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Association of Parent Training With Child Language Development
A Systematic Review and Meta-analysis

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IMPORTANCE Training parents to implement strategies to support child language development is crucial to support long-term outcomes, given that as many as 2 of 5 children younger than 5 years have difficulty learning language.

OBJECTIVE To examine the association between parent training and language and communication outcomes in young children.

DATA SOURCES Searches of ERIC, Academic Search Complete, PsycINFO, and PsycARTICLES were conducted on August 11, 2014; August 18, 2016; January 23, 2018; and October 30, 2018.

STUDY SELECTION Studies included in this review and meta-analysis were randomized or nonrandomized clinical trials that evaluated a language intervention that included parent training with children with a mean age of less than 6 years. Studies were excluded if the parent was not the primary implementer of the intervention, the study included fewer than 10 participants, or the study did not report outcomes related to language or communication.

DATA EXTRACTION AND SYNTHESIS Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were applied to a total of 31 778 articles identified for screening, with the full text of 723 articles reviewed and 76 total studies ultimately included.

MAIN OUTCOMES AND MEASURES Main outcomes included language and communication skills in children with primary or secondary language impairment and children at risk for language impairment.

RESULTS This meta-analysis included 59 randomized clinical trials and 17 nonrandomized clinical trials including 5848 total participants (36.4 female [20.8%]; mean [SD] age, 3.5 [3.9] years). The intervention approach in 63 studies was a naturalistic teaching approach, and 16 studies used a primarily dialogic reading approach. There was a significant moderate association between parent training and child communication, engagement, and language outcomes (mean [SE] Hedges *g*, −0.33 [0.06]; $P < .001$). The association between parent training and parent use of language support strategies was large (mean [SE] Hedges *g*, 0.55 [0.11], $P < .001$). Children with developmental language disorder had the largest social communication outcomes (mean [SE] Hedges *g*, 0.37 [0.17]); large and significant associations were observed for receptive (mean [SE] Hedges *g*, 0.92 [0.30]) and expressive language (mean [SE] Hedges *g*, 0.83 [0.20]). Children at risk for language impairments had moderate effect sizes across receptive language (mean [SE] Hedges *g*, 0.28 [0.15]) and engagement outcomes (mean [SE] Hedges *g*, 0.36 [0.17]).

CONCLUSIONS AND RELEVANCE The findings suggest that training parents to implement language and communication intervention techniques is associated with improved outcomes for children and increased parent use of support strategies. These findings may have direct implications on intervention and prevention.

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Supplemental content

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The World Health Organization has identified language as 1 of the domains of development that is associated with not only early learning and academic success but also economic participation and health across the lifespan.[1] The work of James J. Heckman, Nobel laureate in economics, suggests that deficits in early development are associated with reduced long-term productivity and increased social costs.[2] Early childhood is a critical period of rapid brain growth and heightened neuroplasticity.[3] It is during this period that young children are the most efficient and effective language learners. Thus, it is not surprising that interventions delivered during this critical period have the highest financial return on investment.[2]

Most children learn communication skills (eg, pointing, gesturing) and language skills (eg, saying words, following directions) from high-quality interactions with their parents and caregivers. However, some children may experience difficulties learning language for any number of different reasons, including genetic, neurologic, and environmental. Language impairment is defined as persistent difficulty in the acquisition or use of written or spoken language that is substantially below age expectations.[4] As many as 12% of children between 2 and 5 years of age may exhibit a developmental language delay as a primary condition (ie, not attributable to any other identifiable cause),[5] and an additional 13% may exhibit a language impairment as a secondary condition that is the result of an identifiable disorder (eg, cognitive delay, hearing loss, and autism spectrum disorder).[6] Furthermore, as many as 65% of children from low socioeconomic backgrounds exhibit clinically significant language impairment.[7] With 21% of US children living in poverty,[8] this is equivalent to an additional 14% of children with language delays associated with environmental factors. Taken together, these findings suggest that as many as 2 of 5 children younger than 5 years experience difficulty learning language; this is nearly twice the rate of childhood obesity,[9] which is widely recognized as a public health crisis.[10]

It has been suggested that language impairment should be considered a public health problem[11] given (1) the long-term burden of language impairment (ie, children with language impairment are more likely to have mental health problems,[12] have fewer vocational opportunities,[13] and become incarcerated[14]); (2) the uneven distribution of language impairment (ie, children living in poverty are more likely to have difficulty learning language)[7]; and (3) the positive association of intervention with improving language outcomes.[15] Given that children learn language through social interactions with their parents and caregivers, most early intervention efforts have focused on teaching parents to use specific strategies to support their child's language development. Furthermore, including parents in early language intervention is a cost-effective way to increase the amount of intervention the child receives compared with practitioner-delivered intervention.[16]

Previous syntheses of the literature on the association of parent training with child language outcomes have been restricted to specific populations, such as late talkers,[15,17] children with autism spectrum disorder (ASD),[17-20] children who are deaf or hard of hearing,[21] and children with disruptive behavior.[22] To date, no review has examined the effectiveness of teaching parents to use strategies to support their child's language development across all populations of children with or at risk of language impairment. Therefore, the purpose of this current systematic review and meta-analysis was to examine the association of parent training with language development in children with or at risk for language impairment. The specific research questions include the following: (1) What is the association between parent training and language and communication outcomes in young children? (2) What is the association between parent training and parent use of language support strategies? (3) What child and intervention characteristics moderate intervention outcomes? (4) Do study variables (eg, measure type or diagnosis) moderate intervention outcomes?

Key Points

Question What is the association of parent training with language and communication outcomes for young children?

Findings This systematic review and meta-analysis of 76 studies found that parent-implemented language interventions were associated with language development in children with or at risk of language impairment. Moderate positive associations were found for child outcomes, and strong associations were found for parent outcomes.

Meaning The findings suggest that language interventions that include parent training are associated with communication-related outcomes in young children, which may have implications for prevention and intervention in various populations of parent-child dyads.

Methods

Eligibility Criteria

We included randomized and nonrandomized studies in which parents were taught to use specific strategies to support their child's language or communication and in which the control group did not receive an experimental intervention. Given our focus on early childhood, we only included studies in which the mean age of study participants was younger than 6 years. More information about inclusion and exclusion criteria is provided in **Table 1**. A complete review protocol is available from the first author (M.Y.R.) on request.

Information Sources

An a priori systematic search for articles published in the following 4 databases were selected for this review: ERIC, Academic Search Complete, PsycINFO, and PsycARTICLES. Inclusion of unpublished work (ie, gray literature) or missed references was attempted by reviewing references of included studies and forward searching relevant references (65 unique records identified) and by searching Academic Search Complete to identify dissertations and theses.

Search and Study Selection

The search was conducted on August 11, 2014; August 18, 2016; January 23, 2018; and October 30, 2018 (Table 1). The Partici-

Table 1. Participants, Intervention, Outcomes, Comparison, and Study Design Search Terms and Criteria

Variable	Search Terms	Inclusion Criteria	Exclusion Criteria
Participants	(*child* or *infant* or *toddler*) AND (*parent* or *mother* or *caregiver*)	Participants younger than 6 y	Mean age of participants older than 6 y (or mean age reported plus 1 SD was >6 y)
Intervention	AND (*interactio** OR *synchron** OR *sensitiv** OR *responsiv** OR *facilitation* OR *input* OR *strategy* OR *communicative behavior* OR *parent behavior* OR *caregiver behavior* OR *mother behavior* OR *interaction*)	Parent training in language or related behaviors; parent was primary implementer	Pharmaceutical interventions; therapist-implemented treatments in which parent training occurs in <50% of total intervention time
Comparison	AND (*language* OR *communicat** OR *vocabulary* OR *joint attention* or *joint engagement* OR *verbal behavior*).	No treatment; business-as-usual control group; minimal treatment (<1 h of training per month)	Parent training in language strategies; language intervention delivered by research staff
Outcome	AND (*language* OR *communicat** OR *vocabulary* OR *joint attention* OR *joint engagement* OR *verbal behavior*)	Any measure of language, communication, speech, engagement, play, or verbal skills	Social behavior with peers, complex or social play skills, brain-based measures, biological measures
Study design	Search criteria were not restricted for design	Treatment-control design	Single case; group design with <10 participants per group at baseline; treatment-treatment comparison

pants, Intervention, Outcomes, Comparison, and Study Design[23] framework was used to outline the search criteria and search terms. A doctoral student (B.J.S.) and a postdoctoral fellow (L.H.H.) rated all relevant titles for inclusion. Data were managed using the REDCap (Research Electronic Data Capture) tools.[24] Six coders coded all abstract and full-text inclusion material with 20% overlap to measure interobserver agreement. Agreement on abstract and full-text inclusion exceeded 98%, and disagreements were reviewed by 1 of the authors (L.H.H.) for a final inclusion decision.

Data Collection Process

All studies that met the inclusion criteria were coded by 2 raters (B.J.S., L.H.H., and others) trained to 90% agreement across all variables. Across all rated items for all studies (n = 2690), mean agreement on categorical variables during initial coding exceeded 90%, and agreement on all calculations was 97%. All disagreements were resolved through consensus coding and verified by a primary author (L.H.H.). Disagreements were attributable to (1) miscalculations, (2) unidentified outcome, or (3) different interpretations of a definition.

Variables

Descriptive Measures

All study variables are defined and summarized in eTable 1 in the Supplement. We coded study features (eg, year published, type of publication), intervention characteristics (eg, frequency, length, and strategies taught to parents), and participant characteristics (eg, age, biological sex, race/ethnicity, and reason for language impairment).

Outcome Measures

Outcome data were extracted using means (SDs). When unavailable, 1-way *F* tests, 2-tailed unpaired *t* tests, χ^2 tests, or means (SEs) were used. The postintervention outcome was estimated using the conservative, standardized Hedges *g* effect size correction for the small sample sizes included.[25,26] A standardized metric allows comparison across different measure types and scales. When data were not available to calculate an effect size in the article, authors were emailed for additional information. Of the 3 authors emailed, only 1 replied, and he stated that the data were no longer available.

Risk of Bias

Risk of bias was rated using the Cochrane Collaboration indicators plus an indicator specifically for fidelity of intervention implementation (eTable 2 in the Supplement).[18,27] Studies were rated as low risk (0 points), high risk (2 points), or unclear risk (1 point) for a total risk of bias score of 0 to 16 (eTable 2 in the Supplement). We examined total risk of bias score as a potential moderator of intervention outcomes.

Statistical Analysis

Publication bias was examined using a funnel plot analysis and Eggers regression test to test the null hypothesis of small-study bias and to examine the potential publication bias across studies (eFigure in the Supplement).[28] Effect size heterogeneity was also examined using τ^2 as a measure of between study variance and I^2 as a measure of the proportion of true heterogeneity to total effect size variance.

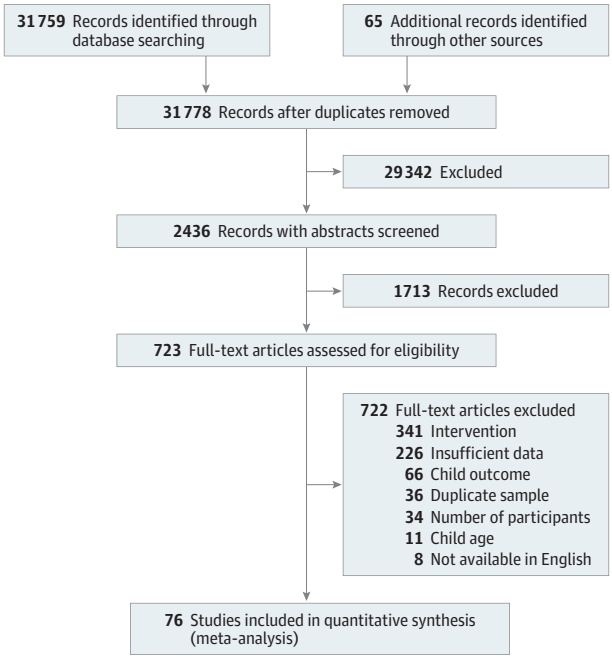
A robust variance estimate model was used to create a random-weights mean difference effect size of parent training on child language outcomes and parent use of language support strategies.[29] All analyses were conducted in R-Studio, version 1.0.136 running R, version 3.3.3 using the robumeta package (R Foundation for Statistical Computing).[30-32] A sensitivity analysis was used to evaluate the stability of the association across ρ values. Meta-regression estimation was used to examine the extent to which study variables influenced the mean standardized effect size (eg, bias score, length of intervention, and amount of parent training). Subgroup main effect and meta-regression analyses were conducted to analyze the separate effects based on language impairment type and measure type.

Results

Study Selection

A total of 31 778 unique records were identified and screened for eligibility (**Figure**). Of the articles that were screened, the full texts of 723 articles were screened for inclusion, and 76 total studies were included (A.P. Kaiser, T.B. Hancock, unpublished data, 1998).[15,16,33-105] Articles were excluded because of the reported age of participants

Figure. Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) Flow Diagram



(mean age plus 1 SD, >6 years; n = 11 studies), the inclusion of too few participants (n = 34 studies), the inclusion of nonparents as the primary interventionists (n = 343 studies), no reported measure of communication or language (n = 66 studies), no availability in English (n = 8 studies), or no reported statistics appropriate for calculating an effect size and no additional details or no author response to a request for information (n = 226 studies).

Study Characteristics

A summary of descriptive characteristics of included studies is provided in **Table 2**. Most studies were published in North America (n = 44 studies) and in peer-reviewed journals (n = 73 studies) between 1988 and 2018 and used a randomized trial design (n = 59 studies). Participants (n = 5848) were a mean (SD) of 3.5 (3.9) years old (range, 2 months to 5 years), and a mean (SD) of 36.4 (20.8%) were female. A total of 35 studies (48%) that reported race/ethnicity data included participants from the nonmajority race/ethnicity. Most studies included participants who were at risk for language impairment (eg, premature birth, low socioeconomic status) or participants who had ASD. The interventions lasted a mean of 23 weeks (median, 12 weeks; range, 4-120 weeks), and dosage ranged from monthly hour-long sessions up to 14 hours of parent training per week. Study-level descriptive information is available in eTable 3 in the Supplement.

Intervention Characteristics

In 63 studies, parents were taught to use responsive and naturalistic strategies (ie, responding to child communication), and 16 studies used a dialogic reading approach (ie, asking questions and engaging in discussions during book reading). Forty-nine studies used a coaching approach, whereas 17 used workshops and 21 used therapist modeling. Only 36 studies measured parent use of the strategies taught during the intervention.

Risk of Bias

Across all studies, risk of bias was moderate (mean [SD], 3.8 [2.0]), and the overall risk of bias ranged from 0 to 11, on a scale of 0 to 16 points. Only 36 studies reported treatment fidelity, and the primary indicators of bias included not reporting masking of assessors or coders and not reporting allocation concealment (eTable 4 in the Supplement).

Publication Bias

The funnel plot of mean effect sizes across studies revealed a symmetrical plot with 4 outliers (eFigure in the Supplement). The Eggers test for asymmetry showed meaningful but nonsignificant asymmetry (z, 1.81; P = .07). However, individual tests of mean effect sizes across studies within each population and measure type revealed small and nonsignificant results for asymmetry (range of z, −1.40 to 1.11; P = .16 to P = .73).

Synthesis of Main Effects

Child Outcomes

Across all studies, controlling for within-study effect size correlations, the mean effect size for the association of parent training with communication, engagement, and language outcomes was moderate (mean [SE] Hedges g, 0.33 [0.06], P < .001) (**Table 3**). The sensitivity analysis demonstrated stable outcomes across ρ values (range, 0.3425-0.3427). The between-study heterogeneity was small (τ^2 = 0.05), and 18% of the unexplained variability was attributable to true and explainable heterogeneity between studies. Children with ASD had consistent and moderate outcomes across all measures (range of mean [SE] Hedges g, 0.09-0.55 [0.06-0.24]). Children with developmental language disorder (DLD) had the largest social communication outcomes (mean [SE] Hedges g, 0.37 [0.17]); large and significant associations were observed for receptive (mean [SE] Hedges g, 0.92 [0.30]) and expressive language (mean [SE] Hedges g, 0.83 [0.20]), whereas all other measure types were not reported for this population. Children at risk for language impairments had moderate effect sizes across receptive language (mean [SE] Hedges g, 0.28 [0.15]) and engagement outcomes (mean [SE] Hedges g, 0.36 [0.17]). All the outcomes reported for each study are available in eTable 5 in the Supplement.

Parent Outcomes

Across all studies that reported parent outcomes, the effect size for the association of parent training with parent use of language support strategies was large (mean [SE] Hedges g, 0.55 [0.11]; P < .001). This pattern of results was observed across each subgroup such that parents across all groups used more language support strategies than parents in the control group.

Table 2. Descriptive Data of Included Articles

Variable	Articles, No. (%)[a]	All (N = 76)[b] Mean (SD)	All (N = 76)[b] Range	ASD (n = 27) Articles, No. (%)	ASD (n = 27) Mean (SD)	DLD (n = 10) Patients, No. (%)	DLD (n = 10) Mean (SD)	At Risk (n = 34) Articles, No. (%)	At Risk (n = 34) Mean (SD)
Peer-reviewed journal	73 (96)	NA	NA	24 (92)	NA	10 (100)	NA	34 (100)	NA
Country									
United States and Canada	44 (57)	NA	NA	17 (63)	NA	6 (60)	NA	19 (56)	NA
Europe	20 (26)	NA	NA	8 (30)	NA	3 (30)	NA	6 (18)	NA
Australia	3 (4)	NA	NA	1 (4)	NA	1 (10)	NA	1 (3)	NA
Malaysia	1 (1)	NA	NA	1 (4)	NA	0	NA	0	NA
Middle East	2 (3)	NA	NA	0	NA	0	NA	2 (6)	NA
South America	2 (3)	NA	NA	0	NA	0	NA	2 (6)	NA
Africa	4 (5)	NA	NA	0	NA	0	NA	4 (12)	NA
Publication year		2010	1988-2018		2011		2004		2011
Before 2000	12 (16)	NA	NA	1 (4)	NA	4 (40)	NA	4 (12)	NA
2000-2009	12 (16)	NA	NA	4 (15)	NA	3 (30)	NA	6 (18)	NA
2010-2018	52 (68)	NA	NA	22 (81)	NA	3 (30)	NA	24 (71)	NA
Randomized	59 (78)	NA	NA	19 (70)	NA	7 (70)	NA	25 (86)	NA
Risk of bias	NA	3.8 (2.0)	0-11	NA	3.1 (2.2)	NA	4.7 (2.4)	NA	3.9 (2.6)
Sample size	NA	77 (78)	20-501	NA	60 (31)	NA	40 (24)	NA	108 (105)
Participant age, y	NA	3.53 (0.8)	0.2-5.0	27 (100)	4.36 (1.4)	10 (100)	2.97 (0.3)	34 (100)	2.75 (1.5)
Nonmajority race/ethnicity	36 (47)	48 (34)	10-100	13 (50)	37.6 (20)	4 (40)	51 (40)	15 (44)	58.3 (34)
Male	70 (90)	64 (21)	46-97	23 (85)	84 (6)	10 (90)	66 (12)	26 (90)	50 (16)
Mean IQ<85[c]	15 (65)	63.6 (5.1)	53-74	11 (41)	62.5 (5.2)	0 (0)	NA	0 (0)	NA
Primarily low-income socioeconomic status	25 (33)	NA	NA	3 (17)	NA	1 (10)	NA	19 (56)	NA
Parent educational level of high school or less	24 (31)	NA	NA	4 (20)	NA	3 (30)	NA	15 (44)	NA
Intervention length, wk	NA	23 (24)	4-120	NA	26 (18)	NA	15 (6)	NA	24 (33)
Intervention dose, mean h/wk	NA	1.3 (1.6)	0.1-14	NA	1.7 (2.5)	NA	1.4 (0.8)	NA	0.9 (0.5)
Intervention type									
Dialogic reading	16 (21)	NA	NA	1 (4)	NA	2 (20)	NA	12 (44)	NA
Naturalistic language	63 (83)	NA	NA	23 (85)	NA	9 (90)	NA	27 (78)	NA
Parent instruction									
Workshop	17 (22)	NA	NA	2 (7)	NA	6 (60)	NA	8 (24)	NA
Coaching	49 (64)	NA	NA	18 (67)	NA	5 (50)	NA	23 (68)	NA
Modeling	21 (28)	NA	NA	8 (30)	NA	4 (40)	NA	7 (21)	NA
No. of effect sizes									
Total effect sizes	377	NA	NA	145	NA	72	NA	131	NA
Expressive language	149	NA	NA	31	NA	41	NA	65	NA
Receptive language	58	NA	NA	19	NA	9	NA	21	NA
Social communication	116	NA	NA	72	NA	13	NA	21	NA
Engagement	31	NA	NA	18	NA	0	NA	13	NA
Parent implementation	146	NA	NA	35	NA	4	NA	61	NA
Fidelity reported	36 (47)	NA	NA	14 (54)	NA	4 (36)	NA	11 (32)	NA

Abbreviations: ASD, autism spectrum disorder; DLD, developmental language disorder; NA, not applicable.

[a] The percentage of articles includes those that have reported data.

[b] All populations include ASD, DLD, at risk, and other (ie, children with hearing loss, children with cleft palate, children with an intellectual disability, and a mixed population of children).

[c] Reported on a mean (SD) scale of 100 (15).

Moderator Analysis

None of the descriptive variables (ie, risk of bias, publication type, intervention type, and age of participants) was significantly associated with the mean effects across studies, and controlling for each of these descriptive variables did not increase the explained heterogeneity in the overall estimate. In addition, intervention characteristics (eg, dialogic reading, workshop instruction, naturalistic language, and directive) was not significantly associated with effects across studies and did not increase explained heterogeneity in the overall estimate. When examining type of language impairment as a binary factor associated with all outcomes (ie, DLD vs all other chil-

Table 3. Mean Effect Size Across Measure Types and Populations

Variable	At Risk				DLD				ASD				All[a]			
	Effect Size (SE) [95% CI]	τ^2[b]	I^2[b]	No. of Outcomes/No. of Studies	Effect Size (SE) [95% CI]	τ^2	I^2	No. of Outcomes/No. of Studies	Effect Size (SE) [95% CI]	τ^2	I^2	No. of Outcomes/No. of Studies	Effect Size (SE) [95% CI]	τ^2	I^2	No. of Outcomes/No. of Studies
Parent outcomes	0.58 (0.10) [0.37 to 0.78][c]	0.22	42.68	61/18	NA[d]	NA[d]	NA	NA	0.44 (0.24) [−0.08 to 0.96][e]	0.80	74.57	35/15	0.55 (0.11) [0.33 to 0.78][c]	0.51	63.90	146/41
Expressive language	0.22 (0.08) [0.04 to 0.41][e]	0	3.55	65/28	0.83 (0.20) [0.38 to 1.29][c]	0.10	21.15	41/9	0.19 (0.08) [0.02 to 0.36][e]	0.11	29.50	31/17	0.28 (0.06) [0.15 to 0.40][c]	0	0	149/58
Receptive language	0.28 (0.15) [0.00 to 0.60][e]	0.26	55.45	21/27	0.92 (0.30) [0.07 to 1.76][f]	0.14	27.53	9/5	0.09 (0.08) [−0.08 to 0.27]	0	0	19/15	0.29 (0.10) [0.09 to 0.48][c]	0.13	34.65	58/43
Social communication	0.18 (0.11) [0.00 to 0.43]	0	0	21/11	0.37 (0.17) [−0.1 to 0.93][e]	0.17	33.67	13/4	0.21 (0.08) [0.05 to 0.40][f]	0.07	2.82	72/25	0.24 (0.06) [0.13 to 0.35][c]	0	0	116/44
Engagement, attention	0.36 (0.17) [−0.10 to 0.83][e]	0	0	13/6	NA[d]	NA[d]	NA	NA	0.55 (0.14) [0.26 to 0.85][c]	0.07	22.24	18/14	0.49 (0.11) [0.27 to 0.72][c]	0.04	15.23	31/20
All outcomes	0.27 (0.09) [0.09 to 0.46][c]	0.07	24.48	131/34	0.82 (0.18) [0.40 to 1.23][c]	0.09	19.53	72/10	0.26 (0.06) [0.13 to 0.39][c]	0	1.14	145/27	0.33 (0.06) [0.22 to 0.45][c]	0.05	16.99	377/76

Abbreviations: ASD, autism spectrum disorder; DLD, developmental language disorder; NA, not analyzed.

[a] All populations include ASD, DLD, at risk, and other (ie, children with hearing loss, children with cleft palate, children with an intellectual disability, and a mixed population of children).

[b] τ^2 And I^2 are not directly comparable across nonnested models. No comparisons in this table are nested.

[c] $P < .001$.

[d] Too few effect sizes to calculate a stable effect size estimate.

[e] $P < .10$.

[f] $P < .01$.

dren), DLD was the only factor associated with child outcomes; children with DLD had significantly better outcomes than other children after parent training (mean [SE] β, 0.51 [0.19]).

Discussion

Findings from this systematic review and meta-analysis demonstrate overall positive associations of parent training with child language outcomes and parent use of language support strategies. With instruction, parents can successfully learn to implement language support strategies, which has a subsequent positive association with child language skills. Intervention characteristics (eg, length, frequency, and type) were not associated with intervention outcomes; however, this finding may be attributable to the collinearity among variables (ie, children with ASD are the most impaired and receive the most intervention).

Given the importance of early language development in long-term academic and societal outcomes coupled with the empirical support for teaching parents to use language support strategies, it is critical to understand the best ways to involve parents early in their child's language development. Law and colleagues[11] proposed a prevention model for language impairment that is mapped to a public health intervention approach (ie, a tiered approach that includes primary, secondary, and tertiary prevention methods). Primary or universal prevention methods include the entire population of young children and focus on preventing the development of future language impairment. Primary prevention methods include raising awareness about the long-term sequelae of language impairments, highlighting the importance of supporting early language development, and delivering low-intensity, low-cost interventions in primary care settings, such as the Reach Out and Read program that occurs during well-child visits. However, results of a recent systematic review[106] of primary care interventions for early development found that only 2 primary care interventions (ie, The Video Interaction Project[107,108] and Healthy Steps for Young Children[109]) examined child language outcomes. Neither of these interventions had significant associations with child language outcomes. These results may occur because these low-dose interventions focus on many areas of development (eg, cognitive, social emotional, and language), such that each domain receives minimal attention.

Secondary or targeted prevention methods provide intervention for children who are at risk for language impairment, with the goal of preventing a clinically significant language impairment. Targeted primary care prevention methods related to early child development have focused primarily on disruptive behaviors (eg, Triple P, Incredible Years).[110] Studies in this review that included a targeted prevention approach were primarily conducted at home, at school, or in groups at a research site.

Tertiary prevention or specialist intervention approaches include children who are likely to have persistent language impairments or children who have not responded to a secondary prevention approach. The focus of tertiary or specialist intervention approaches is to reduce the adverse effects of language impairments and increase participation rather than eliminate the lan-

guage impairment. Most studies in this review (74%) included a specialist intervention approach in which parents were taught by a specialist (eg, speech-language pathologist, PhD student, or social worker). Future research should test the association of an integrated public health approach with language impairment that systematically examines the effects of 3 prevention methods (ie, primary, secondary, and tertiary) at a population level (eg, all infants and toddlers).

This tiered approach to intervention should include careful consideration of what and how parents are taught. For example, many studies in this systematic review included teaching parents to use many different language support strategies, with responsiveness as the most commonly taught intervention strategy. A primary prevention intervention approach for language might include teaching parents only 1 strategy, such as responsiveness, and using a low-cost method, such as video models and a printed handout. A secondary prevention intervention approach might include teaching parents to use a single strategy but with more support (eg, video feedback) or more strategies with less support. A tertiary intervention approach would likely include more instructional support and teaching more strategies to have a maximal influence on those children most likely to have persistent language learning difficulties. Tertiary approaches should also be tailored to account for individual differences in child factors, such as type of language impairment. For example, ASD is often distinguished from primary language impairments by differences in social communication and the presence of restricted and repetitive behaviors or interests.[4] These differences should be considered when deciding which specific strategies to teach to parents. For example, the focus for parents of children with ASD might be pointing and eye contact, whereas the focus for parents of children with primary language impairment might be complex syntax. Understanding the ideal combinations of instructional approaches and language support strategies is critical for maximizing the association of parent training with child outcomes.

In addition to evaluating a tiered intervention approach, future research should also examine barriers to implementation. For example, early intervention specialists spend less than 30% of their session time teaching parents to use specific strategies.[111] Understanding reasons for infrequent inclusion of parents in early language intervention is critical to maximizing the uptake of evidence-based interventions that involve teaching parents to use language support strategies.

Strengths and Limitations

The results of a meta-analysis should be considered in light of the strengths and limitations of the meta-analysis and the body of work that comprises the meta-analysis. First, the use of robust variance estimation in the current study is an ideal method of analysis for these data. Traditional meta-analytic techniques require that each study provide a single, independent effect size. Because many of the studies included in this meta-analysis provided several outcome measures for each measured construct, traditional methods would be unable to accurately model all available data. Although synthetic effect sizes can be derived by combining multiple measures from the same study, to accurately model the effect size estimation errors, the exact covariance structure between each dependent measure in each study must be known.[26] Because these data are rarely available, the error structure of synthetic effect sizes is most likely to be inaccurate, biasing the results of any subsequent meta-analysis. In contrast to these approaches, robust variance estimation allows for the inclusion of multiple dependent effect sizes from the same study with unknown covariance structures. An assumed correlation between dependent measures is used, and a sensitivity analysis checks for the effects of varying these assumed correlations. This method is ideal for the current study because it allows for the simultaneous inclusion of all collected data. Furthermore, this method allows for the inclusion of covariates in a meta-regression to determine whether these variables are significantly associated with the included effect sizes.

Second, the inclusion of children with varying degrees of language abilities and the moderator analyses allow for the examination of the association of parent training with language development for all young children and by specific subtypes. Across all parent training studies, there was a high representation of children with various types of language impairment and risk factors for language impairment (eg, siblings of children with ASD, children from low-income homes, and toddlers with challenging behaviors).

Third, although studies were conducted in a variety of locations (n = 14) and languages (n = 21), there were no studies in Asia, only a few in Central and South America, and only a few African studies outside South Africa. More research is needed across various cultural and linguistic groups. Furthermore, most studies failed to provide information on how parents were trained. Future research should examine the association of specific components of parent training with parent use of language support strategies. In addition, only half of the studies reported parent outcomes, and even fewer examined parent use of language support strategies as a mediator of child intervention outcomes. Future studies should report the specific parent training methods used to teach parents, the association of parent training with parent use of each language support strategy taught, and the association between parent use of each language support strategy and child language outcomes.

Conclusions

This meta-analysis revealed a positive association between parent training and child language and communication skills. These findings suggest that parent training should play a primary role in intervention and prevention programs to maximize language and communication outcomes for children with or at risk for language impairment.

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