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Review Article

Linking Language Skills and Social Competence in Children With Developmental Language Disorder: A Systematic Review and Meta-Analysis

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ABSTRACT

Purpose: This systematic review and meta-analysis aimed to examine the association between language skills and social competence in children with developmental language disorder (DLD) and to assess the potential moderators of these associations.
Method: The study was reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Studies were identified according to a search strategy carried out in PsycINFO, MEDLINE, Scopus, Linguistics and Language Behavior Abstracts, and ProQuest Dissertations and Theses Global databases. A total of 15,069 articles were independently double screened in the title and abstract phases, with 250 articles proceeding to a full-text review. Inclusion criteria comprised (a) a sample of children with DLD between the ages of 2 and 12 years, (b) a language measure, (c) a social competence measure, and (d) an appropriate statistic. Exclusion criteria were (a) intervention studies with no baseline data, (b) language measures based on preverbal abilities, (c) samples of children with DLD and other clinical conditions, and (d) studies without useable statistics. Data were extracted from 21 studies that met the eligibility criteria for the meta-analysis.
Results: Pooled estimates across 21 studies (M_{age} = 7.52 years; 64% male) and 6,830 children indicated a significant association between language skills and social competence in children with DLD (r = .18, 95% confidence interval [.12, .24], $p < .001$), which was small in magnitude. The effect sizes were stronger in studies that assessed overall language skills than in those that specifically measured receptive or expressive language skills.
Conclusions: Findings from this study support a subtle and reliable relationship between language and social competence in children with DLD. The implications and limitations of this study and its future directions are also discussed.
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Although many children acquire language seemingly effortlessly, some children encounter challenges in this domain. For 6%–10% of children, their language difficulties are consistent with a presentation of developmental language disorder (DLD; Calder et al., 2022; Norbury et al., 2016; Tomblin et al., 1997). The challenges that children with DLD face, however, go beyond language learning. That is, children with language problems are more likely to have poorer outcomes in academic achievement, reading, mental health, self-esteem, and independent living with lifelong influences, including lower quality of life across the domains of health and employment (e.g., Conti-Ramsden, 2008; Dubois et al., 2020; Hentges et al., 2021; Johnson et al., 2010; Le et al., 2021; Norbury et al., 2016; Preston et al., 2010; Wadman et al., 2008). In this

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study, we focused on one such developmental impact, examining the associations between language skills and social competence in children with DLD. Specifically, we harness the methodological power of the meta-analysis to (a) examine the scope and magnitude of the association between language abilities and social competence in children with DLD and (b) assess relevant moderators that may impact the strength of this association.

DLD: Context and Consequences

Learning language can present a challenge for many individuals. DLD is a term used to describe children whose language skills are different or develop at a slower rate than their same-age peers (Moyle et al., 2011). DLD is a relatively new term to refer to a subgroup of children with language disorders that has historically been referred to as specific language impairment. Considering the variability among different diagnostic systems (e.g., *Diagnostic and Statistical Manual of Mental Disorders*, *Fifth Edition*; *International Classification of Diseases, Eleventh Revision*) and different terminology used across varied contexts (e.g., research, clinical settings), a Delphi study was conducted to reach a consensus on terminology for developmental language difficulties. Through this process, DLD was the term that was agreed upon by a diverse group of multidisciplinary experts in the field (Bishop et al., 2017).

DLD is diagnosed when significant challenges in understanding or using language occur without an identified medical or intellectual cause (Clegg et al., 2005). It can be identified when a child reaches a certain cutoff on a standardized assessment of language skills (Moyle et al., 2011) and when impairments are observed across a variety of settings (Bishop et al., 2017). DLD screening often occurs around the ages of 2 and 3 years, with diagnoses often emerging around the age of 4 years (Sansavini et al., 2021). DLD is a developmental disorder that emerges in childhood; however, without proper support and interventions, the difficulties associated with language difficulties persist into adolescence and adulthood (Bishop et al., 2017; Botting & Conti-Ramsden, 2008; Clegg et al., 2005; Conti-Ramsden et al., 2018).

Language difficulties have many consequences. In childhood, language challenges have been associated with having fewer close friends and poorer relationship quality (e.g., Clegg et al., 2005; Durkin & Conti-Ramsden, 2007), having poorer conflict resolution skills (Bakopoulou & Dockrell, 2016), experiencing higher rates of victimization and bullying (Coales et al., 2019; Van den Bedem et al., 2018), showing more behavioral difficulties (Bretherton et al., 2014) and reticent behavior (Fujiki et al., 1999), and having a higher likelihood of developing internalizing and externalizing disorders (Hentges et al., 2021). Furthermore, children with language difficulties tend to show poorer academic outcomes (Dockrell & Lindsay, 2000; Tomblin et al., 2000), coupled with lower rates of higher education completion and poorer vocational prospects (Conti-Ramsden et al., 2018).

DLD and Social Competence

This study examined the association between language skills and social competence in children with DLD. Given that language is the primary means by which children interact with others and respond to social situations, it has been proposed that there is a critical relation between children's language skills and social competence (Mulvey & Jenkins, 2021). Social competence is a complex multifactorial construct. In this study, we adopted the tricomponent model, which characterizes social competence as embodying the domains of social skills, social performance, and social adjustment (Cavell, 1990; Cavell et al., 2003). Social skills refer to specific behaviors that promote optimal functioning in social situations and may include abilities such as cooperation, assertion, and self-control (e.g., Elliott & Gresham, 1987). Social performance refers to the extent to which an individual responds appropriately across social situations and may include whether an individual is well-liked, popular, or perceived as prosocial by others (e.g., Cavell, 1990). Social adjustment refers to the extent to which an individual meets socially valued and developmentally appropriate outcomes, such as school readiness and satisfactory academic performance (e.g., Cavell, 1990).

The literature examining the association between language difficulties and social competence has yielded mixed findings regarding this association. For example, several studies have found significant associations between language in children with language difficulties and social skills (Dockrell & Lindsay, 2000), sociometric status (Andrés-Roqueta et al., 2016), peer relations (Gibson et al., 2013), prosocial skills (Hart et al., 2004), and peer relations and prosocial skills combined (Chiat & Roy, 2008). However, other studies have failed to find significant relations between language and prosocial behavior (Farmer, 2000), social acceptance and connection with peers (Coales et al., 2019), peer relations (Farmer & Oliver, 2005), social problems (Redmond & Rice, 2002), and social functioning (Stern et al., 1995). These mixed findings suggest that there may be important moderators of the link between language abilities and social competence in children with DLD, which may be disentangled by assessing the variability in demographic or methodological factors across studies.

The goals of this study are twofold: first, to synthesize the evidence between language and social competence

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in children with DLD and, second, to explore the potential moderators of this relation. Systematic reviews and meta-analyses have documented the relations between language difficulties and problem behaviors (Chow & Wehby, 2018; Curtis et al., 2018), internalizing and externalizing issues (Hentges et al., 2021), theory of mind (Nilsson & de López, 2016), and executive functioning (Pauls & Archibald, 2016). To our knowledge, no systematic review or meta-analysis has focused on synthesizing the evidence related to language skills and social competence in children with DLD.

Potential Moderators in the Association Between Language Skills and Social Competence

The mixed results found in previous studies on the association between language skills and social competence in children with DLD suggest that there is variability in the extant literature and that moderating factors should be considered. In this study, a variety of sample demographics (i.e., sex, socioeconomic status [SES], age at language assessment, age at social assessment) and methodological characteristics (i.e., study design, language aspect, social type, language informant, social informant, publication status) were examined as moderators in the relation between language and social competence in children with DLD.

Demographic Moderators of Interest

There are several demographic factors that may have an important influence on the association between language and social competence in children with DLD. One of those demographic factors is the child's age at assessment. As children develop, the relative connection between language and social skills may change during different time points in childhood. In turn, we were interested in examining the association between language and social competence specifically during the childhood years, exploring whether age has an impact on the relation of interest. We elected to restrict our literature search to children between the ages of 2 and 12 years. This age range was selected to correspond with the age range where DLD is most often screened for and diagnosed (i.e., between 2 and 4 years), coupled with the subsequent early and middle school years, where language and social competence demands increase prior to adolescence. We hypothesized that the strength of association would be stronger for younger versus older children.

Furthermore, the relation between language skills and social competence may differ in children with DLD based on sex assigned at birth. For instance, some literature suggests that there are higher rates of DLD in boys relative to girls (e.g., Chilosi et al., 2023), while some studies have failed to support sex-related differences in prevalence rates of DLD (e.g., Norbury et al., 2016; Tomblin et al., 1997). There have also been some criticisms surrounding DLD research methodology (e.g., Marini, 2023), particularly as it pertains to disproportionate rates of boys relative to girls in the samples examined in DLD research. Indeed, this challenge has been noted in the literature examining social profiles of children with DLD as well. For example, in a recent systematic review on the social strengths and difficulties of children with DLD, boys were disproportionately represented in the overall sample, making it challenging to deduce sex-based differences in social competence (Lloyd-Esenkaya et al., 2020). With respect to children with typical language, sex-based differences in social development have been suggested whereby girls tend to demonstrate a social skills advantage relative to boys (Hajovsky et al., 2022). For instance, girls tend to have higher social skills in early childhood and at school entry, with this benefit remaining across the school-age years; however, boys tend to demonstrate larger heterogeneity in their social skills across the childhood years (Hajovsky et al., 2022). Put together, these varied factors motivated the desire to examine child sex assigned at birth as an exploratory moderator of interest, with no specific hypotheses generated.

SES, which refers to an individual's social class membership based on income, may also play a role in association of interest. For instance, several studies have found that SES is related to language development, such that children from lower SES families tend to have poorer language abilities (e.g., Arriaga et al., 1998; Fernald et al., 2013; Hoff & Tian, 2005; Reilly et al., 2010) and language growth (e.g., Taylor et al., 2013) than children from higher SES families. However, more recent literature suggests that the association between low SES and poor language outcomes is not straightforward (e.g., Anderson et al., 2021; Schwab & Lew-Williams, 2016), pointing to multiple possible pathways between low SES and poor language outcomes (Pace et al., 2017; Purpura, 2019; Shin & McCoy, 2022; Vernon-Feagans et al., 2020). Given the complexity of the relationship between low SES and developmental outcomes, we did not posit any specific predictions regarding the impact of SES on the association between language skills and social competence in children with DLD.

Methodological Moderators of Interest

There are also several methodological factors that influence the association between language and social competence in children with DLD. For instance, studies examining the association between language skills and social competence in children with DLD have measured

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these variables both cross-sectionally and longitudinally. Given the pervasive long-term impacts resulting from early language difficulties (e.g., Bishop et al., 2017; Clegg et al., 2005; Conti-Ramsden et al., 2018), we hypothesized that the association between language skills and social competence would be stronger in longitudinal studies compared to cross-sectional studies. Moreover, we sought to examine whether the association between language and social competence varied across published and unpublished studies. The file-drawer problem is a well-documented issue in the scientific literature, whereby research with larger effect sizes tends to be published at a higher rate (e.g., Franco et al., 2014). To control for publication bias, a screening strategy was designed to capture both published and unpublished studies examining language and social competence in children with DLD. We hypothesized that the association would be stronger in published literature because of the rigor and methodological scrutiny that accompany the peer review process.

Language development is often assessed in terms of receptive, expressive, or overall/global aspects of language. Receptive language refers to the comprehension of spoken language (e.g., the words a child understands), while expressive language refers to the production of language (e.g., the words a child uses to communicate and express their needs). Overall/global language measures assess both receptive and expressive aspects of language and thus take a broader view on language skills. As different studies may focus more or less on these aspects of language, and given that children with DLD often demonstrate heterogenous language profiles, the type of language aspect (i.e., receptive, expressive, or overall/global) assessed may differentially impact social competence outcomes. In turn, language aspect was included as a moderator of interest; however, no specific hypotheses were made. Similarly, there are differences across studies with respect to the type of social competence construct assessed. It was of interest to examine whether the association between language and social competence varied according to the types of social constructs assessed, in consideration of the tri-component model of social competence (Cavell, 1990; Cavell et al., 2003). This moderator was exploratory in nature. Relatedly, there are various ways in which language and social competence can be measured, resulting in the use of different informants depending on the measures selected in a particular study. For example, a child's language and social competence skills may be evaluated by a clinician (e.g., speech-language pathologist), trained coders (e.g., experimenter), parents, teachers, or children, and some studies have relied on different informants for different constructs or the combined efforts of multiple informants. Different informants would certainly observe children in different environments and interactions with different demands, which may influence the informants' perceptions of a child's language and social functioning. To this end, we explored informant type as a moderator between language and social competence in exploratory analyses, with no specific a priori hypotheses.

Method

This study was reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021).

Search Strategy

The database search for this study took place in June 2021. Searches were conducted by a librarian (H.G.) using the following databases with no date restrictions: PsycINFO, MEDLINE (both on the Ovid platform), Scopus (Elsevier), Linguistics and Language Behavior Abstracts (ProQuest platform), and ProQuest Dissertations and Theses Global (ProQuest platform). Subject heading and keyword search strings were developed for the following concepts: "language," "social competence," and "children." Appendices A–E present the complete search strategies for all databases. The reference lists of the included studies were reviewed for other relevant studies. To broaden the results of the meta-analysis and minimize bias, both published and unpublished studies were included in the article search. As this meta-analysis focused on the results of the primary research, books and chapters were excluded.

Eligibility Criteria

Each study was reviewed by two reviewers to determine whether they met the eligibility criteria. Studies were included if they included the following criteria: (a) a sample of children between the ages of 2 and 12 years who were identified with clinical level language difficulties (i.e., DLD in more recent studies, language impairment, or delay in older literature), (b) a measure of language skills, (c) a measure of social competence and (d) an independent statistic for language skills and social competence in children with DLD that could be used to calculate a Pearson *r* correlation coefficient as the effect size. Studies that compared children with DLD to children who were typically developing but did not include statistics on the DLD group alone were not included. Studies were excluded if they (a) did not meet all the inclusion criteria, (b) were intervention studies that did not include baseline data for language skills and social competence, (c) included a language measure that was based on preverbal abilities (e.g., gestures) rather than verbal abilities, (d) were not written in English, and (e) focused on children with language

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difficulties who were also diagnosed with another clinical or psychological condition, such as attention-deficit/hyperactivity disorder, autism spectrum disorder, hearing loss or impairment, or a medical or genetic disorder.

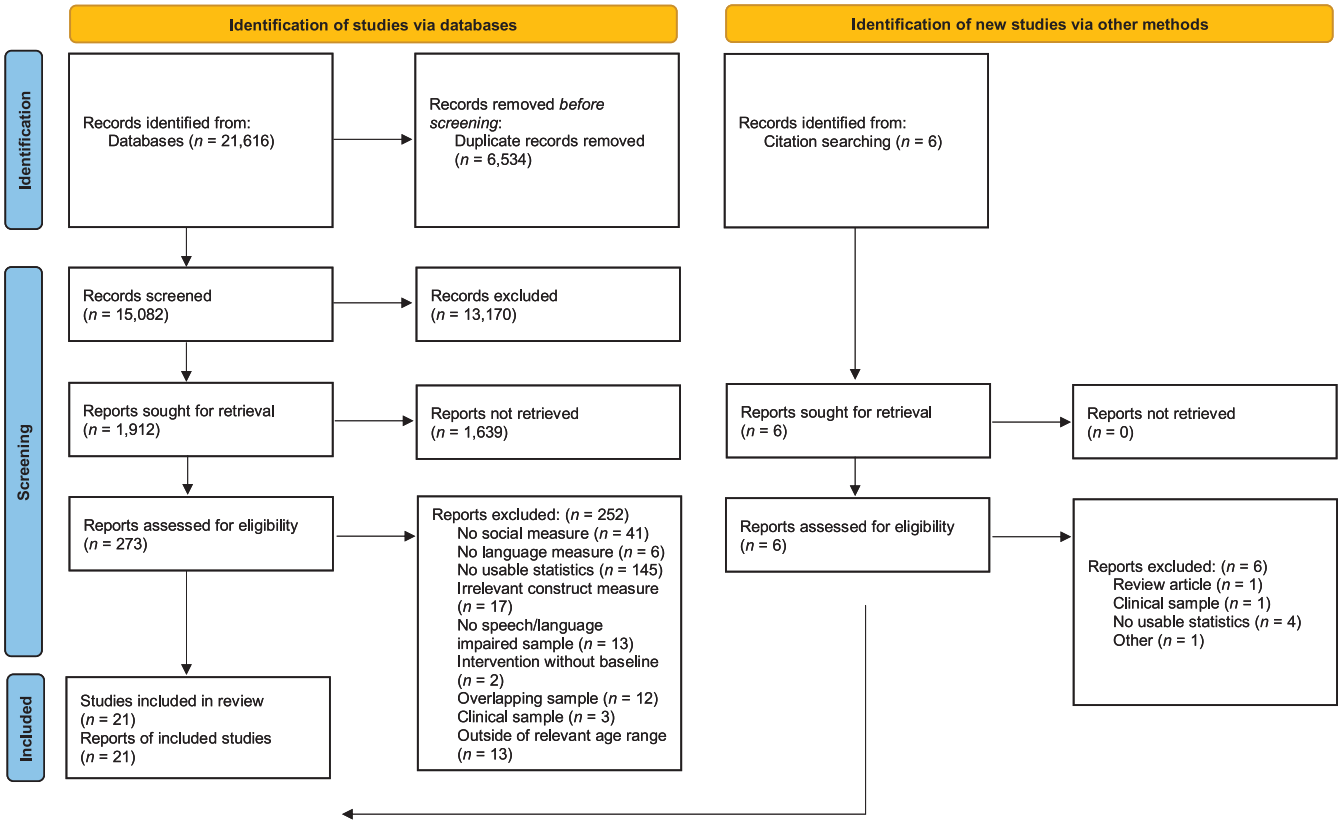
Study Screening

The PRISMA flow diagram for this study is shown in Figure 1, which depicts the review and exclusion process (see Supplemental Materials S1 and S3 for the PRISMA checklist as well as included and near-miss study references). Studies identified through the search strategy were entered into Covidence for Systematic Reviews (Covidence Inc.). Duplicate articles were recorded and removed by the software (N = 5,981) and through an additional manual screening (N = 553). The initial database search identified 21,603 studies, and 6,534 total duplicates were removed. A total of 15,069 studies were included in the review of titles and abstracts. Before beginning the review process, each coder involved in the review completed the training facilitated by an experienced coder. The titles and abstracts of each study were screened by two independent reviewers and either removed or moved to a full-text review based on the eligibility criteria. In cases where there was disagreement between the two coders on the eligibility of an abstract, a consensus vote was undertaken by the coders and the research supervisor. Weekly meetings were conducted with all coders to answer clarification questions regarding inclusion and exclusion criteria.

Data Extraction and Coding

Full-text articles were obtained for each study that was deemed eligible during the title and abstract review stages. A total of 273 studies were included in the full-text review as part of a larger study. Two independent coders read the full-text articles to verify that the study contained all the necessary information to meet the inclusion criteria for this specific study. This included verifying that the participants were in the desired age range, that the study included measures of language skills and social competence, and that it reported statistics for calculating effect sizes. A total of 21 studies met the inclusion criteria and were included in the data extraction and coding for this study. As part of a larger project, six independent reviewers were trained and participated in the data extraction process. Two independent coders coded each study according to relevant participant demographics, study

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram (adapted from Page et al., 2021). DLD = developmental language disorder.



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characteristics, and statistical data, which were compiled into a Microsoft Excel spreadsheet. Unadjusted effect sizes were selected for the analyses given that they were reported most frequently across studies and because adjusted effect sizes were adjusted based on inconsistent variables across studies. A summary of psychometric properties of the language and social measures used was completed (see Supplemental Material S2).

Demographic characteristics. Child sex at birth was coded according to the percentage of male participants in each study. Child age was coded according to the mean age in years reported for both the language and social competence assessments. SES was coded according to the SES of the majority of each sample (80% or more of the sample) as (a) low, (b) middle/high, (c) mixed, or (d) not specified.

Methodological characteristics. Language was coded according to whether the measure assessed (a) receptive, (b) expressive, or (c) combined/global language. Social competence was coded according to whether the social measure assessed (a) social skills, (b) social acceptance, (c) social competence, (d) social adjustment, (e) broad social functioning, (f) prosocial skills, (g) specific social skills, or (g) other social skills. After coding, we noted a large degree of overlap between the social constructs identified in the initial coding system. To make the moderator analyses more parsimonious in accordance with the tri-component model of social competence, the type of social competence was simplified into measures that focused on (a) social skills and (b) social performance. No studies had measures that represented social adjustment. Regarding the social skills aspect of social competence, studies that operationalized the social construct according to specific social behaviors related to social competence (i.e., social competence, social skills, specific social skills, or social functioning) were grouped together. For the social performance aspect of social competence, studies that operationalized the social construct according to peer acceptance (e.g., popularity or likeability) or prosocial abilities were grouped together. The informants for the language and social measures were coded as (a) parent, (b) teacher, (c) clinician/specialist, (d) trained coder (e.g., experimenter), (e) child, (f) self-report, or (g) combination of the above. The study design was coded as (a) cross-sectional or (b) longitudinal. The publication source was coded as (a) unpublished or (b) published.

Study Quality Coding

Eligible studies were assessed for study quality using an adapted version of the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart, Lung, and Blood Institute, 2014). Each eligible study was coded by two independent coders who had received training from an experienced coder. The interrater reliability for study quality coding was within an acceptable range (Cronbach's $\alpha = .61$; moderate according to Taber, 2018). Discrepancies were resolved by an experienced coder. The maximum study quality coding value was 12. No studies were determined to be of poor quality ($M = 9.43$, $SD = 1.34$, range: 6–12; see Supplemental Material S1 for coding scores and criteria); thus, all 21 studies were retained for the effect size estimate and moderator analyses.

Data Synthesis

A protocol was developed to identify overlapping samples and ensure that only one independent effect size was used in the meta-analysis for each respective data set. When overlapping samples were present across multiple studies, those with the largest sample size and the most comprehensive effect size statistics were selected for inclusion. Longitudinal data were selected over cross-sectional data. When data were presented for multiple age groups, the data for the oldest age group within the inclusion criteria were selected, assuming more developed abilities with an increase in age. Global measures of language were prioritized; when multiple forms of language were assessed (e.g., receptive and expressive language), the data were pooled across both language modalities to obtain the most comprehensive statistic. Global measures of social competence were prioritized; when multiple forms of social competence were assessed (e.g., prosocial skills and peer acceptance), the data were pooled across both social types to acquire the most comprehensive statistic. Finally, when a study utilized multiple informants for language or social competence measurements, effect sizes were pooled across informants to elicit a combined informant effect size.

Outlier Analyses

The data were inspected for outliers using SPSS (Version 28.0; IBM SPSS Statistics, IBM Corporation) by examining boxplots for effect sizes outside 3 *SD*s from the mean as well as by examining the 5% trimmed mean. Sensitivity analyses were completed on one study that presented as a potential outlier. This study was not significantly impacting the results when removed ($r = .17$, 95% confidence interval [CI] [.11, .23]); thus, all studies were retained.

Data Analysis

Statistical analyses, including the calculation of effect sizes, assessment of publication bias, examination of heterogeneity in the data, and moderator analyses, were performed using Comprehensive Meta-Analysis (CMA)

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software (Version 3.0; Borenstein et al., 2013). The effect sizes were calculated based on the information retrieved during the data extraction step. Given that language and social competence are often measured as continuous variables, Pearson *r* correlation coefficients were used as effect size statistics. In cases where other effect size statistics were reported, the respective data were input into the CMA program and transformed into *r* values (Borenstein et al., 2009). Two studies reported nonsignificant findings but did not include associated statistics; for these studies, a *p* value of .50 was inputted into CMA (Rosenthal, 1995). All effect sizes were bound by 95% CIs according to a random-effects model, assuming variability among studies. Publication bias was assessed by examining funnel plot and Egger statistics. A funnel plot is a method of visualizing the effect sizes around the mean effect size while looking for symmetry in the distribution. When the distribution appears asymmetrical, publication bias may exist in the data set. The Egger statistic is an additional source of evidence for or against publication bias. When the Egger statistic is significant, it suggests that publication bias may exist among the effect sizes examined (Borenstein et al., 2009). Heterogeneity analyses were performed to confirm whether there was sufficient variability among the effect sizes to suggest the need to examine moderators, using Cochran's Q and I^2 statistics. When Cochran's Q is significant, it suggests that the effect sizes are heterogeneous. Furthermore, the I^2 statistic examines how much heterogeneity exists across studies compared to chance as a percentage; when I^2 exceeds 50%, this suggests that the effect sizes are heterogeneous. Categorical and continuous moderators were run separately in CMA. For categorical moderators (e.g., language aspect), the Q statistic was examined as an indicator of significant variability within the moderators assessed. For continuous variables (e.g., age at language assessment), metaregressions were performed using mixed-effects models.

Results

Study Characteristics

A total of 21 studies were included in the final analyses, with a total of 6,830 children (see Tables 1–2; see Figure 1 for the PRISMA flow diagram). The mean age of children at the time of the language assessment was 7.52 years (SD = 2.91), and the mean age of children at the social competence assessment was 7.54 years (SD = 2.94). The mean percentage of boys in the final sample was 64.05% (SD = 13.32). The studies were conducted in the United States (n = 4, 19%), the United Kingdom (n = 12, 57%), Europe (non-U.K. European countries; n = 3, 14%), and Australia (n = 2, 10%).

Effect Size Estimates

The estimated effect size of the association between language skills and social competence in children with DLD was pooled across 21 studies and 6,830 children. The resulting effect size was significant (r = .18, 95% CI [.12, .24], p < .001; see Figure 2), indicating that stronger language skills were associated with better social competence in children with DLD. When examining the strength of r correlations, .10 has been suggested as a small effect, .20 has been suggested as a medium effect, and .30 has been suggested as a large effect in psychological research (see Funder & Ozer 2019, for more information). As such, the results of this study suggest that the association between language and social competence in children with DLD falls within the small effect range, indicating that there is a subtle albeit reliable relation between language and social competence outcomes in children with DLD. Among the 21 studies examined, heterogeneity statistics were significant (Q = 74.411, p < .001, I^2 = 73.12), suggesting sufficient variability among the studies to evaluate moderators.

When examining publication bias, the funnel plot was symmetrical (see Figure 3), whereas the Egger statistic was significant (intercept = 1.99, 95% CI [1.14, 2.84], p < .001), indicating that publication bias was not a concern. Demographic and methodological moderator analyses were conducted (see Tables 1–3). Among the examined moderators, only language aspect emerged as a significant moderator (Q = 45.57, p < .001). Specifically, larger effect sizes were found when studies utilized combined or global measures of language (k = 17; r = .20, 95% CI [.15, .25]) compared to studies that only assessed receptive (k = 2; r = .01, 95% CI [−.02, .04]) or expressive aspects of language (k = 2; r = .13, 95% CI [.06, .20]). No other moderators emerged as significant (all ps > .20).

Discussion

The current meta-analysis demonstrated a significant positive association between language and social competence in children with DLD, with the effect falling within a small effect size range (r = .18, 95% CI [.12, .24], p < .001), indicating a subtle but reliable relation between language skills and social competence in children with DLD. In addition to the pooled effect size estimate across 21 studies and 6,830 children, we examined demographic and methodological moderators to explain between-studies heterogeneity and found that language aspect moderated the association between child language skills and social competence in children with DLD.

The meta-analytic finding that language skills are positively associated with social competence in children

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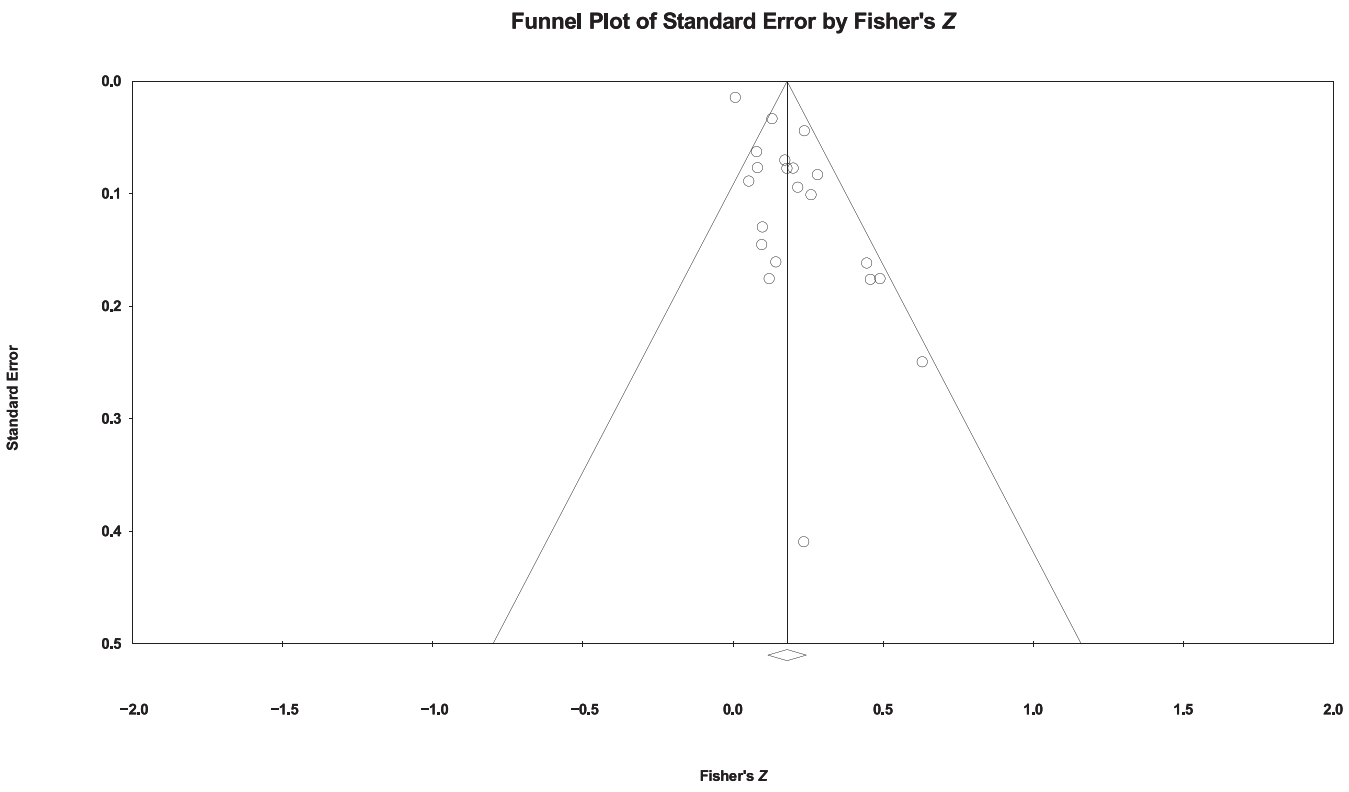
Figure 2. Funnel plot assessing for publication bias. The plot appears visually symmetrical indicating that publication bias was not a concern.



with DLD is consistent with the theoretical proposal that language plays an important role in children's social relations (e.g., Mulvey & Jenkins, 2021). Indeed, theorists have long proposed that the purpose of language is to communicate and that communication is inherently a social phenomenon (Vygotsky, 1934). Of course, the relation between language and social competence in children with DLD likely occurs in a bidirectional fashion. For example, language allows children to approach and form connections with their peers, and in turn, forming a social relation with a peer offers opportunities for more language turn-taking. More specifically, the extent to which these interactions are successful is partly related to whether children can understand and respond appropriately to whom they are interacting by clearly conveying their intentions and adding to ongoing conversations in a meaningful way (Gallagher, 1993). At the same time, children who demonstrate socially competent behaviors, such as engaging cooperatively and sharing with their peers, might be perceived more positively by their peers, which may result in them being presented with more opportunities to practice their language skills. A related possibility is that the development of language and social competence follows a developmental cascade or "skills beget skills" relation (e.g., Tamis-LeMonda et al., 2019), such that children with stronger language abilities engage in more social interactions, which then further develops their language abilities.

There are many possibilities as to why language and social competence are linked in children with DLD. First, some authors have argued that language promotes the use of private speech (Bono & Bizri, 2014) and that private speech allows for self-regulation, particularly in challenging situations or conflicts with others. However, when it comes to conflict resolution in children with language difficulties, some research has shown that children with DLD are more likely to use strategies that do not rely on language use (e.g., physical aggression, submission to others; Bakopoulou & Dockrell, 2016). As such, children with DLD who have higher language abilities may be better able to use language-based strategies to communicate and resolve conflicts more effectively, which could in turn improve their functioning in social contexts. Second, language may promote the development of sociocognitive skills, such as theory of mind, which allows a child to anticipate what a speaker might say, interpret what they are saying, and then follow through with a socially appropriate response (Milligan et al., 2007). Indeed, meta-analytical studies have supported the association between theory of mind and language (e.g., in children with

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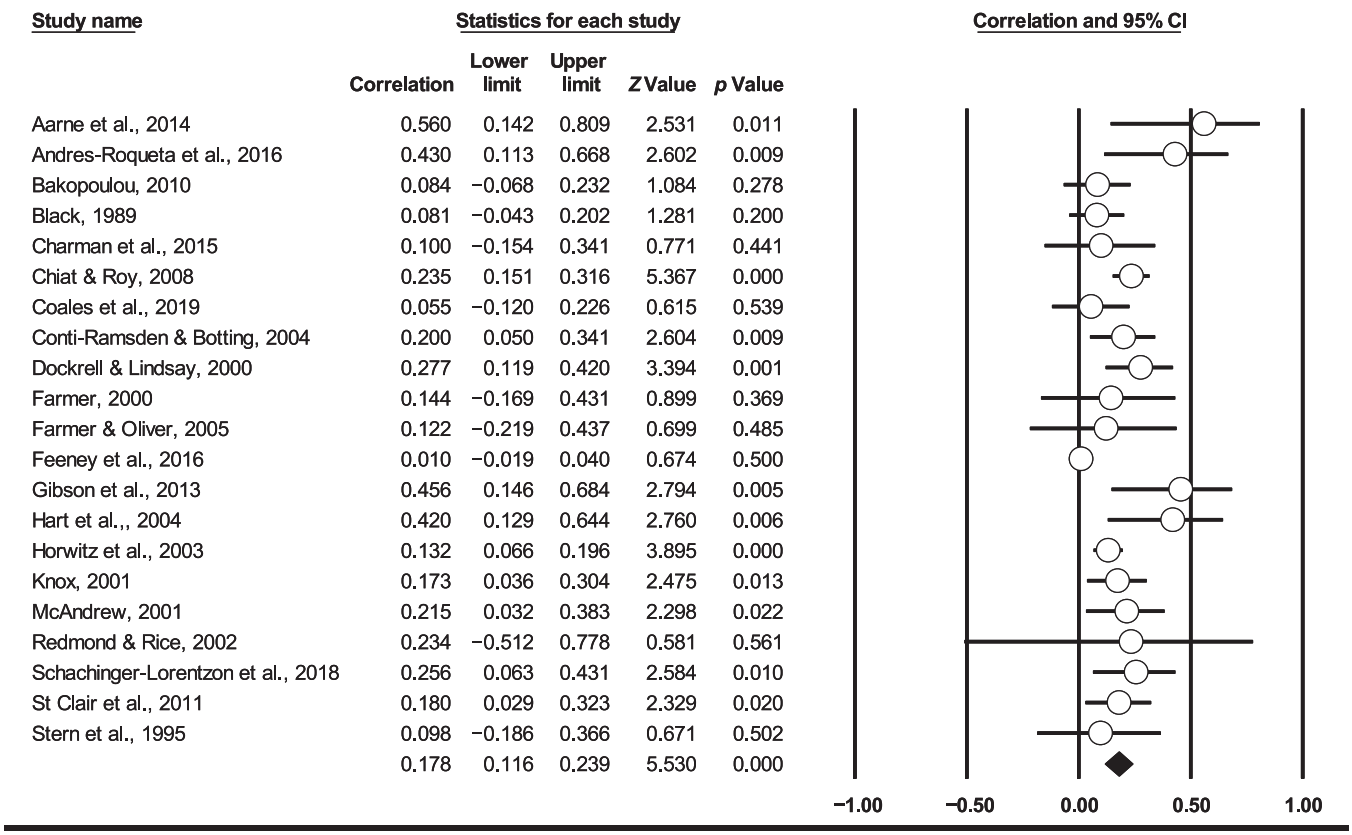
Figure 3. Forest plot demonstrating the correlation between language and social competence in children with developmental language disorder, within 95% confidence intervals.



language difficulties; Nilsson & de López, 2016) and prosocial behavior (e.g., in children with typical language; Imuta et al., 2016). Mediation studies have also shown that theory of mind is linked to socioemotional functioning through language skills in children with DLD (Smit et al., 2019). A fruitful avenue for future research is to further disentangle the developmental pathways between language and social functioning in children with DLD to better characterize the direction of the effect as well as potential mediating variables.

The current meta-analysis found that the association between language and social competence was moderated by language aspect. Specifically, the association between language and social competence was stronger in studies that assessed combined or global aspects of language relative to those that only examined expressive or receptive aspects of language. The finding that the association between language and social competence was stronger for measures that assessed global/combined language skills is consistent with some findings from meta-analyses examining the association between language and other constructs (e.g., theory of mind; Milligan et al., 2007). Given that global measures of language skills are more comprehensive, they provide a more thorough assessment of a child's language skills and are thus more likely to capture an array of language skills that could then be tied to social competence. Furthermore, it is possible that items tapping into social aspects of language (i.e., pragmatic language) are more likely to leak into global/combined composites compared to measures that focus only on receptive or expressive language, which may contribute to these findings.

Contrary to the language aspect findings, the association between language and social competence did not vary according to the type of social competence measured. This study conceptualized social competence according to the tri-component model, where social competence comprises social skills, social performance, and social adjustment (Cavell, 1990; Cavell et al., 2003). Among the 21 included studies, the social measures used best represented assessments of social skills or social performance. The lack of a significant moderating effect of social type suggests that language ability is related to various aspects of social functioning among children with DLD. A recent meta-analysis examining the association between social competence and problem behaviors in children also failed to find a moderating effect based on social type (i.e., social skills

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Table 1. Characteristics of studies included in the meta-analysis on language and social competence in children with developmental language disorder (DLD).

Study name	Geographic location	Sample size	% Male[a]	Age at language assessment[a]	Age at social assessment[a]	SES	Study design	Publication status
Aarne et al., 2014	Europe	19	79.0	3.1	3.1	NS	Cross-sectional	Published
Andrés-Roqueta et al., 2016	Europe	35	68.6	6.2	6.2	Middle/high	Cross-sectional	Published
Bakopoulou, 2010	United Kingdom	42	88.1	7.8	7.8	NS	Cross-sectional	Unpublished
Black, 1989	United States	124	68.3	4.6	4.6	Middle/high	Cross-sectional	Unpublished
Charman et al., 2015	United Kingdom	62	74.2	9.1	9.7	Mixed	Longitudinal	Published
Chiat & Roy, 2008	United Kingdom	209	75.0	3.0	4.5	NS	Longitudinal	Published
Coales et al., 2019	United Kingdom	63	76.0	10.4	10.4	NS	Cross-sectional	Published
Conti-Ramsden & Botting, 2004	United Kingdom	168	75.0	10.9	10.9	Mixed	Cross-sectional	Published
Dockrell & Lindsay, 2000	United Kingdom	133	71.4	7.5	7.5	NS	Cross-sectional	Published
Farmer, 2000	United Kingdom	8	94.0	10.9	10.9	NS	Cross-sectional	Published
Farmer & Oliver, 2005	United Kingdom	19	NS	8.6	8.6	NS	Cross-sectional	Published
Feeney et al., 2016	Australia	4,386	51.2	4.7	4.7	NS	Cross-sectional	Published
Gibson et al., 2013	United Kingdom	19	NS	8.3	8.3	NS	Cross-sectional	Published
Hart et al., 2004	United States	82	56.1	9.0	9.0	Middle/high	Cross-sectional	Published
Horwitz et al., 2003	United States	870	51.0	2.1	2.1	Mixed	Cross-sectional	Published
Knox, 2001	United Kingdom	96	86.0	11.0	11.0	NS	Cross-sectional	Unpublished
McAndrew, 2001	United Kingdom	166	76.2	7.5	7.5	NS	Cross-sectional	Unpublished
Redmond & Rice, 2002	United States	12	67.0	8.1	8.1	NS	Cross-sectional	Published
Schachinger-Lorentzon et al., 2018	Europe	100	65.4	2.9	2.9	NS	Cross-sectional	Published
St. Clair et al., 2011	United Kingdom	167	76.5	7.0	11.0	NS	Longitudinal	Published
Stern et al., 1995	Australia	50	76.0	4.1	10.2	NS	Longitudinal	Published

Note. SES = socioeconomic status; NS = not specified.

[a]Values are rounded to one decimal place.

or social competence; Hukkelberg et al., 2019). What might be the reason for the discrepant results across meta-analyses? One possibility is the lack of consensus regarding a dominant or overarching theory of social competence (e.g., Hukkelberg et al., 2019). Various theories have been proposed (e.g., Cavell, 1990; Dodge et al., 1986; Junge et al., 2020; Rose-Krasnor, 1997); however, no single theory has been adopted uniformly across studies. In turn, measures purported to assess different aspects of social competence often examine overlapping characteristics (e.g., Dirks et al., 2007; Hukkelberg et al., 2019), while the scope of social competence may vary across the measures selected. Social competence measures also vary in their psychometric properties, yet authors variably report on these characteristics (see Supplemental Material S2; readers are also directed to Cordier et al., 2015, and Denman et al., 2017, for systematic reviews of the psychometric properties of varied language and social measures).

The current meta-analysis did not find support for child sex at birth as a moderator in the relation between language and social competence in children with DLD. Recall that some literature suggests that boys may have disadvantages with respect to both their language and social skills attainment. For instance, some research shows that boys are at a higher risk for DLD and demonstrate elevated prevalence rates of DLD (e.g., Chilosi et al., 2023). Boys generally demonstrate more variability and poorer performance on social skills measures (e.g., Hajovsky et al., 2022). However, some studies have failed to find sex-related differences in DLD and language development more broadly (Etchell et al., 2018; Norbury et al., 2016; Tomblin et al., 1997) and social profiles of children with DLD (e.g., Lloyd-Esenkaya et al., 2020) with various confounding factors noted as contributing to the patterns observed. For example, boys are more likely to show overt difficulties with language, coupled with more overt behavior challenges (e.g., externalizing disorders; Hentges et al., 2021). These factors may result in a selection bias whereby boys are referred for clinical services more readily (e.g., Morgan et al., 2017), which in turn may cascade to inflated rates of male DLD diagnoses in clinical samples (Calder et al., 2022) coupled with higher rates of boys captured in DLD research

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Table 2. Characteristics of measures used in included studies in the meta-analysis on language and social competence in children with developmental language disorder.

	Language			Social competence		
Study name	**Measure**	**Informant**	**Modality**	**Measure**	**Informant**	**Type**
Aarne et al., 2014	CDI	Parent	Combined/global	BSITD	Parent	Social skills
Andrés-Roqueta et al., 2016	CEG, ELI	Trained coder	Combined/global	PM	Child	Social performance
Bakopoulou, 2010	CELF	Clinician/specialist	Combined/global	SDQ	Combination	Social performance
Black, 1989	EOWPVT, K-ABC, MSCA, PPVT, SB	Clinician/specialist	Combined/global	CBCL, KSCS, PIC	Combination	Social skills
Charman et al., 2015	BPVS, CELF, TROG	Trained coder	Combined/global	SDQ	Teacher	Social performance
Chiat & Roy, 2008	PLS	Trained coder	Combined/global	SDQ	Combination	Social performance
Coales et al., 2019	BPVS, CELF, TROG	Trained coder	Receptive	KIDSCREEN-52	Self-report	Social performance
Conti-Ramsden & Botting, 2004	CELF	Trained coder	Combined/global	SDQ	Teacher	Social performance
Dockrell & Lindsay, 2000	PPQ	Clinician/specialist	Combined/global	PPQ	Clinician/ specialist	Social skills
Farmer, 2000	BPVS, CELF, CTNR	Clinician/specialist	Combined/global	SDQ	Teacher	Social performance
Farmer & Oliver, 2005	CCC	Combination	Expressive	SDQ	Combination	Social performance
Feeney et al., 2016	PPVT	Trained coder	Receptive	Peds-QL	Parent	Social performance
Gibson et al., 2013	ACE, CCC, TROG	Clinician/specialist	Combined/global	MIPO	Trained coder	Social performance
Hart et al., 2004	CELF	Trained coder	Combined/global	TBRS	Teacher	Social performance
Horwitz et al., 2003	CDI	Parent	Expressive	ITSEA	Parent	Social skills
Knox, 2001	BPVS, WISC	Clinician/specialist	Combined/global	CBQ,[a] JRS,[a] MLIS, SPPC,[a] SDQ[a]	Combination	Social performance
McAndrew, 2001	TROG	Clinician/specialist	Combined/global	HPSPC	Combination	Social performance
Redmond & Rice, 2002	TOLD	Trained coder	Combined/global	CBCL, TRF	Combination	Social performance
Schachinger-Lorentzon et al., 2018	RDLS	Clinician/specialist	Combined/global	FTF	Parent	Social skills
St. Clair et al., 2011	CELF	Trained coder	Combined/global	SDQ	Teacher	Social performance
Stern et al., 1995	RDLS	Trained coder	Combined/global	VABS	Teacher	Social performance

Note. The following acronyms were used for the language measures: CDI = MacArthur–Bates Communicative Development Inventories; CEG = Comprension de Estructuras Gramaticales; ELI = Evaluacion de Lenguaje Infantil; CELF = Clinical Evaluation of Language Fundamentals; EOWPVT = Expressive One-Word Picture Vocabulary Test; K-ABC = Kaufman Assessment Battery for Children; MSCA = McCarthy Scales of Children's Abilities; PPVT = Peabody Picture Vocabulary Test; SB = Stanford Binet; BPVS = British Picture Vocabulary Scale; TROG = Test for the Reception of Grammar; PLS = Preschool Language Scale; PPQ = Personalized Postal Questionnaire; CTNR = Children's Test of Nonword Repetition; CCC = Children's Communication Checklist; ACE = Assessment of Comprehension and Expression Naming Test; WISC = Wechsler Intelligence Scale for Children; TOLD = Test of Language Development; RDLS = Reynell Developmental Language Scales. The following acronyms were used for the social competence measures: BSITD = Bayley Scales of Infant and Toddler Development; PM = Peer Nominations; SDQ = Strengths & Difficulties Questionnaire; CBCL = Child Behavior Checklist; KSCS = Kohn Social Competence Scale; PIC = Personality Inventory of Children; Peds-QL = Pediatric Quality of Life Inventory; MIPO = Manchester Inventory for Play Observation; TBRS = Teacher Behavior Rating Scale; ITSEA = Infant–Toddler Social and Emotional Assessment; CBQ = Children's Behaviour Questionnaire; JRS = Junior Rating Scale; MLIS = My Life in School; SPPC = Self-Perception Profile for Children; HPSPC = Harter Pictorial Scale of Perceived Competence; TRF = Teacher Report Form; FTF = Five to Fifteen Questionnaire; VABS = Vineland Adaptive Behavior Scale.

[a]In this study, a customized questionnaire titled the Teacher Questionnaire was created and was comprised of items from the CBQ, JRS, SPPC, and SDQ.

samples as well. As such, the lack of significant results related to child sex may be in part be explained by the higher proportion of boys relative to girls captured in the current sample, which in turn limited the ability to capture sex-related differences. An alternative possibility is that language and social competence may be similarly linked in boys and girls with DLD. Future research should seek to include equal proportions of boys and girls in DLD research studies to better disentangle possible sex-based differences.

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Table 3. Results for the categorical and continuous moderators examined for the correlation between language and social competence in children between the ages of 2–12 years with developmental language disorder (DLD).

Results					
Categorical moderators	***k***	***r***	**95% CI**	**Homogeneity *Q***	***p* value**
Socioeconomic status				1.454	.483
Middle to high	3	.287	[0.005, 0.527]		
Mixed	3	.140	[0.082, 0.198]		
Unspecified	15	.179	[0.096, 0.259]		
Publication status				1.657	.198
Published	17	.196	[0.119, 0.271]		
Unpublished	4	.128	[0.056, 0.198]		
Study design				0.283	.595
Cross-sectional	17	.179	[0.109, 0.247]		
Longitudinal	4	.205	[0.137, 0.272]		
Language aspect				45.556	< .001*
Receptive	2	.011	[–0.018, 0.041]		
Expressive	2	.131	[0.066, 0.195]		
Combined/global	17	.202	[0.152, 0.250]		
Social type				0.047	.829
Social performance	16	.173	[0.095, 0.250]		
Social skills	5	.187	[0.088, 0.283]		
Language informant				2.013	.570
Clinician/specialist	8	.190	[0.119, 0.259]		
Parent	2	.311	[–0.153, 0.662]		
Trained coder	9	.178	[0.065, 0.285]		
Combination	2	.090	[–0.049, 0.225]		
Social informant				7.693	.261
Clinician/specialist	1	.277	[0.119, 0.420]		
Parent	4	.141	[0.012, 0.266]		
Teacher	6	.186	[0.101, 0.268]		
Trained coder	2	.305	[0.058, 0.517]		
Child	1	.430	[0.113, 0.668]		
Self-report	1	.055	[–0.120, 0.226]		
Combination	6	.172	[0.113, 0.230]		
Continuous moderators	***k***	***b***	**95% CI**	***z* score**	***p* value**
% Male	19	0.0019	[–0.0018, 0.0055]	.99	.3229
Age at language assessment	21	0.0022	[–0.0151, 0.0195]	.25	.8006
Age at social assessment	21	0.0021	[–0.0146, 0.0188]	.25	.8031

Note. CI = confidence interval.

*$p < .001$

Age did not emerge as a significant moderator in this study, indicating that the association between language and social competence in children with DLD did not vary between the ages of 2 and 12 years. This finding was unexpected as we predicted that the association would be stronger in younger children, a finding that would be consistent with the results of a recent meta-analysis examining language and social acceptance in typically developing children (Troesch et al., 2016). Why might the association between language and social functioning be moderated by age for typically developing children but not for children with DLD? One possible explanation is related to the variability in overall language skills, as well as the language growth trajectories between these two populations. As children acquire and develop language, there is vast variability in their individual language development trajectories (Rowe et al., 2012); however, children generally demonstrate increased language capabilities across childhood years (e.g., Rice & Hoffman, 2015; Rice et al., 2010). Similar trends have been noted for social competence development as well (e.g., Lloyd-Esenkaya et al., 2020; Toseeb & St Clair, 2020). However, as children with DLD age and demonstrate advancements in their skills, their relative standing to typically developing children has

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been shown to remain with respect to both their language (Sansavini et al., 2021; Tomblin et al., 2003) and social competence (e.g., prosocial skills; Toseeb & St Clair, 2020), even when certain interventions are applied (i.e., language-based interventions to target language; Sansavini et al., 2021). Thus, children with DLD may show a shallower trajectory with respect to language and social development and growth across childhood, suggesting less variability in their capabilities over time. At the same time, it is also possible that the lack of an age effect found in our meta-analysis is due to our restricted age range, which only captured children between the ages of 2 and 12 years. One meta-analysis that examined the association between language and problem behaviors in children with typical language as well as in children with language difficulties found that the association between language and problem behavior was moderated by age, such that stronger associations were found with an increase in age (Curtis et al., 2018). However, this study included an age range that included samples up to 18 years of age. It is possible that by limiting our age range to focus only on childhood, we did not capture a large enough range to pick up on age-related impacts between language and social functioning that could arise later, such as in adolescence.

This study did not find support for SES as a moderator in the relation between language and social competence in children with DLD. There has been a long-documented history of SES being associated with language outcomes (e.g., Arriaga et al., 1998; B. Hart & Risley, 1995; Hoff & Tian, 2005). At the same time, a recent systematic review found that while low SES was a predictor of language difficulties, the predictive power of SES was low (Sansavini et al., 2021). The lack of significant findings regarding SES in this meta-analysis is not surprising, given that there were no studies that included a sample of children with lower SES. Indeed, out of the 21 studies in this meta-analysis, all children originated from middle or high SES backgrounds, or a combination of both, or the study failed to specify the SES distribution of the sample. This finding is in support of the tendency for child development research to examine Western, Educated, Industrialized, Rich, and Democratic samples (Nielsen et al., 2017). To this end, there is a need for research on DLD to recruit and study diverse and lower SES populations, while also considering broader intersectional factors that may impact the associations found.

The results did not suggest that the study design (i.e., longitudinal vs. cross-sectional) had an impact on the relation between language and social competence in children with DLD. The absence of this finding suggests that language and social competence are concurrently and longitudinally positively related. This finding may be, in part, related to the previously mentioned restricted range of language (e.g., Rice & Hoffman, 2015; Rice et al., 2010) and social (e.g., prosocial skills; Toseeb & St Clair, 2020) capabilities found in children with DLD. Furthermore, the current meta-analysis included only four studies with longitudinal data, supporting the need for more longitudinal research to examine social and language patterns in children with DLD.

This study found that the association between language and social competence remained despite the use of varied language and social competence informants across studies. Such findings suggest that various informants (e.g., teachers, family members, and health care providers) similarly rated both language skills and social competence in children with DLD. Future research may consider the reliability and validity, along with cost–benefit analyses, of using varied informants to assess child language and social development.

Limitations

This study has several limitations that should be addressed. First, inherent to all meta-analytic studies, the results of this study cannot make any causal conclusions regarding the association between language skills and social competence in this population of children given that the results are correlational and not experimental. While we found a significant and positive relation between language and social competence in children with DLD, we cannot conclude that higher language capabilities cause stronger social competence, or vice versa, in children with DLD. Second, meta-analytic studies are limited by the search strategy employed and the availability of studies on the topic of interest coupled with the screening criteria used. While we used multiple strategies to facilitate a thorough search and capture gray areas of literature, such as dissertations and theses, and to screen the reference list of included studies for additional possible studies, it remains possible that relevant studies may not have been captured in our search. Furthermore, none of the included studies originated from geographic locations outside the United States, the United Kingdom, Europe, and Australia, suggesting the results may not be generalizable outside these areas. Finally, this study did not examine the association between language skills and social competence in children based on the specific types or severity of language difficulties; rather, all children with DLD were examined together. Although studies have varied in their categorization of children based on these factors, it is possible that these differences matter in their association with social competence. DLD is heterogeneous, with deficits varying in severity across receptive, expressive, and mixed receptive–expressive domains of language. As the type of impairment has been shown to be related to peer relations (Conti-Ramsden

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et al., 2019; Mok et al., 2014) and the severity of language challenges has been related to social problems (Hart et al., 2004), these factors should be considered in future research on children with DLD.

Implications

The finding that language and social competence are associated in children with DLD has several clinical implications. Within this population, which has a narrower scope of language and social abilities than other populations, the current meta-analysis demonstrates a small but reliable relation between stronger language skills and better social competence. Given that children with DLD often do not outgrow developmental language difficulties and experience long-term consequences, our findings suggest that going upstream to support early language development may confer positive outcomes for children's social functioning. Given the unique role of speech-language pathologists in assessing, planning, and facilitating interventions for DLD, they are in an ideal position to target children's language and social development in an intentional fashion. Interventions may differentially target more or less language and/or social aspects depending on the profile of each unique child; there is utility in identifying areas of weakness while bolstering existing language and social strengths (e.g., Lloyd-Esenkaya et al., 2020). Furthermore, interventions that focus on both language and social functioning may confer benefits in other domains. For example, social functioning has been proposed as a mediator between language skills and emotional problems (Forrest et al., 2021). Therefore, bolstering social functioning in children with DLD may buffer future emotional difficulties. Future research could focus on identifying treatment strategies that optimize language and social functioning, while also examining the impacts on other domains of life that are commonly impacted in children with DLD.

Conclusions

The current meta-analysis found a significant, positive relation between language and social competence among children with DLD, providing support for a subtle and reliable relation between language skills and social competence in this population of children. This study adds to the body of literature supporting the need for further research on children with DLD. Although the prevalence rates of DLD are higher than those of other neurodevelopmental disorders (McGregor, 2020), DLD remains poorly identified (Hollo et al., 2014) and understudied relative to other conditions. Greater awareness of DLD and its relationship with domains of life, such as social competence, is warranted.

Ethical Compliance

This study utilized a systematic review and meta-analysis design that used anonymized public data; thus, ethics approval was not required. This review was not registered; a protocol was created and can be accessed by contacting the authors.

Author Contributions

Karolina Wieczorek: Conceptualization (Equal), Data curation (Lead), Formal analysis (Lead), Methodology (Equal), Project administration (Lead), Visualization (Equal), Writing – original draft (Lead), Writing – review & editing (Lead). **Megan DeGroot:** Conceptualization (Supporting), Data curation (Supporting), Formal analysis (Supporting), Investigation (Lead), Validation (Lead), Visualization (Equal), Writing – original draft (Supporting), Writing – review & editing (Supporting). **Sheri Madigan:** Conceptualization (Supporting), Resources (Supporting), Supervision (Supporting). **Paolo Pador:** Project administration (Supporting), Validation (Supporting). **Heather Ganshorn:** Data curation (Supporting), Writing – original draft (Supporting), Writing – review & editing (Supporting). **Susan Graham:** Conceptualization (Equal), Formal analysis (Supporting), Funding acquisition (Lead), Methodology (Equal), Project administration (Supporting), Supervision (Lead), Writing – original draft (Supporting), Writing – review & editing (Supporting).

Data Availability Statement

The data set used for the effect size and moderator analyses completed in Comprehensive Meta-Analysis can be found on the Open Science Framework website (https://osf.io/f7n28/). Supplemental information and data are available from the corresponding author upon request.

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Appendix A

PsycINFO Search Strategy

Table A1. Database(s): APA PsycInfo 1806 to May, Week 3, 2021 search strategy.

No.	Searches	Results
1	language/or exp Language Development/	69,722
2	exp speech development/ or exp Verbal Communication/	128,468
3	verbal ability/ or verbal fluency/	10,320
4	exp Language disorders/	38,636
5	((language* or speech* or verbal* or linguistic*) adj (skill* or develop* or fluen* or abilit* or competenc* or disabil* or delay* or disorder* or impair*)).tw.	48,797
6	(Language adj3 (expressive or receptive)).tw.	4,243
7	1 or 2 or 3 or 4 or 5 or 6	238,852
8	social skills/ or social communication/ or social emotional learning/ or social functioning/ or socioemotional functioning/	21,005
9	social behavior/ or altruism/ or prosocial behavior/ or "sharing (social behavior)"/ or "Assistance (Social Behavior)"/ or self-control/ or social adjustment/ or interpersonal interaction/ or caring behaviors/ or social integration/ or interpersonal relationships/ or social interaction/	133,055
10	self-control/ or emotional control/ or emotional regulation/ or self-regulation/	33,706
11	empathy/ or social emotional learning/	14,774
12	((social* or prosocial* or pro-social* or emotion* or socioemotion* or socio-emotion* or interpersonal* or inter-personal* or peer*) adj2 (competen* or skill* or develop* or behavio?r* or function* or success* or adapt* or adjust* or perform* or regulat* or relation* or intelligen* or abilit*)).tw.	275,131
13	8 or 9 or 10 or 11 or 12	386,277
14	exp Childhood Development/	110,738
15	(child* or toddler* or preschool* or pre-school* or kindergarten* or kid or kids or boy* or girl* or tween* or teen* or p?ediatric*).tw.	828,765
16	(child* or p?ediatric*).jn.	50,767
17	14 or 15 or 16	852,999
18	7 and 13 and 17	8,056

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Appendix B

MEDLINE Search Strategy

Table B1. Database(s): Ovid MEDLINE(R) and epub ahead of print, in-process, in-data review, and other non–indexed citations and daily 1946 to May 31, 2021, search strategy.

No.	Searches	Results
1	language/or exp Language Development/	57,380
2	exp Language Disorders/	49,688
3	((language* or speech* or verbal* or linguistic*) adj (skill* or develop* or fluen* or abilit* or competenc* or disabil* or delay* or disorder* or impair*)).kf,tw.	34,121
4	(Language adj3 (expressive or receptive)).kf,tw.	3,310
5	1 or 2 or 3 or 4	119,633
6	interpersonal relations/ or social integration/ or social interaction/ or social skills/	76,341
7	social behavior/ or altruism/ or cooperative behavior/ or self-control/	106,386
8	emotional intelligence/ or empathy/	22,206
9	((social* or prosocial* or pro-social* or emotion* or socioemotion* or socio-emotion* or interpersonal* or inter-personal* or peer*) adj2 (competen* or skill* or develop* or behavio?r* or function* or success* or adapt* or adjust* or perform* or regulat* or relation* or intelligen* or abilit*)).kf,tw.	147,687
10	6 or 7 or 8 or 9	307,502
11	exp Child Development/	62,445
12	(child* or toddler* or preschool* or pre-school* or kindergarten* or kid or kids or boy* or girl* or tween* or teen* or p?ediatric*).kf,tw.	1,839,987
13	(child* or p?ediatric*).jn.	235,669
14	11 or 12 or 13	1,948,623
15	5 and 10 and 14	4,183

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Appendix C

Linguistics and Language Behavior Abstracts Search Strategy

Table C1. Search strategy: linguistics and language behavior abstracts.

Set no.	Searched for	Databases	Results
S1	MAINSUBJECT.EXPLODE("Language Acquisition") OR MAINSUBJECT.EXPLODE("Language Pathology")	Linguistics and Language Behavior Abstracts (LLBA)	10,341
S2	AB,TI((language* or speech* or verbal* or linguistic*) NEAR/1 (skill* or develop* or fluen* or bility* or competenc* or disabil* or delay* or disorder* or impair*))	Linguistics and Language Behavior Abstracts (LLBA)	38,928
S3	AB,TI(Language NEAR/3 (expressive OR receptive))	Linguistics and Language Behavior Abstracts (LLBA)	2,397
S4	s1 or s2 or s3	Linguistics and Language Behavior Abstracts (LLBA)	47,205
S5	MAINSUBJECT.EXPLODE("Empathy") OR (MAINSUBJECT("Interpersonal Relationships") OR MAINSUBJECT.EXPLODE("Social Perception") OR MAINSUBJECT.EXPLODE("Social Functions of Language"))	Linguistics and Language Behavior Abstracts (LLBA)	2,763
S7	ab,ti((social* OR prosocial* OR "pro-social*" OR emotion* OR socioemotion* OR "socio-emotion*" OR interpersonal* OR "inter-personal*" OR peer*) NEAR/2 (competen* OR skill* OR develop* OR behavior* OR behaviour* OR function* OR success* OR adapt* OR adjust* OR perform* OR regulat* OR relation* OR intelligen* OR bility*))	Linguistics and Language Behavior Abstracts (LLBA)	12,402
S8	s5 OR s7	Linguistics and Language Behavior Abstracts (LLBA)	14,445
S10	ab,ti(child* OR toddler* OR preschool* OR pre-school* OR kindergarten* OR kid OR kids OR boy* OR girl* OR tween* OR teen* OR pediatric* OR paediatric*)	Linguistics and Language Behavior Abstracts (LLBA)	81,273
S11	pub(child* OR pediatric* OR paediatric*)	Linguistics and Language Behavior Abstracts (LLBA)	9,023
S12	s10 OR s11	Linguistics and Language Behavior Abstracts (LLBA)	83,315
S13	s4 AND s8 AND s12	Linguistics and Language Behavior Abstracts (LLBA)	1,574

Note. Date of search: June 2, 2021.

Appendix D

Scopus Search Strategy

Search Strategy: Scopus
Date searched: June 3, 2021

((TITLE-ABS-KEY ((language* OR speech* OR verbal* OR linguistic*) W/1 (skill* OR develop* OR fluen* OR abilit* OR competenc* OR disabil* OR delay* OR disorder* OR impair*)) OR TITLE-ABS-KEY (language W/3 (expressive OR receptive))))
AND
(TITLE-ABS-KEY ((social* OR prosocial* OR "pro-social*" OR emotion* OR socioemotion* OR "socio-emotion*" OR interpersonal* OR "inter-personal*" OR peer*) W/2 (competen* OR skill* OR develop* OR behavio?r* OR function* OR success* OR adapt* OR adjust* OR perform* OR regulat* OR relation* OR intelligen* OR abilit*)))
AND
((TITLE-ABS-KEY (child* OR toddler* OR preschool* OR "pre-school*" OR kindergarten* OR kid OR kids OR boy* OR girl* OR tween* OR teen* OR p?ediatric*) OR SRCTITLE (child* OR p?ediatric*)))
Results: 6,273

Complimentary Author PDF: Not for Broad Dissemination

Appendix E

ProQuest Dissertations and Theses Global

Table E1. Search strategy: ProQuest dissertations.

Set no.	Searched for	Databases	Results
S1	AB,TI((language* or speech* or verbal* or linguistic*) NEAR/1 (skill* or develop* or fluen* or abilit* or competenc* or disabil* or delay* or disorder* or impair*)) OR AB,TI(Language NEAR/3 (expressive OR receptive))	ProQuest Dissertations & Theses Global	22,024
S2	ab,ti((social* OR prosocial* OR "pro-social*" OR emotion* OR socioemotion* OR "socio-emotion*" OR interpersonal* OR "inter-personal*" OR peer*) NEAR/2 (competen* OR skill* OR develop* OR behavior* OR behaviour* OR function* OR success* OR adapt* OR adjust* OR perform* OR regulat* OR relation* OR intelligen* OR abilit*))	ProQuest Dissertations & Theses Global	135,504
S3	ab,ti(child* OR toddler* OR preschool* OR pre-school* OR kindergarten* OR kid OR kids OR boy* OR girl* OR tween* OR teen* OR pediatric* OR paediatric*)	ProQuest Dissertations & Theses Global	284,232
S4	s1 AND s2 AND s3	ProQuest Dissertations & Theses Global	1,563

Note. Date of search: June 7, 2021.