Parenting Behavior and Child Language: A Meta-analysis

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abstract

CONTEXT: Early language development supports cognitive, academic, and behavioral success. Identifying modifiable predictors of child language may inform policies and practices aiming to promote language development.

OBJECTIVE: To synthesize results of observational studies examining parenting behavior and early childhood language in typically developing samples.

DATA SOURCES: Searches were conducted in Medline, Embase, PsycINFO, Web of Science, and Dissertation Abstracts (1967 to 2017).

STUDY SELECTION: Studies had 1 of 2 observational measures of parenting behavior (i.e., sensitive responsiveness or warmth) and a measure of child language.

DATA EXTRACTION: Data from 37 studies were extracted by independent coders. Estimates were examined by using random-effects meta-analysis.

RESULTS: Two meta-analyses were conducted, which examined (1) the association between sensitive-responsive parenting and child language (k = 36; r = 0.27; 95% confidence interval: 0.21 to 0.33); and (2) the association between parental warmth and child language (k = 13; r = 0.16; 95% confidence interval: 0.09 to 21). The pooled effect size for the association between sensitive responsiveness and child language was statistically higher than that of warmth and child language. The association between sensitive responsiveness and child language was moderated by family socioeconomic status (SES): effect sizes were stronger in low and diverse SES groups compared with middle to upper SES groups. Effect sizes were also stronger in longitudinal versus cross-sectional studies.

LIMITATIONS: Results are limited to typically developing samples and mother-child dyads. Findings cannot speak to causal processes.

CONCLUSIONS: Findings support theories describing how sensitive parenting may facilitate language and learning.

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Dr Madigan conceptualized and designed the study, coordinated data collection, conducted the analyses, and drafted the initial manuscript; Dr Prime supervised and assisted in data collection, drafted the initial manuscript, and reviewed and revised the manuscript; Ms Rodrigues, Ms Anderson, and Dr Khoury assisted in data collection and contributed to and critically reviewed the manuscript; Drs Jenkins and Graham assisted with study conceptualization and design and critically reviewed the manuscript; and all authors approved the final manuscript as submitted.

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One of the most critical developmental milestones in early childhood is the acquisition of language.[1] Early deficits in language have been found to be associated with difficulties in cognitive abilities, academic achievement, occupational outcomes,[2,3] and mental health.[4,5] Many factors are associated with children's language development, which include both genetic and environmental influences. Heritability for language skills has been estimated at 25%.[6,7] Many environmental influences have been associated with language development, including birth outcomes,[8] socioeconomic status (SES),[9] spoken language by parents,[10,11] turn-taking,[12] and sibling behavior.[13]

Several aspects of parenting behavior, focused on relationship quality and including behaviors such as sensitivity, responsiveness, and warmth, have also been associated with children's language outcomes. Sensitive responsiveness includes contingently responding to children's verbalizations and initiations, and accordingly, attuned and stimulating communicative exchanges. One account of why such behavior is important to children's development is rooted in attachment theory,[14] which suggests that sensitive-responsive parenting provides a secure base for exploration and aids in the formation of secure attachment. Moreover, a sensitive-responsive parent is believed to operate within the child's zone of proximal development, thereby building the neural architecture for joint attention and language.[15–17] Warmth involves providing comfort and support during interactions with the child. These parenting behaviors have been linked to a variety of advantageous outcomes in children worldwide,[18–21] including in language. Although the majority of studies to date have confirmed associations between parenting behaviors and child language, there are some studies that have shown no association or weak associations.[22–24] These mixed findings led us to compare the relative strength of the associations of sensitive responsiveness and warmth, respectively, with child language. Because of the contingent nature of sensitive-responsive behaviors, which foster attuned dyadic communicative engagement,[8,25,26] we hypothesized that sensitive-responsive behaviors would be more strongly associated with child language than parental warmth.

Moderator analyses can systematically examine why there is variation in effect sizes across studies in a meta-analysis. They can detail "for whom" and "when" effect sizes are stronger or weaker, which can prove highly informative for prevention and interventions seeking to target their efforts. For example, socioeconomic disparities are associated with children's language skills[9,27] as well as parental behaviors such as linguistic input and sensitivity.[28,29] Because several studies have found that parenting behaviors are more strongly associated with child language in high-risk circumstances,[8,13] it is important to test this meta-analytically. It is also of interest to examine child sex and age as potential moderators of associations. There is evidence that mothers may exhibit less responsive parenting toward male versus female children[30] and that parenting behavior may have a greater impact on children's language skills at certain developmental stages of language.[31]

Our primary objective in the current study was to statistically synthesize findings from a large number of studies on 2 primary types of parenting (sensitive responsiveness and warmth) as they relate to child language skills. A second objective was to further understand variation in effect sizes, and thus, moderator analyses were used to explore when effect sizes are stronger or weaker. These included child age, sex, and family SES. Also included were methodologic moderators such as dyadic observation duration and location, sample type (term versus preterm), and study design (cross-sectional versus longitudinal).

METHODS

Definitions of Constructs

Child language in the current study refers to either receptive or expressive language assessed via parent-report questionnaires (eg, MacArthur Communicative Development Inventory[32]) or standardized assessments (eg, Peabody Picture Vocabulary Test[33]). In terms of observed parenting constructs, sensitive responsiveness refers to a parent's ability to perceive and interpret the child's signals and cues and to respond to those cues and signals promptly and appropriately.[14] Warmth refers to caregiver physical affection or their positive affective quality during contact and involvement with the child.

Search Strategy

Searches were conducted by a medical librarian in Medline, Embase, PsycINFO, Web of Science, and Dissertation Abstracts up to June 2017 (Supplemental Information). Both database-specific subject headings (when available) and text word fields were searched for the concepts of "language," "parents," and "children." Synonymous terms were first combined with the Boolean "OR." These 3 concepts were then combined with the Boolean "AND." In all databases, truncation symbols were used in text word searches when appropriate to capture variations in spelling and phrasing. References of all included studies were also searched. No language or date limits were applied.

Study Eligibility Criteria

Inclusion criteria were as follows: (1) a typically developing sample; (2)

a measure of child language, in English, including measures of receptive (eg, understanding of words) or expressive language (eg, total utterances); (3) an observational measure of sensitive responsiveness or warmth; and (4) a statistic that could be transformed into an effect size. If effect sizes could not be calculated from the statistics provided, the corresponding author was contacted for this information. Exclusionary criteria included samples of children with diagnostic language delays, intellectual disabilities, deafness (in parents or children), hearing loss or middle ear disease, autism spectrum disorders, speech anomalies, and brain injuries. Intervention studies were only included if they provided pretest (or baseline) estimates of parenting and language.

Screening of Search Results

All titles and abstracts emerging from the search strategy were reviewed to determine eligibility criteria. An experienced systematic reviewer (S.M.) trained a group of coders on the title and abstract review. When titles and abstracts were insufficient to determine eligibility criteria, full texts were retrieved.

Data Extraction

A data-extraction coding protocol was developed to extract effect sizes as well as the following moderator variables: (1) SES, ≥80% of sample considered middle to upper or low SES (mixed SES = diverse); (2) child sex (percentage of boys); (3) child age (in months at language measurement); (4) location (home versus laboratory) and duration of parenting observation (in minutes); (5) sample type (term versus preterm); and (6) study design (cross-sectional versus longitudinal). Approximately 10% of the articles meeting inclusion criteria were double coded throughout the data extraction process. Reliability on continuous measures based on Pearson correlations were $r > 0.93$. Reliability on categorical measures based on κ estimates ranged from 0.64 to 1.0. Any disagreements were resolved with the expert coder.

Assessment of Study Methodologic Quality

An assessment of the methodologic quality and validity of each study and their risk of bias was conducted by using a 13-point quality assessment tool adapted from the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies[34] (Supplemental Table 3). Studies were assigned a score of 1 if the criterion was sufficiently met (Supplemental Table 4). A total score was then calculated by summing criteria with possible scores ranging from 0 to 13. Any study deemed to have low methodologic quality (scores ≤5) were removed from analyses.

Data Synthesis and Analysis

Data Synthesis

We identified overlapping studies and developed a protocol for sample selection to ensure inclusion of independent effect sizes for both meta-analyses. If there were multiple studies published based on the same data set, we selected the study with the largest sample size, readily available statistics, and psychometrically sound measurement. If a single study assessed sensitive responsiveness or warmth, both effect sizes were extracted and their associations with child language were examined in separate meta-analyses. If a single study provided a measure of receptive and expressive language, these 2 effect sizes were pooled to provide the most global and representative assessment of child language. If studies assessed language at multiple time points, the latest time point of language was selected to capture the most developed language skills.[35,36] The most temporally distant effect size for parenting and child language was selected when multiple assessments of parenting behavior were provided. Finally, if studies reported multiple effect sizes for term versus preterm infants and the samples did not contain overlapping participants, they were entered into the meta-analysis separately.

Sensitivity Analysis

Outlier detection was examined in SPSS (version 23.0; IBM SPSS Statistics, IBM Corporation) by using visual inspection of box plots. Studies with an effect size value ±3 SDs from the mean were considered outliers.

Data Analysis

Comprehensive Meta-Analysis Software (version 3.0)[37] was used to calculate and analyze effect sizes and moderator analyses. Effect sizes were calculated directly from information provided in each study (eg, correlations, means and/or SDs, etc; see Supplemental Table 5 for details of data extraction of effect sizes). In 1 study, a nonsignificant finding was reported without accompanying statistical information, and therefore, $P = .50$ was entered into the Comprehensive Meta-Analysis Software.[38] Pooled effect sizes are represented as correlations with 95% confidence intervals (CIs). Calculations were based on a random-effects model to account for existing heterogeneity among studies.[38] To formally assess for heterogeneity of effect sizes, the Q and I^2 statistics were computed. A significant Q statistic and an $I^2 > 50\%$ suggest moderators should be explored.[23] Heterogeneity of effect size and significance of categorical moderators were determined by Q-statistics,[38,39] and dimensional moderators were determined by mixed-effects–model meta-regressions.[40] Given the preference for studies with significant findings to be published in the literature, there is risk of meta-analyses overestimating

overall effect sizes. Thus, in addition to including a dissertation database search in our search strategy, the Egger test and funnel plots were used to examine publication bias.

RESULTS

Studies Selected

The number of nonduplicate abstracts identified by using this search strategy was 12 949. Figure 1 outlines the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.[41] Of those identified in the search, 315 met initial screening criteria, and full-text abstracts were retrieved. Of these, 278 were excluded. No outliers were identified. In total, 37 studies (with 39 samples) met full inclusion criteria and proceeded to methodologic review for final determination of study inclusion.

Study Characteristics

A detailed description of study and sample characteristics can be found in Table 1. Sample size across studies ranged from 9 to 1026 (median = 142). The average child age at the language assessment was 33.5 months (range = 12–71 months), and the mean percentage of boys was 51.1%.

Methodologic Quality Review

The mean score across all studies for methodologic quality was 9.24 of a possible maximum of 13.0 (range = 6–12; Supplemental Table 4). Thus, all studies met the inclusion criteria for methodologic quality (ie, a score of ≥5).

Meta-analyses: Pooled Effect Sizes

The effect size for the association between sensitive responsiveness and child language across 36 samples (7315 parent-child dyads) was significant (r = 0.27 [95% CI: 0.21 to 33]; Fig 2). There was no indication of publication bias (Supplemental Fig 3; Egger test P = .14). A separate meta-analysis was conducted to determine the pooled association between parental warmth and child language across 13 samples (1961 parent-child dyads). This association was also significant (r = 0.16 [95% CI: 0.09 to 0.21]; Fig 2). There was no indication of publication bias (Supplemental Fig 4; Egger test P = .13). CIs (95%) around the pooled effect sizes for sensitive responsiveness and language versus parental warmth and language were used to assess statistical significance between the 2 effect sizes.[78] Results indicated that the association between sensitive responsiveness and child language was statistically stronger than that between parental warmth and child language.

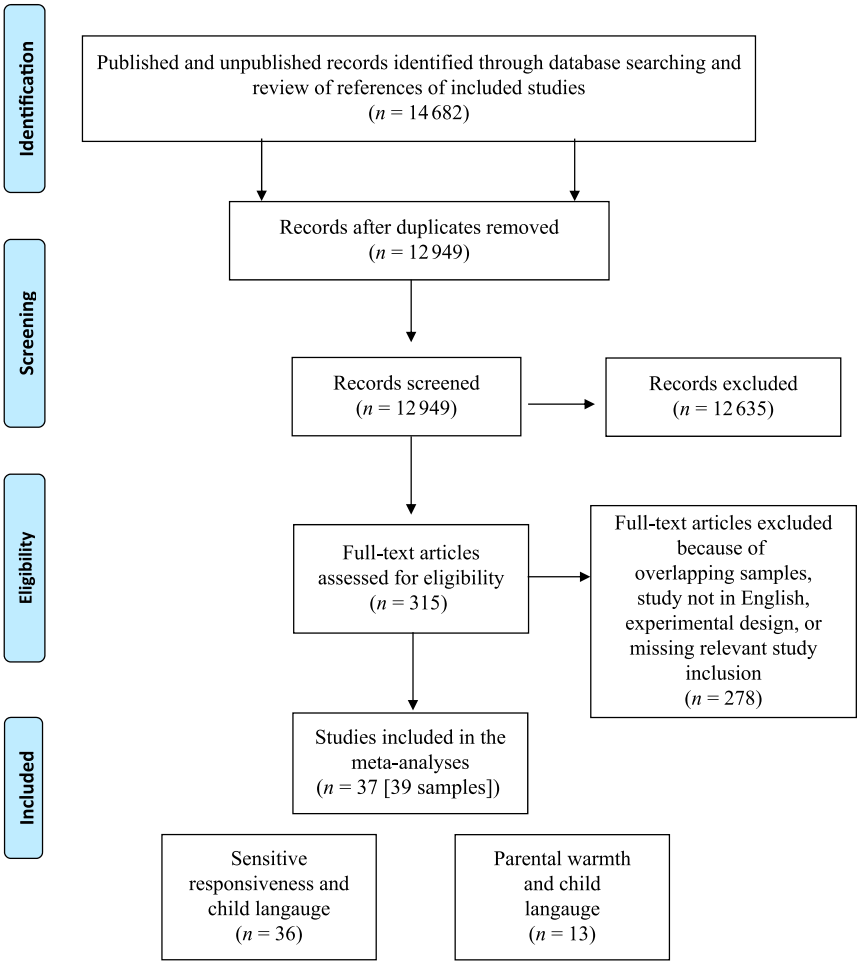

FIGURE 1
Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow used to identify studies for detailed analysis of parenting and children's language.

Moderator Analyses

For the association between sensitive responsiveness and child language, the Q statistic was significant (Q = 225.11; $P < .001$; I^2 = 84.5), indicating heterogeneity of effect sizes. Moderator analyses revealed that effect sizes varied according to family SES, with stronger effect sizes seen in the low SES (k = 7; r = 0.37; 95% CI: 0.19 to 0.53) and diverse SES (k = 17; r = 0.29; 95% CI: 0.22 to 0.36) groups compared with the middle to upper SES group (k = 12; r = 0.15; 95% CI: 0.05 to 0.24). Effect sizes also varied as a function of whether the study examined associations longitudinally (k = 24; r = 0.30; 95% CI: 0.23 to 0.37) versus cross-sectionally (k = 12; r = 0.18;

TABLE 1 Study Characteristics for Studies Included in the Meta-analyses on Parenting Behavior and Child Language

Study	Year	*N*	Child Characteristics		SES	Observation Location and Duration[a]	Study Design	Sample Type	Parenting Type	Language Type
			Age[b]	Boys, %						
Baker et al[42]	2010, no autism group	9	30	64	Middle-upper	Laboratory, 5	Longitudinal	Term	SR	Both
Barnett et al[43]	2012	174	36	48	Diverse	Laboratory, 10	Longitudinal	Term	SR	Both
Beckwith and Rodning[44]	1996	51	36	55	Diverse	Laboratory	Longitudinal	Preterm	SR	Both
Bee et al[45]	1982	140	36	49	Middle-upper	Home	Longitudinal	Term	SR	Both
Bornstein et al[46]	2007	254	20	54	Diverse	Home, 10	CS	Term	SR	Both
Cheung and Elliott[47]	2016	164	67	44	Middle-upper	Home, 30	CS	Term	SR	Both
Clarke-Stewart[48]	1973	38	17	53	Low	Home, 90	Longitudinal	Term	SR	Both
Cusson[49]	2003	43	26	50	Low	Laboratory	Longitudinal	Preterm	SR	Both
Gaertner[c,50]	2013	236	54	56	Diverse	Laboratory, 6	Longitudinal	Term	SR, warmth	Both
Gocek[c,51]	2007, no risk	39	21	59	Diverse	Laboratory, 10	CS	Term	SR	Both
	2007, risk	39	21	54	Diverse	Laboratory, 10	CS	Term	SR	Both
Greenberg[52]	1988, term	40	24	57	Middle-upper	Laboratory,10	Longitudinal	Term	SR	Both
	1988, preterm	30	24	44	Middle-upper	Laboratory, 10	Longitudinal	Preterm	SR	Both
Hann et al[53]	1996	69	44	45	Diverse	Laboratory, 6	Longitudinal	Term	SR, warmth	Receptive
Heinicke et al[54]	1986	44	24	50	Middle-upper	Home	Longitudinal	Term	SR	Expressive
Karrass et al[55]	2003	102	16	55	Middle-upper	Laboratory, 5	Longitudinal	Term	SR	Both
Kelly et al[56]	1996	53	36	57	Diverse	Laboratory, 20	Longitudinal	Term	SR, warmth	Both
Keown et al[57]	2001	42	43	50	Diverse	Home, 30	CS	Term	SR, warmth	Both
Landry et al[58]	2008	69	22	50	Low	Laboratory, 10	Longitudinal	Preterm	SR, warmth	Both
Lovas[c,59]	2002	113	18	56	Low	Laboratory, 12	CS	Term	SR	Expressive
Madigan et al[8]	2015	467	36	51	Middle-upper	Home, 15	Longitudinal	Term	SR	Both
Magill-Evans and Harrison[60]	2001	93	48	59	Middle-upper	Home, 120	Longitudinal	Term, preterm	SR	Both
McElwain et al[61]	2012	120	33	50	Diverse	Laboratory, 22	CS	Term	SR	Expressive
Mistry et al[62]	2004	984	36	52	Diverse	15	Longitudinal	Term	SR	Both
Mol and Neuman[63]	2014	60	71	37	Diverse	Home, 12.5	Longitudinal	Term	SR	Both
Nozadi et al[64]	2013	212	30	55	Middle-upper	Laboratory, 3	Longitudinal	Term	SR	Expressive
Olson et al[65]	1984	117	24	57	Diverse	Home, 360	CS	Term	Warmth	Receptive
Pearson et al[66]	2011	732	49	52	Diverse	Laboratory, 5	Longitudinal	Term	Warmth	Both
Podmore[67]	1988	75	42	47	Diverse	Home	CS	Term	SR, warmth	Both
Pungello et al[68]	2009	146	27	50	Low	Laboratory, 10	Longitudinal	Term	SR	Both
Ransone[c,69]	2017	946	27	50	Diverse	Laboratory, 10	Longitudinal	Term	SR	Both
Ruffman et al[70]	2006	55	48	40	Middle-upper	10	Longitudinal	Term	SR, warmth	Receptive
Steelman et al[71]	2002	282	40	47	Low	Home, 60	Longitudinal	Preterm	SR, warmth	Both
Stein et al[72]	2008	944	36	50	Diverse	Home, 120	Longitudinal	Term	SR	Both
Tompkins[c] and Farrar[73]	2011	37	57	49	Diverse	Home	Longitudinal	Term	Warmth	Both
Vernon-Feagans et al[74]	2012	1026	37	51	Low	Home, 40	Longitudinal	Term	SR	Both
Vibbert and Bornstein[75]	1989	34	13	50	Middle-upper	Home, 70	CS	Term	Warmth	Both
Wallace et al[76]	1998	92	12	48	Diverse	Laboratory, 10	CS	Term	SR, warmth	Both
Wasserman et al[77]	1988 control	45	24	62	Middle-upper	Laboratory, 5	CS	Term	SR	Expressive
	1988, nonspeech anomalies	13	23	38	Diverse	Laboratory, 5	CS	Preterm	SR	Expressive

CS, cross-sectional; SR, sensitive responsiveness.

[a] Time in min.

[b] Age in mo at child language assessment.

[c] Dissertation.

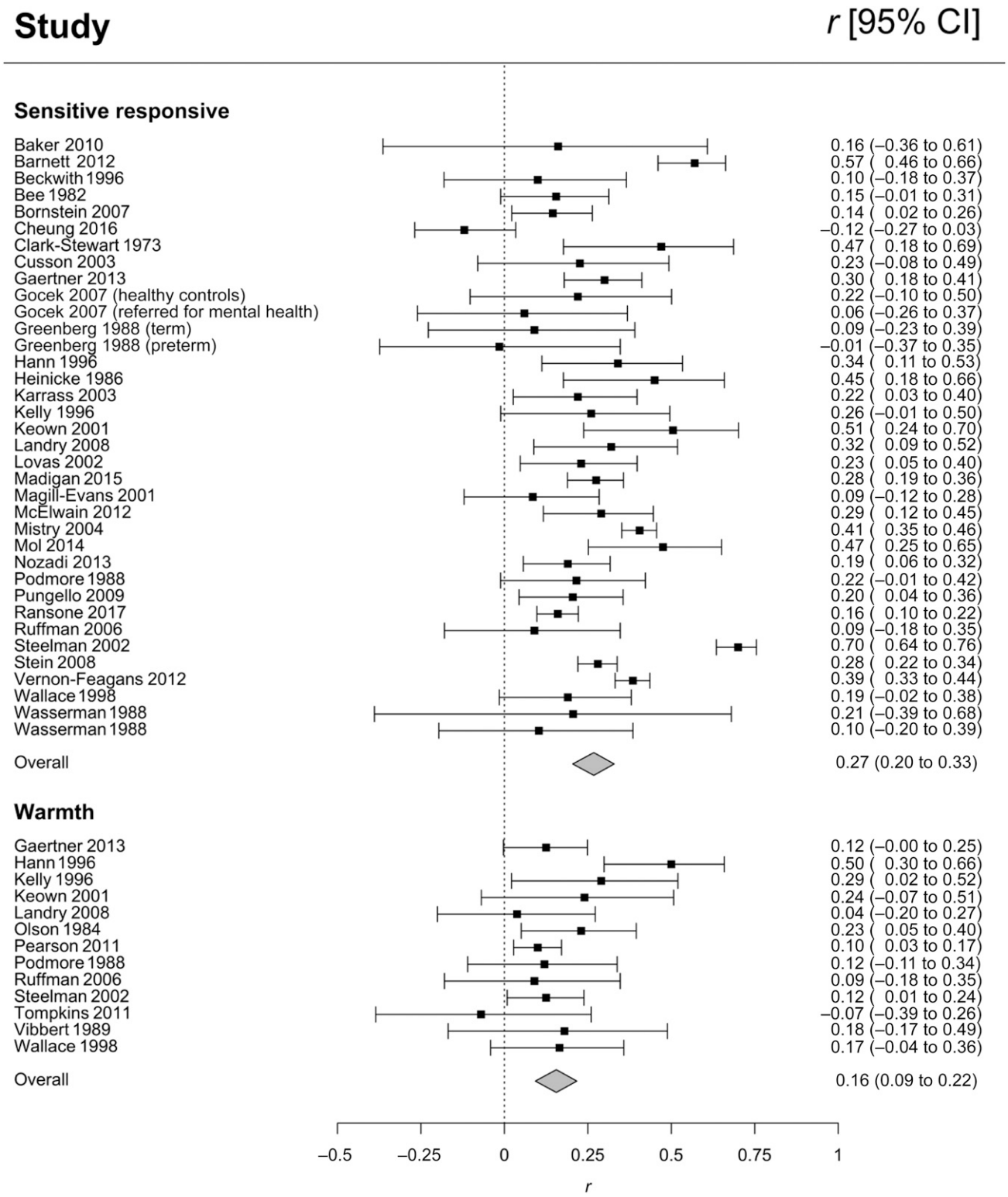

FIGURE 2
Forest plot of the association between parenting behavior and child language. Observed effect sizes and 95% CIs are indicated for each sample. The diamond shapes represent the pooled effect size.

95% CI: 0.09 to 0.27). No other moderators were significant (Table 2).

For the association between parental warmth and child language, between-study heterogeneity was not identified (Q = 17.5; P = .13; I^2 = 31.3); thus, moderator analyses were not explored.

DISCUSSION

Language development is 1 of the fundamental building blocks for school readiness, reading comprehension, academic achievement, and occupational outcomes.[2,3,79–81] Results of the current meta-analyses indicate that children whose caregivers show higher levels of sensitive responsiveness and warmth display stronger language skills compared with children who received lower levels of such parenting behavior. The magnitude of this effect size translates into 2.8-fold increased odds that children who receive these parenting behaviors will acquire stronger language skills. This finding is in line with theoretical frameworks describing how parenting behaviors can help build the mental architecture required for children to engage with and learn from the social world.[26,82]

The meta-analytic association between sensitive responsiveness and child language was higher compared with the association between parental warmth and child language. Consistent with attachment theory,[14] this finding may speak to the importance of attuned interactions between a parent and child to foster learning versus warmth alone. That is, measures of sensitive responsiveness are more likely to capture the parents' contingent response to their children's interests, focus of gaze, and developmental capacity. A sensitive-responsive parent can build on the moment-to-moment shifts in children's attention, providing a finely tuned enhancement to the child's experience.[26,82] Neural development is thought to occur through the internalization of these finely tuned, reciprocal interactions.[83] Warmth, on the other hand, does not involve contingency or reciprocity. Warmth can be demonstrated without solicitation if, for example, the parent is providing affection to the child, without any cues from the child. The provision of warmth can also be nonverbal, whereas sensitive responsiveness is more likely to have accompanying utterances in response to cues, which may be crucial for child language development.

On a behavioral level, responsive parenting may encourage children into social interactions that enhance learning. For instance, children of responsive mothers have been found to have an eager and willing stance toward others[84] and are more motivated, exploratory, and enthusiastic to seek out new information. This, in turn, enhances the likelihood that they will learn from their caregivers and others in their environment.[85] This willing stance positions children to benefit considerably from stimulating interactions. That said, a consequence of children's limited language and/or limited interest or engagement in reciprocal exchanges with a parent is that parents may find fewer opportunities to engage in sensitive-responsive parenting. Future research should examine this possibility through cross-lag models that examine the directionality of associations between parenting behavior and child language over time.[43]

Findings indicated that the associations between parental sensitive responsiveness and child language were comparatively larger in samples with low and diverse SES groups, as compared to middle to upper SES groups. A possible interpretation of this finding is that maternal sensitive responsiveness is particularly advantageous to children's language when they are raised in socially disadvantaged families. These findings are in line with previous evidence from observational research documenting the protective effect of high-quality parent-child interactions in the context of adversity.[8,86] These

TABLE 2 Results of Categorical and Continuous Moderators for the Association Between Parental Sensitive Responsiveness and Child Language

Results					
Categorical moderators	*k*	*r*	95% CI	Homogeneity *Q*	*P*
SES	—	—	—	8.09	.02
Low	7	0.37*	0.19 to 0.53	—	
Middle to upper	12	0.15*	0.05 to 0.24	—	
Diverse	17	0.29*	0.22 to 0.36	—	
Sample type	—	—	—	0.20	.65
Term birth	30	0.26*	0.19 to 0.41	—	
Preterm birth	4	0.36	−0.11 to 0.69	—	
Observation location	—	—	—	1.12	.29
Family home	15	0.30*	0.19 to 0.41	—	
Laboratory	19	0.23*	0.16 to 0.30	—	
Study design	—	—	—	4.04	.05
Cross-sectional	12	0.18*	0.09 to 0.27	—	
Longitudinal	24	0.30*	0.23 to 0.37	—	
Continuous moderators	*k*	*b*	95% CI	*z* score	*P*
Child age at language assessment	35	−0.001	−0.004 to 0.006	−0.43	.67
Percentage of boys in sample	36	−0.007	−0.020 to.006	−1.12	.27
Parenting observation length	31	0.001	−0.002 to 0.003	0.71	.48

—, not applicable.
* $P < .001$.

findings also lend additional support to economic analyses suggesting that early investments in preventive interventions in disadvantaged groups may have the best return on investment.[87,88] Although these interventions can be expensive to undertake, initial investment costs are often recovered because of cost-saving reductions in social services and health professional use. Specifically, it has been shown that early investments in disadvantaged children aged 0 to 5 result in a 13% return on investments.[88]

The association between sensitive responsiveness and child language was larger in studies using longitudinal versus cross-sectional study designs. The sheer number of longitudinal studies is notable (k = 24), especially given the arduous nature of collecting long-term research and the potential they provide in terms of distinguishing predictions from outcomes and addressing directionality of associations.[89] Methodologically speaking, longitudinal designs are more stringent and less susceptible to bias and are therefore considered to yield a truer estimate of effect sizes. Longitudinal designs are also more likely to capture the enduring effect of parenting on child development.[90]

LIMITATIONS

Several limitations should be noted. First and foremost, meta-analyses of observational studies are correlational in nature and thus do not permit conclusions about causality. Conclusions about causality can only be made in the context of experimental studies,[58,91–93] and approximations of causality may be derived from longitudinal designs that address directionality and temporal precedence.[94] Second, these meta-analysis focused on typically developing samples, and thus, findings are not generalizable to children with language delay, intellectual disability, autism, and/or hearing or vision difficulties. Third, the generalizability of the current findings is also limited to samples of mother-child dyads. Although fathers engage in sensitive and responsive parenting,[95] the large majority of studies retrieved in this review reported on maternal, as opposed to paternal, measures of parenting behavior. Given the unique role that fathers' language plays in children's language development,[96,97] there is a need for more published research in this area. Finally, because of insufficient studies stratifying results on the basis of birth order,[98–100] we were unable to examine this variable as a potential moderator of associations.

CONCLUSIONS

Early language development is an essential developmental skill that fosters academic, social, and behavioral success and well-being.[29,101] As such, understanding the antecedents to individual differences in children's language abilities is critical to informing the policy and practice guidelines that aim to lay the foundation for healthy developmental trajectories. The findings indicate a moderate association between sensitive-responsive parenting and children's language skills.[102,103] Sensitive responsiveness is a modifiable risk factor that has been successfully trained in parents in randomized controlled trials and shown to improve the language development of children.[25,58,91–93] Thus, the demonstration of a significant association between sensitive responsiveness and children's language coupled with the evidence from randomized controlled trials on improving parental responsiveness suggests the importance of addressing this skill in parents, particularly in economically disadvantaged families.

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ABBREVIATIONS

CI: confidence interval
SES: socioeconomic status

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