizes for parent responsiveness for each study is provided in Figure 3. Parents who received parent training also used more language models than parents who were not trained, g = 0.38, p = .07, CI [–0.03, 0.80]. In addition to changes in responsiveness and language modeling, parent training may have increased rate of adult communication, but the difference between trained parents and parents in the control condition was not significant, g = 0.26, p = .19, 95% CI [–0.13, 0.64].

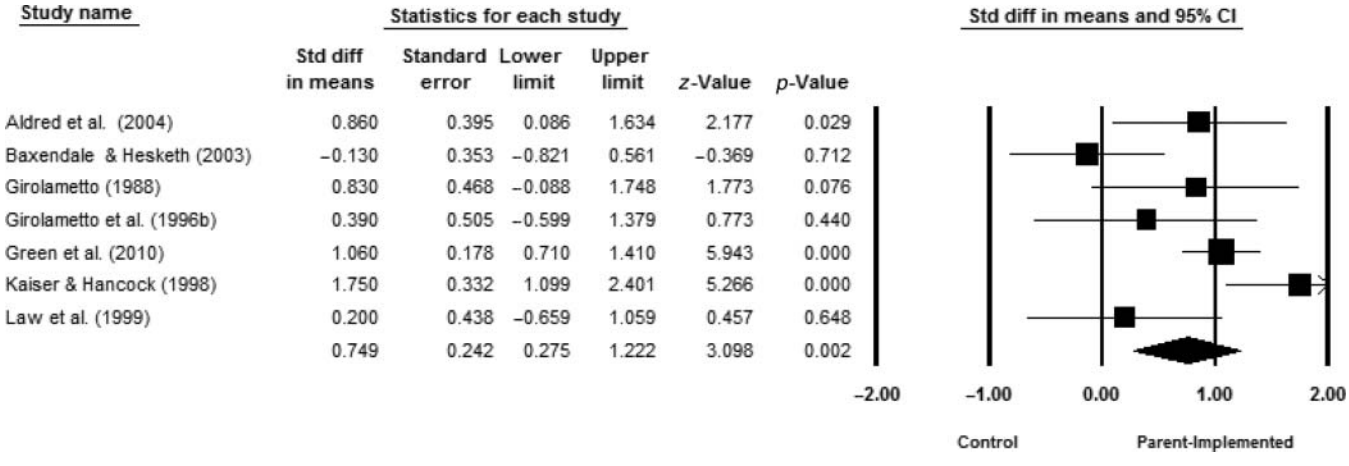
Discussion

The objective of this meta-analysis was to understand the extent to which parent-implemented language interventions were effective in increasing the language skills of children between 18 and 60 months of age with primary and secondary language impairments. Because the research base was small (i.e., 18 studies), and all studies included small samples, meta-analysis was an effective synthesis technique. In meta-analysis, the results of the small studies are pooled, thereby increasing the statistical power to detect differences between experimental conditions.

In general, parent-implemented language interventions had positive effects on children's language outcomes when compared to a control group, as indicated by significant effect sizes across six of the seven language outcome constructs. The relative effects of parent-implemented interventions were larger in comparison to a control group than in comparison to a therapist-implemented intervention group. While effects for all seven constructs were significant or near significant for the control comparison, only receptive language and expressive syntax were significant for the therapist-implemented comparison. Measures that were more proximal to the intervention (e.g., expressive morphosyntax) had larger effect sizes than more distal measures of developmental outcomes (e.g., overall language). Parent-implemented language interventions were effective for both children with and without ID. There were no differences in language outcome effects for children with and without ID, except for expressive vocabulary. There were no differences in the magnitude of effects between parent report and direct-observational measures of vocabulary and syntax, suggesting that intervention effects were not simply the result of changes in parental perceptions of their children's language skills, which might have been reflected in parent report measures. Parent training also had positive effects on parent use of intervention strategies, with the largest effect on parent responsiveness.

While the results clearly indicate that the overall effects of parent-implemented language interventions were positive and significant, there are several weaknesses in this body of

FIGURE 3. Forest plot of responsiveness for the parent-implemented intervention versus control comparison.



research studies. First, the majority of studies (72%) did not measure treatment fidelity, and half of the studies (50%) did not adequately describe the parent training procedures. Little information was provided about the personnel who delivered the parent training, strategies used to teach parents, or how much parent training occurred within the parent and child sessions. Parents' implementation of the language intervention techniques during and after training was measured in only 10 of the 18 studies. Without specific descriptions of the parent training intervention and how it was actually implemented, it is difficult to determine what specific characteristics of the independent variable (i.e., parent training) resulted in changes in the dependent variable (i.e., child language outcomes). Thus, while the effects of parent-implemented language interventions are positive, it is unclear (a) how parent training is best accomplished and (b) which specific language strategies or key intervention components are effective at improving language skills for children with language impairments. Future research should include detailed descriptions and direct measures of the parent training procedures. In addition, systematic measurement of parents' use of intervention strategies as an outcome of parent training procedures is also necessary. Only when measures of parent training and parent implementation are included in studies will it become possible to examine particular parental characteristics (e.g., education or buy-in to the intervention) that may influence parental use of language intervention strategies and child language outcomes.

Second, while all of the studies reviewed included children with language impairments, not all profiles of young children with language impairments were represented in this data set. The majority of studies included children with language impairments and intellectual or developmental delays or children who had expressive language delays and typical intellectual abilities. Only one study (Law, Kot, & Barnett, 1999) included participants who had both receptive and expressive language impairments with no intellectual impairment. In this study, there were negative effects for receptive ($g = –0.17$) and expressive ($g = –0.62$) language. It is important to note that this was the only study in which effect sizes were calculated based on standard scores rather than raw scores. Because standardized scores are adjusted for age and designed to be stable estimates, differences in standard scores over a period of 10 weeks would not be expected.

Third, it is not yet clear whether the effects of parent-implemented intervention differ for receptive and expressive child language outcomes. Across all studies in which parent-implemented interventions were compared to a control group, the average effect sizes for general receptive language skills and general expressive language skills were statistically different than zero ($g = 0.35$ and 0.61, respectively). In general, the effect sizes were larger for general expressive language and smaller for receptive language in the majority of studies. Because parent-implemented interventions focused primarily on improving children's expressive language skills, these results may indicate that parent-implemented language interventions might be strengthened by including a component that specifically targets receptive language abilities. In particular, the addition of strategies to improve receptive skills might be needed for children who exhibit both receptive and expressive language impairments.

Fourth, only four studies followed children over time (Baxendale & Hesketh, 2003; Buschmann et al., 2008; Law et al., 1999; van Balkom, Verhoeven, Van Weerdenburg, & Stoep, 2010). In a 6-month follow-up, Buschmann et al. (2008) found that effect sizes remained positive and significant over time, with an effect size of $g = 0.68$ for expressive vocabulary and $g = 0.63$ for expressive morphosyntax at the 6-month follow-up when compared to a control group. Van Balkom et al. (2010) also found that language skills maintained over time. The effect for mean length of utterance was $g = 0.12$ at posttest and $g = 0.21$ at follow-up; the effect size for receptive language was $g = 0.37$ at posttest and $g = 0.71$ at follow-up when comparing a parent-implemented intervention to a therapist-implemented intervention. The Law et al. (1999) study that had negative effects for expressive language at the posttest showed positive effects for expressive language at the 6-month follow-up. General expressive language ability, which had a negative effect size ($g = –0.46$) at posttest, had a positive effect size at the 6-month follow-up assessment ($g = 0.37$) when compared to a therapist-implemented intervention group. However, receptive language outcomes that had a negative effect size ($g = –0.56$) at posttest remained negative at the 6-month follow-up assessment ($g = –0.25$). Thus, it appears that while long-term expressive language gains were made for children in the parent-implemented intervention group, receptive language changes over time were less than those made by the therapist-implemented group.

Studying the longitudinal effects of parent-implemented interventions is important for several reasons. One rationale for parent-implemented interventions is that intervention effects are expected to maintain over time. Findings from Buschmann et al. (2008) and Law et al. (1999) support this premise. As noted previously, Law et al. included children with expressive and receptive language impairments, while Buschmann et al. included younger children with only expressive language delays. The difference in population may have contributed to differences in the long-term outcomes in these studies. Additional research examining growth of child language skills as well as parents' use of intervention strategies over time is necessary to determine the long-term effects of parent-implemented language interventions for specific populations of children with language impairments.

Limitations of the Review

There are several limitations to this review. First, as mentioned previously, minimal information was provided about the two critical components of parent-implemented intervention: (a) parent training (e.g., how parents were trained and how much training occurred) and (b) subsequent parental use of language support strategies. This lack of information limits the conclusions that may be drawn from this review. The results of this review indicate that parent-implemented language interventions resulted in positive language outcomes for children with language impairments. The results are somewhat ambiguous as to which intervention components led

to increases in language skills. Thus, no recommendations can be made regarding specific effective features of parent-implemented language interventions.

Second, the results of a meta-analysis are only as strong as the studies that are included in the analysis. The methodological rigor of the studies varied substantially, as reflected in the study characteristics presented in Table 5. Seven studies had sample sizes of less than 25 participants. Two studies exhibited nonequivalence between groups on variables that were not accounted for statistically in the outcome analysis. This nonequivalence is not surprising given the small sample sizes, but failure to statistically correct for nonequivalence is problematic. These methodological limitations should be considered when interpreting the results.

Third, in addition to the small sample sizes in individual studies, this review included a total of only 18 studies. The small number of studies restricts both the generalizability of the findings and the number of methodological variables that can be analyzed statistically to explore moderators of intervention effects. Secondary analyses are further limited by the range of outcome measures that were used across studies. The number of studies contributing to any one analysis ranged from two to 14. Analyses that included fewer than three studies should be interpreted with caution.

Fourth, the external validity of these results is limited because the socioeconomic status for the majority of the study participants was middle class, and all parents volunteered to participate in parent training and to learn the intervention strategies. It is unclear whether the positive results of parent-implemented language interventions would generalize to parents and children from a lower socioeconomic status or to parents who were provided parent training as part of routine speech-language therapy. Additional research that includes a more diverse sample of participants is needed to understand for which populations of parents and children parent-implemented language interventions is effective.

Implications for Practice

In addition to providing empirical support for the practice of parent-implemented language interventions, several specific implications for practices related to parent-implemented language interventions may be drawn from this review: (a) interventions should focus on socially communicative interactions between parents and children, (b) parents should be taught to increase their use of specific linguistic forms through models and expansions, (c) parents should be trained at home and across everyday routines, (d) parent-implemented interventions may be effective for children with a range of intellectual and language skills, and (e) training parents about once per week may be sufficient to improve child language outcomes. While specific parent training techniques were not clearly described in this set of studies, general intervention principles were common across the majority of parent-implemented language interventions. The consistent use of common principles across parent-implemented interventions and the quantitative outcomes of this review together support these recommendations for practice.

Most of these experimental interventions included a social-communication focus. The context for parent-implemented language teaching was the interaction between the child and the parent occurring during play, routines, and everyday activities. The focus of many parent-implemented interventions was enhancing turn-taking interactions to increase child communicative initiations and amount of parent–child interaction. Increasing parent responsiveness to child communication was targeted in 10 of the 18 studies, and in the seven studies that measured parent strategy use, there was clear evidence of changes in parent responsiveness resulting from training. In general, increasing parent–child turn taking in interactions and improving parent responsiveness to communication appear to be associated with positive child language outcomes.

Parent-implemented interventions focused on increasing two types of linguistic input to the child: what the parent says (i.e., language models) and how much the parent says. For example, in focused stimulation, the child is exposed to multiple examples of a linguistic target form during a parent–child interaction. In the Hanen Parent Program, parental linguistic input is increased by expanding what the child says to include more complex models of language contingent upon child verbalizations. For example, if the child says, "Dog eats," the parent is instructed to say, "The dog eats the bone." Enhancing parental input by increasing exposures to language targets and increasing complexity of the models provided to the child by expanding the child's utterances appears to have positive effects on children's language development.

In some studies, parents were taught to use specific language targets. From the results of this review, it is unclear if teaching parents to use child-specific language targets (e.g., modeling specific words or word combinations) is more effective than simply increasing parent responsiveness or changing their rate of talking. The degree of individualization of child language targets needed to affect child outcomes is likely influenced by child characteristics (e.g., cognitive level and language skills).

Several parent-implemented language interventions used everyday routines that occurred in the child's natural environment (usually the home) as a context for intervention. Over half of the included studies (n = 11) included at least some training in the home. By training parents in the home, it is more likely that intervention will affect both the parent and the child in their everyday interactions and that these effects will generalize to other settings and maintain over time. Future research is needed to test this hypothesis empirically. Thus, these studies suggest that training occur at home whenever possible. The duration of parent training in the included studies was 36 hr or less, with a mean of 23 hr and a range of 9–36 hr. The majority of interventions were fewer than 26 hr, which is equivalent to 1 hr of parent training per week for 6 months. This is a relatively small amount of direct intervention with the parent and child given the magnitude and consistency of the effects on child language outcomes. These results indicate that parent-implemented language intervention is an effective approach and may be an efficient intervention for children with language impairments.

Parent-implemented interventions were used with parents of children with varying degrees of cognitive and language impairments. In general, parent-implemented interventions were effective for children with and without ID. These results

indicate that parent-implemented interventions may be effective for several populations of children with language impairments, including children with autism, developmental delays, and expressive language delays.

Conclusion

The results of this review indicate that parent-implemented language interventions are an effective early language intervention for young children with language impairments from middle-class families whose parents agreed to participate in research studies. Parents can be taught to implement both general and specific language support strategies. Parent-implemented interventions appear to be associated with substantial language growth in young children with varying degrees of cognitive and language impairments. The largest effects on language skills were for expressive morphosyntax for both comparisons. Children whose parents received training used more complex language than children whose parents did not receive this training. These results indicate that even a small amount of parent training can have substantial effects on children's language development. Although the exact mechanisms linking changes in parental language support to children's outcomes were not examined in these studies, it appears that children made receptive and expressive language gains when compared to a control group, as a result of parents learning to use specific language intervention strategies. These conclusions must be considered in the context of the limitations of this meta-analysis and the limitations of the individual studies.

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