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Screening for Speech and Language Delay and Disorders in Children Age 5 Years or Younger: An Evidence Review for the U.S. Preventive Services Task Force

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Prepared by:
RTI International–University of North Carolina at Chapel Hill Evidence-based Practice Center
Research Triangle Park, NC

Investigators:
Cynthia Feltner, MD, MPH
Ina F. Wallace, PhD
Sallie Nowell, PhD, CCC-SLP
Colin J. Orr, MD, MPH
Brittany Raffa, MD
Jennifer Cook Middleton, PhD
Jessica Vaughan, MPH
Claire Baker
Roger Chou, MD
Leila Kahwati, MD, MPH

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Structured Abstract

Purpose: To systematically review the evidence on screening for speech and language delay and disorders in children age 5 years or younger.

Data Sources: PubMed/MEDLINE, the Cochrane Library, APA PsycInfo, ERIC, Linguistic and Language Behavior Abstracts (ProQuest), and trial registries through January 17, 2023; reference lists of retrieved articles; outside experts; and reviewers, with surveillance of the literature through November 24, 2023.

Study Selection: Two investigators independently selected English language studies using a priori criteria. Eligible studies included cohort studies or trials directly comparing screening versus no screening, as well as studies of screening test accuracy for speech and language delay or disorders among children age 5 years or younger. Randomized, controlled trials (RCTs) of interventions for speech and language delay or disorders enrolling children age 6 years or younger reporting on the benefits and harms of interventions were also eligible.

Data Extraction: One investigator extracted data and a second checked accuracy. Two reviewers independently rated quality for all included studies using predefined criteria.

Data Synthesis: Thirty-eight studies reported in 41 articles (N=9,006) were included. No study evaluated the direct benefits of screening compared with no screening. Twenty-one studies (23 articles; N=7,489) assessed the accuracy of 23 instruments for detecting speech and language delay and disorders in young children. The sensitivity and specificity varied widely across included studies, and no more than one or two studies reported on the accuracy of each instrument. Ten instruments, described in 10 studies (11 articles), used parent reports to detect speech and language delay and disorders, and 13 instruments, described in 14 studies, required a trained examiner to administer the instrument to children. Most included instruments were designed to screen for global language problems (provide an overall score for "language") and nine provided scores for specific aspects of language (e.g., expressive language skills only). Sensitivity and specificity of the three parent-reported instruments of emerging expressive language skills were consistent; median sensitivity was 91 percent, (range, 88% to 93%) and specificity was 88% (range, 88% to 85%). The accuracy of global language instruments based on parent reports was inconsistent, with a median sensitivity of 74 percent (range, 55% to 93%). Accuracy of provider-reported global and specific language problems varied significantly across tools.

Seventeen RCTs (18 articles; N=1,517) compared an intervention for a speech and language delay or disorder with an inactive control. Eight RCTs of treatment were limited to children with language delay and no obvious speech-sound or fluency disorder. Three assessed parent-delivered, group training interventions. Of these, two that evaluated longer, more intensive interventions (11 bimonthly 60- to 75-minute sessions, and 11 weekly 2.5-hour sessions followed by 3 weekly home visits) found benefit on different measures of expressive language outcomes, and one RCT of a shorter parental group training intervention (6 weekly 2-hour sessions) found no statistically significant difference between groups for any language outcome measure. Other RCTs of interventions for language delay that enrolled heterogeneous populations and assessed different interventions showed mixed results. Two RCTs delivered interventions featuring

school-based, whole-class curriculum components (or Tier 1 interventions) designed to advance language and literary skills over the course of an academic year. Both demonstrated improved receptive and expressive language outcomes in favor of the intervention; however, one found improvement for some measures but not others. Two RCTs that assessed fluency treatment in young children focused on the Lidcombe Program of Early Stuttering Intervention delivered by speech-language pathologists (SLPs) and featured parent training to provide verbal contingencies for stutter-free speech (e.g., "that was smooth talking") and stuttering (e.g., "that was a bit bumpy"). Both found benefit for stuttering fluency associated with the intervention at 9 months. One RCT, which delivered the intervention face-to-face in a clinic setting, showed a 2.3 percent lower proportion of syllables stuttered (95% confidence interval [CI], 0.8 to 3.9) compared with the control group, whereas the second RCT, which was delivered via telehealth, showed a larger reduction from the baseline mean number of syllables stuttered in the intervention group than in controls (-3.0; p=0.02). Three RCTs assessed interventions for three different types of speech-sound disorders and reported on various measures of speech-sound; results were generally inconsistent across different measures of speech. Two RCTs that evaluated treatment for children newly referred from primary care for any speech or language problem found inconsistent results, with improvement on some domains of speech and language but not others and no consistent benefit for a similar outcome domain.

Eight RCTs (N= 1,239) reported on one or more outcomes specific to school performance or early literacy, health-related quality of life, function, behavior, or socialization. No studies assessing the same type of intervention among similar groups of children reported on similar outcomes, and most studies found no difference between groups for measures of early literacy, function, and quality of life. No RCTs reported on the harms of interventions.

Limitations: No studies reported on the benefits and harms of screening vs. no screening, or on the potential harms of interventions. Studies of screening test accuracy and interventions for children with speech and language problems were heterogeneous in terms of the enrolled population and specific type of speech or language disorders targeted. Very few studies of screening test accuracy evaluated the same instrument. Similarly, few studies of interventions for speech and language delay or disorder enrolled similar populations and evaluated similar types of interventions. Two RCTs of treatment enrolled children who were newly referred from primary care; however, it is not clear whether children were identified via routine screening and if the studies differed in terms of setting, mean age of enrolled children, and other factors.

Conclusions: We found no eligible studies that reported on benefits directly arising from screening when compared with usual care or no screening. Parent-reported screening tools of emerging expressive language skills had reasonable accuracy for detecting expressive language delay; however, the accuracy of global language instruments based on parent reports was inconsistent. Accuracy of examiner-administered instruments was also variable, especially for examiner-administered instruments of specific language skills. Existing evidence supports the benefit of group parent training programs for speech delay that provide at least 11 parental training sessions for improving receptive language skills, as well as the Lidcombe Program of Early Stuttering Intervention delivered by SLPs for reducing stuttering frequency.

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Chapter 1. Introduction

Scope and Purpose

The U.S. Preventive Services Task Force (USPSTF) will use this review to update its recommendation on screening for speech and language delay and disorders in children. In 2015, the USPSTF concluded that the evidence was insufficient to assess the balance of benefits and harms of screening for speech and language delay and disorders in children age 5 years or younger (I statement).[1]

Condition Definition

Speech or language delay refers to children who are developing speech and language in the correct sequence but at a slower rate than expected, whereas speech or language disorders refer to children with speech or language ability that is qualitatively different from typical development. There is no universally accepted threshold for "delay" in speech or language development. For research purposes, performance on a standardized assessment of language that falls at least one standard deviation below the mean for their age is often considered a delay.[2] Speech disorders are defined by difficulty with forming specific sounds or words correctly (articulation or phonological disorders) or making words or sentences flow smoothly (fluency disorders like stuttering).[3] Language disorders are characterized by difficulty understanding (receptive language) or speaking (expressive language) relative to their peers.[3] Speech and language disorders can exist alone or together.

The focus of this review is routine screening for developmental (or "primary") speech or language delay and disorders that are not caused by another condition known to affect speech or language development. Acquired or "secondary" causes of speech and language delay or disorders result from an injury or condition known to cause speech or language problems (e.g., acquired aphasia secondary to a seizure disorder; neurologic impairment secondary to tumors, infections, or radiation; autism). Routine screening in primary care settings would not be appropriate for children who have a suspected or known acquired cause of speech and language delay. Evaluation and treatment of communication difficulties in children with secondary speech or language disorders would be part of disease management. However, in the context of routine screening, some children identified with a speech or language delay or disorder may go on to receive a primary diagnosis for a disorder such as hearing loss subsequent to the screening and diagnostic evaluation. This may be considered an additional outcome of screening.

Etiology and Natural History

Heterogeneous terminology has been used to categorize speech and language disorders based on etiology, in addition to other factors. As outlined above, disorders may be developmental (primary) or acquired (secondary). The focus of this review is on speech and language delay and disorders that become apparent as development unfolds but which are thought to be present at birth with unknown etiology. Some risk factors, such as adverse social conditions (as outlined

below), are thought to increase the risk of speech and language delay. In terms of natural history, many children identified with speech or language delay go on to recover without an intervention. One systematic review (18 cohort studies) that included studies published through 1997 estimated that approximately 60 percent of children identified with an early expressive language delay and 25 percent with a receptive and expressive language delay will recover without intervention.[2] However, evidence suggests that school-age children with speech or language delay may be at increased risk of learning and literacy disabilities, including difficulties with reading and writing.[4-6] Observational cohort studies suggest that children with these conditions may also be at higher risk for social and behavioral problems in addition to learning problems,[7] some of which may persist through adulthood.[8, 9] The extent to which these studies accounted for treatment history and confounding factors is limited.

Risk Factors

Risk factors for developmental speech and language delay and disorders are not well understood. Observational evidence has shown an association with multiple factors, including male sex, family history, and various adverse social conditions and higher rates of various speech and language problems. Despite popular myth, children raised in bilingual or multilingual households are not at increased risk for speech and language disorders.[10] In fact, some studies have found cognitive[11, 12] advantages to bilingualism over monolingualism in children with and without developmental disorders. The previous USPSTF evidence review for this topic included a key question (KQ) about risk factors for speech and language delay and disorders.[13] Based on evidence from observational studies, the following were identified as possible risk factors: male sex, family history of speech or language impairment, lower levels of parental education, and various perinatal risk factors (e.g., low birth weight).[13]

More recent studies have evaluated risks associated with various adverse social conditions. For example, one population-based cohort study from the United Kingdom (28,634 children born between January 2011 and December 2014) found that speech, language, and communication concerns at ages 27 to 30 months are common (with a prevalence of 13%) and are significantly associated with increasing levels of neighborhood deprivation, categorized using the Scottish Index of Multiple Deprivation 2016 quintiles (taking into consideration level of income, employment, health status, education, geographic access to services, crime, and housing).[14] Other studies have shown an association between speech and language diagnoses and poverty, poor parental mental health, and lack of medical home or reliable access to medical services.[15] Finally, emerging evidence suggests that environmental changes associated with the COVID-19 pandemic (e.g., stay-at-home orders, mask mandates, social distancing requirements) may increase the risk of language delay. Preliminary results (preprint publication) from a longitudinal cohort study enrolling healthy, neurotypically developing children from Rhode Island (n=700) found statistically significantly reduced verbal, motor, and overall cognitive performance (by approximately 2 standard deviations) among children age 1 year or younger born during the pandemic (2020 and 2021) compared with children born between 2011 and 2019, controlling for multiple confounding factors. Similar findings were seen among all children younger than age 3 years who were assessed in 2021 compared with historical controls.[16] These results suggest that males have been most affected and that higher levels of maternal education was a protective factor.

Prevalence and Burden

Nationally representative estimates of the prevalence of speech and language delay and disorders in children are limited. Published estimates vary in terms of population age, measurement or definition of delay and disorder, and other factors. In terms of speech and language delay, a 2003 U.S. cohort study enrolling a random sample of children ages 12 to 39 months (n=1,189) born at Yale New Haven Hospital estimated a 13.5 percent prevalence (among those ages 18 to 23 months) to 17.5 percent prevalence (among those ages 30 to 36 months) for expressive language delay measured by the MacArthur Communicative Development Inventories (CDIs), short-form versions.[17] This prevalence is similar to more recent estimates from a cohort study in Canada, which found a 12.6 percent prevalence among those ages 24 to 30 months using the same measure.[18] In terms of speech and language disorders, using data from both peer-reviewed studies and national surveys, the National Academy of Sciences estimated that the prevalence of speech and language disorders ranges between 3 and 16 percent of U.S. children ages 3 to 18 years.[19] Multiple studies have demonstrated a higher prevalence among boys than girls and among certain groups defined by race/ethnicity.[19, 20] For example, based on data from the 2012 National Health Interview Survey, nearly 8 percent of children ages 3 to 17 years had a communication disorder (any speech or language disorder), with boys almost twice as likely to be affected than girls (9.6% vs. 5.7%, respectively).[20] In the same study, approximately 10 percent of non-Hispanic Black children were affected compared with 7.8 percent and 6.9 percent of children identified as White or Hispanic, respectively.[20] Disparities in the prevalence of speech and/or language delay has also been observed based on various measures of socioeconomic status, including type of insurance. For example, a nationally representative U.S. cohort study found that by age 8 years, the prevalence of speech or language disorders was significantly higher among publicly insured children than privately insured children (8.4% vs. 4.5%, respectively).[21]

Children with speech and language difficulties are at risk for both learning and behavioral problems, some of which may persist through adulthood.[8, 9] The burden associated with untreated speech delay and disorders is addressed under the Etiology and Natural History section.

Rationale for Screening and Screening Strategies

The rationale for screening for speech and language delay or disorders among children without a known condition that affects speech and language development is to identify these conditions early and provide effective interventions before the condition interferes with school learning or psychosocial adjustment. A variety of screening tools exist that could be used in primary care settings to detect speech and language problems. Some tools, such as the Ages and Stages Questionnaires (ASQ-3), are part of a larger instrument designed to assess general development and includes multiple questions specific to speech and language. Other tools are designed to assess only speech and language development. Screening instruments may be broadly characterized as those that are designed to be administered to the child and those that are completed by a knowledgeable informant such as a parent, caregiver, or teacher. In a few cases, both procedures are used. Most screening instruments are unable to discern the difference between a child who has a delay (i.e., a child with late-emerging language during the first 2 years

of life) that will subsequently resolve without treatment, and one who will go on to display a speech and language disorder (i.e., a child who will later receive a formal diagnosis of specific language impairment). Children who screen positive for speech and language difficulties require referral for a diagnostic evaluation to confirm the suspected delay or disorder.

Treatment Approaches

Once a formal speech or language disorder is diagnosed, treatment is variable and individualized to the needs of the child, their family, and their school team based on how the child's disorder impairs their function in different settings. For example, when treating a child with an articulation disorder, the speech-language pathologist (SLP) may model the production of problematic sounds, have the child listen to and discriminate between sounds, cue the child on placement of the articulators, and provide multiple opportunities for the child to practice. Similarly, for children with language disorders, therapy will be designed to address the child's specific weaknesses in expressive or receptive language related to vocabulary, syntax, semantics, pragmatics, or some combination of these. Strategies may include providing the child with a rich exposure to vocabulary and language structures through responsive interactions with caregivers and peers. These naturalistic strategies, often delivered by a caregiver who is coached by an SLP, include expanding the child's utterances, recasting what the child has just said with correct grammar, describing the child's actions as they play, providing visual supports for communication, and using child-directed speech.[22] Interventions targeting stuttering in young children may involve similar naturalistic strategies to manage and reduce stuttering, such as training parents to provide verbal contingencies for periods of stutter-free speech in the form of acknowledgment ("That was smooth") or praise, and contingencies for moments of stuttering ("That was a bit bumpy") and requests for self-correction. For children who have limited or no ability to speak intelligibly, an augmentative and alternative communication system, such as a speech-generating device or a visual representation of a word on a button or board, may be used. Many assistive technology options are now available to support individuals with speech and language disorders in their daily functioning.[23, 24]

Speech-language therapy sessions may take place in natural or more structured clinical environments. Children younger than age 3 years will typically receive state-supported infant and toddler early intervention services either in a day-care setting or in their home with a caregiver. School services provided to children older than age 3 years are generally offered in a preschool classroom, either embedded in classroom routines or in a separate treatment room. Private speech-language therapy, which may occur in addition to early intervention or school services, usually takes place in a clinic, though some therapists visit family homes or provide telehealth appointments. Children may be seen individually or in a small group for treatment depending on their therapy goals. Telehealth delivery of speech-language services has become more common, and evidence suggests that treatment outcomes have been equivalent or better than traditional in-person therapy.[25]

Speech-language treatment may be delivered by a licensed SLP or a speech-language pathology assistant supervised by an SLP. In early intervention for toddlers, it is now common for caregivers to be the primary implementers of speech-language interventions with the therapist coaching them. Teachers, paraprofessionals, and even peers may also collaborate with school

SLPs to support a child's communication goals at school. The duration of treatment for speech-language disorders varies by the child's needs and the child's rate of progress in meeting therapy goals.

Current Clinical Practice

The American Academy of Pediatrics recommends that children without identified risks or developmental problems receive periodic *general* developmental screening using a standardized tool at 9-, 18-, and 30-month well-child visits.[26] These guidelines do not recommend screening separately for speech and language concerns or recommend a specific general developmental screening tool that is designed to provide a separate score for speech and language problems. Despite existing guidelines, routine developmental screening in clinical practice varies by practice settings and states. Based on data from the 2015 National Survey of Children's Health, an estimated 30 percent of U.S. children ages 9 to 35 months received a parent-completed developmental screening in the past year, with variation across states (ranging from 17% in Mississippi to 59% in Oregon).[27] Commonly used tools in practice that contain questions about global development, including the Parents' Evaluation of Developmental Status questionnaire, ASQ-3, and the Survey of Well-being of Young Children, include items specific to speech delay but generally have low sensitivity for detecting speech delay.[28] It is not clear what proportion of providers use general developmental screening tools in current practice that have adequate sensitivity for detecting speech and language delay or disorders.

Although screening for general developmental delay is common in practice, challenges may arise in implementing screening, particularly because of concerns about clinic flow in busy settings.[29] Some children who screen positive may not be referred for treatment, or families may not follow through with recommended referrals.[29] Some evidence suggests disparities in rates of referral or services by race/ethnicity for children who are identified in primary care settings as having a potential speech or language problem. For example, based on data from the 2012 National Health Interview Survey, approximately half of all children ages 3 to 17 years with a communication disorder received an intervention service in the past 12 months; however, children identified as Hispanic/Latinx and Black are less likely to receive services compared with children identified as White (47.3%, 45.8%, and 60.1%, respectively).[20] **Appendix A** provides detailed information regarding disparities in rates of detection, age at diagnosis and receipt of treatment by age, race/ethnicity, and various measures of socioeconomic factors.[20]

Chapter 2. Methods

Key Questions and Analytic Framework

The scope and KQs were developed by the Evidence-based Practice Center (EPC) investigators, USPSTF members, and Agency for Healthcare Research and Quality (AHRQ) Medical Officers. The analytic framework and KQs that guided the review are shown in **Figure 1**. Six KQs were developed for this review:

1. Does screening for speech and language delay or disorders in children age 5 years or younger improve speech and language outcomes, school performance, function, or quality-of-life outcomes?

2. What is the accuracy of screening tools to detect speech and language delay or disorders in children age 5 years or younger?

3. What are the harms of screening for speech and language delay or disorders in children age 5 years or younger?

4. Do interventions for speech and language delay or disorders in children age 6 years or younger improve speech and language outcomes?

5. Do interventions for speech and language delay or disorders in children age 6 years or younger improve school performance, function, or quality-of-life outcomes?

6. What are the harms of interventions for speech and language delay or disorders?

In addition to addressing the KQs, this review also looked for evidence related to the three contextual questions (CQs) listed below. These CQs were not a part of this systematic review. They are intended to provide additional background information. Literature addressing the CQs is summarized in **Appendix A**.

1. Are there disparities in the prevalence of speech and language delay or disorders among specific populations of children? If so, what factors contribute to these disparities?

2. Are there disparities in the detection of speech and language delay or disorders in clinical practice and referral for diagnostic evaluation among specific populations of children? If so, what factors contribute to these disparities?

3. Are there disparities in the provision and utilization of treatment for speech and language delay or disorders among specific populations of children? If so, what factors contribute to these disparities?

Data Sources and Searches

PubMed/MEDLINE, the Cochrane Library, APA PsycInfo, ERIC, and Linguistic and Language Behavior Abstracts (ProQuest) were searched for English language articles published through January 17, 2023. Medical Subject Headings were used as search terms when available and keywords when appropriate, focusing on terms to describe relevant populations, tests, interventions, outcomes, and study designs. The model PubMed/MEDLINE search was peer reviewed by the Scientific Resource Center librarian for the EPC Program, who recommended the addition of database searches for interventions in ERIC and Linguistic and Language Behavior Abstracts. Complete search terms and limits are listed in **Appendix B**. Targeted searches for unpublished literature were conducted by searching ClinicalTrials.gov. To supplement electronic searches, the reference lists of pertinent review articles and studies that met the inclusion criteria were reviewed. Studies suggested by peer reviewers or public comment respondents were also reviewed and, if appropriate, incorporated into the final review. Since January 17, 2023, ongoing surveillance was conducted through article alerts and targeted searches of journals to identify major studies published in the interim that may affect the conclusions or understanding of the evidence and the related USPSTF recommendation. The last surveillance was conducted on November 24, 2023, and no additional studies meeting eligibility criteria were identified. All literature search results were managed using EndNote™ version 9.2 (Thomson Reuters, New York, NY).

Study Selection

We developed inclusion and exclusion criteria for populations, interventions, comparators, outcomes, timing, settings, and study designs with input from the USPSTF (**Appendix B**). We included studies published in English enrolling children age 5 years or younger who communicate using any language conducted in countries categorized as "very high" on the Human Development Index.[30] We excluded studies limited to children who were preterm infants (<36 weeks of gestation) or who had known conditions associated with speech and language delay or disorders, such as selective mutism, hearing impairment, developmental disorders (e.g., Down syndrome, fragile X syndrome, and autism), craniofacial anomalies, or neurological and neurogenetic disorders.

For studies relevant to KQs specific to the benefits and harms of screening (KQs 1 and 3) and screening test accuracy (KQ 2), we included unselected or explicitly asymptomatic children age 5 years or younger enrolled from primary care settings or primary care–relevant settings, including childcare, schools, and other education settings. Studies using any validated screening questionnaire or procedure designed to identify speech and/or language delay or disorder applicable for use in primary care settings were eligible, including those requiring 10 minutes or less to administer or to be interpreted in a primary care setting, as well as longer questionnaires completed by parents or teachers that are interpreted by primary care providers. General developmental screening instruments that do not include a separate component for speech and language skills were excluded.

For studies assessing the benefits and harms of interventions (KQs 4, 5, and 6), studies enrolling children referred for treatment from primary care, or children identified by educators or parents

as having a possible speech or language problem were also eligible. Treatment studies enrolling children up to age 6 years were also eligible given that children who would be screened at age 5 years and referred for treatment may not receive services immediately. Any interventions designed to improve speech and/or language among eligible populations of children were eligible, including those delivered in various formats (e.g., individual or group settings, face-to-face, or via telehealth) and delivery personnel (e.g., SLPs or other clinicians, parents, or teachers).

We included randomized, controlled trials (RCTs); nonrandomized, controlled trials; and controlled cohort studies reporting on the benefit and harms of screening compared with no screening (or usual care) (KQs 1 and 3), or harms of interventions for children with a speech or language delay or disorder compared with an inactive control group (KQ 6). For studies reporting on the benefit of interventions to improve speech and language outcomes (KQ 4) or academic skills, behavior, function, or quality of life (KQ 5), we limited to RCTs comparing an intervention to an inactive control group. For studies assessing the accuracy of screening tools (KQ 2), we included cross-sectional or cohort studies comparing screening tools with a reference standard (diagnostic evaluation by a qualified clinical professional) reporting on measures of test accuracy (e.g., sensitivity and specificity).

Titles and abstracts were independently reviewed by two investigators. Those marked for potential inclusion by either reviewer were retrieved for evaluation of the full text. The full texts were then independently reviewed by two investigators to determine final inclusion or exclusion. Disagreements were resolved by discussion and consensus.

Quality Assessment and Data Abstraction

For newly identified studies, two experienced reviewers independently assessed each study's methodological quality using predefined criteria developed by the USPSTF (**Appendix B**) and informed by tools designed for various study designs (Cochrane Risk of Bias 2.0 tool for RCTs;[31] Quality Assessment of Diagnostic Accuracy Studies-2 for screening test accuracy).[32] We spot-checked and carried forward quality ratings of eligible studies included in the previous update for this topic. Disagreements were resolved by discussion. Only studies rated as having good or fair quality were included in the synthesis.

For each included study, one investigator extracted pertinent information about the methods, populations, interventions, comparators, outcomes, timing, settings, and study designs. All data extractions were checked by a second investigator for completeness and accuracy.

Data Synthesis and Analysis

Findings for each KQ were summarized in tabular and narrative format. The overall strength of the evidence for each KQ was assessed as high, moderate, low, or insufficient based on the overall quality of the studies, consistency of results between studies, precision of findings, risk of reporting bias, and limitations of the body of evidence using methods developed for the USPSTF (and the EPC program).[33, 34] Additionally, the applicability of the findings to U.S. primary care

populations and settings was assessed. Discrepancies were resolved through consensus discussion.

For studies included for KQ 2 (accuracy of screening tools) we calculated sensitivity, specificity, likelihood ratios, and predictive values based on data reported by articles, when sufficient, in order to compare consistency across similar measures. When qualitatively evaluating likelihood ratios, we considered positive likelihood ratios (PLRs) to indicate a minimal (1–2), small (2–5), moderate (5–10), or large (>10) increase in the risk of a language delay or disorder. We considered negative likelihood ratios (NLRs) to indicate a minimal (0.5–1), small (0.2–0.5), moderate (0.1–0.2), or large (<0.1) decrease in the risk of a language delay or disorder. Likelihood ratios below 0.1 or above 10 are typically thought to provide strong evidence for ruling out (NLR<0.1) or ruling in (PLR>10) a diagnosis.[35]

To determine whether meta-analyses were appropriate, the clinical heterogeneity and methodological heterogeneity of the studies were assessed following established guidance.[36] The populations, tests, treatments, comparators, outcomes, and study designs were assessed qualitatively, looking for similarities and differences. Due to heterogeneity and few studies assessing the same screening tool or interventions, meta-analysis was not appropriate.

Expert Review and Public Comment

The draft research plan for this topic was posted on the USPSTF website for public comment from January 20, 2022, to February 16, 2022. In response to public comments, the USPSTF clarified that children who communicate using any language at home are eligible, not just spoken language, and that studies enrolling unselected as well as asymptomatic populations are eligible. Studies enrolling an unselected population may include children with conditions listed as excluded who have not yet been diagnosed. Finally, the USPSTF added minor edits to clarify that screening and treatment for speech disorders, language disorders, or both are included. The final version of the research plan was posted on the USPSTF website on June 9, 2022. The draft evidence review was reviewed by content experts, representatives of Federal partners, USPSTF members, and AHRQ Medical Officers and minor revisions were made based on comments received, mostly related to clarifying information summarized in the Introduction. The draft evidence review was posted for public comment from July 25, 2023, through August 21, 2023. Most comments related to contextual issues specific to current clinical practice and future research needs. In response to comments, a minor revision was made to the Discussion to note that future research on this topic should aim to enroll a population representative of families living in the United States, including those who speak languages other than English at home..

USPSTF and AHRQ Involvement

The authors worked with USPSTF liaisons at key points throughout the review process to develop and refine the analytic framework and key questions, as well as to resolve issues around scope for the final evidence synthesis.

AHRQ staff provided project oversight, conducted reviews of the draft report, and helped facilitate an external review of the evidence synthesis. Although AHRQ staff and members of the

USPSTF participated in developing the scope of work and reviewed draft reports, the authors are solely responsible for the report's content.

Chapter 3. Results

Literature Search

We identified 7,929 unique records and assessed 594 full-text articles for eligibility (**Figure 2**). We excluded 553 articles for various reasons, as detailed in **Appendix C**, and included 41 articles representing 38 studies. Details of quality assessments of the newly included studies are in **Appendix D Tables 1–6**.

Results by Key Question

KQ 1. Does Screening for Speech and Language Delay or Disorders in Children Age 5 Years or Younger Improve Speech and Language Outcomes, School Performance, Function, or Quality-of-Life Outcomes?

We found no eligible study that addressed this KQ.

KQ 2. What Is the Accuracy of Screening Tools to Detect Speech and Language Delay or Disorders in Children Age 5 Years or Younger?

Summary

Twenty-one studies (23 articles; 7,489 participants) assessed the accuracy of 23 instruments for detecting speech and language disorders in young children.[37-59] Seven studies were new to this update.[37-41, 58, 59] About half of the studies recruited at least a portion of their participants from primary care or health departments. Of the 23 instruments, 13 were speech and language instruments administered to children by a trained examiner, and 10 were parent reports of children's speech or language skills. Twelve instruments were designed to screen for global language delay or disorders (any type); nine were designed to screen for specific language problems such as expressive language skills or understanding of syntactic forms; and four instruments were used to screen for articulation problems, two of which also screened for global language problems. Excluding two studies[43, 45] that enrolled all children who screened positive and a random sample of children who screened negative, the overall prevalence of speech and language disorders ranged between 4 percent and 33 percent, with a median prevalence of 14 percent. The sensitivity of instruments for detecting speech and language delay and disorders ranged between 17 and 100 percent with a median of 86 percent, and specificity ranged between 32 and 98 percent with a median of 87 percent. When parent-reported and trained examiner instruments were considered separately, we found that the median sensitivity of parent reports was 84 percent, with a range of 55 to 93 percent, and the median specificity was 84 percent, with a range of 32 and 96 percent. For trained examiner instruments, the median sensitivity was 87 percent, with a range of 17 to 100 percent, and the median specificity was 88 percent, with a range of 58 to 98 percent.

Detailed Evidence

Four good-quality studies (reported in 5 articles)[43, 44, 52-54] and 17 fair quality studies (reported in 18 articles)[37-42, 45-51, 55-59] assessed the accuracy of 23 instruments for detecting speech and language disorders in young children. Seven studies were new to this update.[37-41, 58, 59] Study designs included both cross-sectional and prospective cohort designs.

Enrolled populations ranged from ages 12 to 70 months, with an average age of 38.9 months (**Table 1**). In the 16 studies that reported sex of the participants, on average, 47 percent were female. Children were recruited in a variety of ways, including through pediatric and other primary care practices (n=8), childcare centers/preschools/kindergartens (n=9), health/public health centers (n=3), birth announcements (n=2), and public advertisements in local media (n=1), WIC offices (n=1), mailed invitations to children born within a public health district (n=2), a child welfare clinic (n=1), and a program providing services for children at risk of delay (n=1). Some studies recruited participants from multiple venues so that the number exceeds the number of included studies. Nine studies were conducted in the United States,[45-50, 56-58] one in Canada,[42] one in Hong Kong,[37] one in Australia,[54] four in the United Kingdom,[52, 53, 55, 59] and five in other Western European countries.[38-41, 43] Of the 13 studies in which a trained examiner directly assessed children (see below), four were screened in a health facility, five were screened in a child care center or school, and the location of the screening was unclear in the remaining four studies. Of the 10 studies that included parent reports, one was completed in the pediatric office; in seven studies, parents completed the reports at home; in one study, the reports were completed either in the home or the clinic; and in one study, the location was not described.

Most studies did not report race/ethnicity.

Overall, 23 instruments provide data on accuracy and assess a variety of speech and language skills (**Table 2**). Ten instruments, described in 10 studies (12 articles), used parent reports to detect speech and language delay and disorders.[37, 38, 40, 42-45, 50, 51, 54, 55, 59] All but four of the parent report instruments have a limited number of items, ranging from four to 26. Four other instruments[40, 43, 50, 59] ask parents to report on a range of vocabulary items and syntactic forms and contain from 50 to several hundred items in a checklist form. Thirteen instruments, described in 13 studies, require a trained examiner to administer them to children,[39, 41, 42, 46-49, 52-54, 56-58] although in one case, the examiner can be an aide who only needs to monitor the child's use of a touchscreen.[58] The instruments range from six to 50 items, but only a portion of items need be administered in some cases. All but three instruments were examined in only one study each. These instruments were the Ages and Stages Questionnaire.[42, 59] Hackney Early Language Screening Test/Structured Screening Test,[52, 53] and the Nurse Screening.[39, 41] In addition, two studies examined the Fluharty Preschool Screening Test[47] and a later version with a language component, the Fluharty Preschool Speech and Language Screening Test.[56] Although the Sprachentwicklungsscreening (SPES-3)[40] was designed as both a parent report and trained examiner instrument, the authors recommended that only the parent report subscales be include as a screen for language delay; therefore, we have classified the SPES-3 as a parent report instrument.

Most instruments evaluated by included studies are designed to screen for global language problems. Twelve instruments (the Ages and Stages Questionnnaire,[42, 59] the Davis Observation

Checklist for Texas,[46] the Developmental Nurse Screen,[54] the Early Language Scale,[38] the Fluharty Preschool Screening Test,[47] the General Language screen,[55] the Hackney Early Language Screening Test/Structured Screening Test,[52, 53] the Infant-Toddler Checklist,[45] the Nurse Screening,[39, 41] the Parent Questionnaire,[54] the Screening Kit of Language Development (SKOLD)/Screening Kit of Language Development Black English (SKOLDBE),[48] and the Sentence Repetition Screening Test (language component)[57] provide an overall score for language that was compared with a reference measure.

In contrast, nine screening tools provide scores for specific aspects of language: the Brigance Preschool Screen[42] includes both receptive and expressive language scores; the Early Screening Profiles[42] screens for semantic development; the Elternfragebogen für die Fruberkennung von Riskokindern (ELFRA-2),[43, 44] the SPE-3,[40] and the Language Development Survey (LDS) measure early expressive language;[50, 51] the Quick Interactive Language Screener (QUILS)[58] screens for vocabulary and syntax comprehension along with learning of new vocabulary and syntactic structures; the Sure Start Language Measure (SSLM)[59] measures vocabulary; and the Northwest Syntax Screening Test[47] screens for expressive and receptive knowledge of syntax. Note that although the Battelle Developmental Inventory Screening Test-Communication[42] provides both expressive and receptive scores, the authors only provided accuracy for the receptive score.

Three of the trained examiner tools specifically screen for articulation skills—the Denver Articulation Screening Exam[49] and the articulation portion of both the Fluharty Preschool Speech and Language Screening Test,[56] and the Sentence Repetition Screening Test.[57] In addition, one parent-administered instrument measured articulation.[37] In our analysis of accuracy, we consider the articulation instruments separately from specific language instruments.

Studies used a variety of reference standards to document speech and language disorders. Measures included both global assessments of language skill such as the Preschool Language Scale, Fourth and Fifth Editions, the Reynell Developmental Language Scales, and the Test of Language Development, Primary and specific indices such as the Templin-Darley Tests of Articulation, the British Picture Vocabulary Scale, and the Test for Auditory Comprehension of Language. In some cases, studies used more than one reference measure to provide appropriate comparisons for different screening measures that were examined (e.g., Sentence Repetition Screening Test Articulation subtest with the Arizona Articulation Proficiency Scale and Sentence Repetition Screening Test Language scale with the Illinois Test of Psycholinguistic Abilities and the Bankson Language Screening Test) (**Table 3**).

Excluding the two studies[43, 45] that enrolled all children who screened positive and a random sample of children who screened negative, the prevalence of speech and language disorders based on reference standards ranged between 4 percent and 33 percent, with a median prevalence of 14 percent (**Table 3**). For studies that included multiple instruments using the same reference measure, the prevalence was calculated only once. Although we did include different prevalence values for studies that included different reference measures, we did not consider prevalence based on different reference measure cut points.

Accuracy of Instruments

To examine accuracy, we considered both the source of the information (parent report vs. trained examiner) and whether the instrument was designed as a global index of language, a specific measure of language skills (e.g., word knowledge), or a measure of articulation. **Table 3** provides accuracy for instruments categorized by global language, specific language, and articulation instruments within parent-reported tools and within trained examiner tools.

Parent Reported

As shown in **Table 3**, both sensitivity and specificity varied greatly in screening tools that used parent reports. Across the 14 indices of sensitivity, the median was 84 percent, with a range of 55 to 93 percent. The median specificity was 84 percent, and the variability was somewhat greater than for sensitivity, ranging between 32 percent and 96 percent. Note that some instruments included two subtests or calculated accuracy with different reference measures that did figure into the median calculations, but two indices in Table 3 are for an English-speaking-only subset whose values were not included in the median calculations.

Instruments for global language vs. specific language vs. articulation. Just examining the global language instruments based on parent reports, the median sensitivity was 74 percent, ranging between 55 percent and 89 percent. Specificity was somewhat less variable, ranging between 73 percent and 95 percent with a median of 79 percent. In contrast, both sensitivity and specificity of the parent-reported instruments of specific skills (all emerging expressive language skills) were fairly consistent and high: median sensitivity of 91 percent, ranging between 83 percent and 93 percent, and the median specificity was 88 percent, ranging between 81 percent and 96 percent. The one parent-rated measure of articulation had a reasonably high sensitivity (86%) but a low specificity (32%). In the studies in which parent reports were used, two showed high positive likelihood ratios indicating a high likelihood of a language delay or disorder for children who screened positive, the LDS[51] (using a revised scoring method) and one study of the ASQ—24.1 and 10.0, respectively.[59] The two studies assessing the ASQ found inconsistent results, but also varied in terms of population (age and recruitment setting, and used different reference standards.[42, 59] Both the LDS and the ELFRA-2[43, 44] displayed high negative LRs (0.09 and 0.08, respectively), indicating low odds of a language delay in children with a negative screen. No other parent report instrument showed either large positive LRs or negative LRs, although quite a few displayed moderate LRs, suggesting utility for identifying children for whom further evaluation could be beneficial.

Trained Examiners

Table 3 provides the accuracy of 13 screening tools that trained examiners administered to children. The median sensitivity of these instruments was 87 percent, with a range of 17 to 100 percent, and the median specificity was 88 percent, with a range of 58 to 98 percent. Similar to parental-reported instruments, there is substantial variability in the accuracy of examiner-administered tools.

Instruments for global language vs. specific language vs. articulation. Restricting the accuracy summary to trained examiner screenings of global language shows that the median

sensitivity and specificity were 88 and 89 percent, respectively; sensitivity ranged between 17 percent and 100 percent, and specificity ranged between 69 percent and 98 percent. The median sensitivity of trained examiner instruments for specific language skills was 86 percent, ranging between 56 percent and 94 percent, but the median specificity was 70 percent, ranging between 58 percent and 90 percent. Across the three trained examiner tools for assessing articulation, the median sensitivity was only 66 percent, ranging between 43 percent and 92 percent; however, the median specificity was 96 percent, with a range of 93 to 97 percent. Several trained examiner instruments display high likelihood ratios, suggesting that they may be useful for both ruling in a diagnosis and ruling out a diagnosis of a language delay or disorder. Failures on three trained examiner global instruments, the Davis Observation Checklist for Texas,[46] the Nurse Screening revised scoring,[39] and the SKOLD/SKOLDBE,[48] each indicate a large increase in the likelihood of a language delay or disorder. Failure on the articulation portion of the Sentence Repetition Screening Test[57] also indicates a large increase in the likelihood of an articulation disorder. Passing scores on two trained examiner instruments of global language, the Hackney Early Language Screen Test[53] and the SKOLD/SKOLDBE[48] and on one examiner instrument of specific language skills, the Early Screening Profiles,[42] indicate a large decrease in the likelihood of a language disorder.

KQ 3. What Are the Harms of Screening for Speech and Language Delay or Disorders in Children Age 5 Years or Younger?

We found no eligible study that addressed this question.

KQ 4. Do Interventions for Speech and Language Delay or Disorders in Children Age 6 Years or Younger Improve Speech and Language Outcomes?

Summary

Seventeen RCTs (18 articles) compared an intervention for a speech and language delay or disorder (SLD) with an inactive control. Eight RCTs assessed interventions specific to children with language delay and no obvious fluency or speech-sound impairment. Of these, three RCTs focused on parent-delivered, group training interventions, with two evaluating more intensive interventions delivered over a longer duration (11 bimonthly 60- to 75-minute sessions[60] and 11 weekly 2.5-hour sessions followed by 3 weekly home visits[61]) found benefit for different expressive language outcome measures. One intervention delivered over six weekly 2-hour sessions found no significant difference between groups for any language outcome measure.[62] Other interventions for language delay varied by delivery setting, population, and other factors. In general, results were inconsistent, with some studies showing improvement in some measures of receptive or expressive language but others not. Two RCTs assessed treatment for young children based on the Lidcombe Program of Early Stuttering Intervention delivered by an SLP. This intervention features parent training to provide verbal contingencies for stutter-free speech (e.g., “that was smooth talking”) and stuttering (e.g., “that was a bit bumpy”). Both RCTs found benefit for reducing stuttering frequency associated with the intervention at 9 months. One delivered the intervention face-to-face in a clinic setting and showed a 2.3 percent lower proportion of syllables stuttered (95% CI, 0.8 to 3.9) compared with the control group, and one

RCT that delivered the intervention via telehealth showed a larger reduction from baseline mean number of syllables in the intervention group than controls (-3.0; p=0.02). Three RCTs assessed interventions for three distinct types of speech-sound disorders with inconsistent results; each showed improvement on some measures of speech but not others. Two RCTs evaluated treatment for children newly referred from primary care for any speech or language problem and found inconsistent results, with improvement on some domains of speech and language but not others, and no consistent benefit across similar outcome domains.

Detailed Evidence

Seventeen RCTs (18 articles) compared an intervention for SLD with an inactive control (either no treatment or wait-list control/delayed treatment).[60-77] Characteristics of studies are shown in **Appendix E Table 1**. Most RCTs were set in the United States (4 studies),[66, 69, 75, 76] Australia (5 studies),[62-64, 74, 77] or Canada (4 studies).[61, 65, 68, 70] Two studies were set in the United Kingdom[60, 72] and one study each was set in Spain[67] and New Zealand.[73] No studies enrolled children identified by routine screening in primary care settings; however, one cluster-randomized trial of Australian maternal and child health centers recruited participants, who had not been previously referred for cognitive problems, autism, or major medical problems, during their routine 12-month visit (or by mail if they did not attend). Parents who consented to participate in the trial and spoke sufficient English to participate were mailed screening expressive vocabulary checklists to determine eligibility.[62] Most studies recruited participants from schools or early childhood education centers (4 studies),[64, 67, 69, 75] or from referrals to speech and language treatment centers (6 studies).[60, 63, 68, 70, 72, 73] Four studies recruited participants via advertisements[74] or a mix of advertisements and outreach to schools, clinical settings, or community-based programs to identify participants,[65, 66, 76] and one recruited participants from two previous population-based early childhood trials that focused on promoting literacy and language development.[77]

The mean age of enrolled populations ranged from 18.1 to 67.8 months; most (10 studies) included a population with a mean age of 48.4 months or older. The proportion of enrolled children who were female ranged from 10 to 49 percent. Few (4 studies) described the race/ethnicity of enrolled children. Three of these were set in the United States, one enrolled a population that was 100 percent Latino,[66] one enrolled a population that was 100 percent White,[76] and one enrolled a population that was mostly White (54%) and also inclusive of persons who identified as Black (2%), Hispanic (26%), multiracial (12%), American Indian (2%), and Asian (3%).[69] Study sample size ranged from 20 to 301.

Included RCTs evaluated heterogeneous interventions that were targeted to different populations of children (e.g., any delay or disorder, speech disorders only) and also varied by setting, intensity/duration, and delivery personnel (**Appendix E Table 1**). Most studies focused on individual therapy administered by an SLP in a clinical setting, or parent training to deliver interventions for young children with language delay. Three focused on interventions delivered in schools, including two that featured whole-class curriculum components to advance language and literary skills[67, 69] and one individual intervention for children with a speech sound disorder.[64] Results are summarized below by intervention target and setting.

Results

Language Delay Interventions

Across eight RCTs (9 articles) evaluating interventions for young children with delayed acquisition of expressive language or "late talkers," six RCTs demonstrated positive effects on child receptive and expressive communication,[60, 61, 65, 66, 71, 75, 76] and two found mixed results or no statistically significant differences between groups with regard to child language outcomes.[62, 77] Four interventions were primarily implemented by parents who were trained by clinicians;[60-62, 66] others were primarily delivered by SLPs either alone[76] or in collaboration with parents[65] or trained peers,[75] and one was delivered by trained but nonspecialist staff.[77] Detailed results are shown in **Appendix E Table 2**.

Parent-implemented language delay interventions. Four RCTs assessed parent-implemented interventions involving parent participation in community workshops where parents were trained by program leaders in naturalistic strategies for promoting their child's language development.[60-62, 66] Although training approaches and specific content varied, all included naturalistic strategies such as expanding a child's utterances, following the child's interests, repeating what the child says, and setting up the environment to encourage communication.

In the three RCTs evaluating group training interventions, two RCTs evaluated modifications of the Hanen Program® for Parents curriculum, which uses a combination of group training sessions composed of a small group of parents and a trained SLP or other trained facilitator, and individual consultations with the SLP while the child is present,[61, 62] and one evaluated a parental training program to improve child linguistic complexity.[60] Two RCTs that assessed group training over a longer duration and higher intensity found benefit for various language outcomes measures. (**Appendix E Table 2**). One RCT (n=25), which delivered the training program with the addition of specific vocabulary targets over eight 2.5-hour parent training sessions and three home coaching visits, saw statistically significant improvements in child vocabulary, utterance length, and utterance complexity in favor of the intervention at 14 weeks. (Cohen's d effect sizes ranged from 0.62 to 1.13 across measures, indicating a medium to large effect size,[61] and the second evaluated parental training delivered more than 11 bimonthly 60- to 75-minute training sessions (n=36) and found statistically significant improvement in child expressive and receptive language outcomes among the intervention group compared to the control group (**Appendix E Table 2**).[60] The RCT assessing a condensed version of the Hanan program (n=301) that delivered more than six weekly 2-hour parent educational sessions found no statistically significant differences between groups on language outcomes at 6 and 18 months post-intervention (2 and 3 years from baseline).[62]

The RCT evaluating parent training delivered during individual home-based sessions led by trained coaches [60] (n=21), culturally and linguistically tailored to Spanish-speaking families in the United States, found mixed results.[66] The intervention group had significantly higher scores on measures of receptive language vocabularies (measured by the Receptive One-Word Picture Vocabulary Test-4, Spanish-Bilingual Edition) than the control group at 26 weeks (mean score: 11.29 vs. 6.53; p=0.050). However, no statistically significant difference between groups was found for other outcomes, including expressive vocabulary number of different words used and number of total words used (**Appendix E Table 2**).[66]

Clinician-implemented interventions. Four RCTs assessing an intervention for language delay enrolled heterogeneous populations and evaluated different interventions.[65, 75-77] One RCT (n=21) enrolled toddlers (mean age 21 to 30 months) identified with language delay but normal oral and speech motor abilities and compared an individual intervention delivered by an SLP over 12 weeks, including twice weekly 75-minute sessions designed to be interactive and emphasizing vocabulary development, with a wait-list control group.[76] At 12 weeks, children in the intervention group showed statistically significant improvements on all measures of linguistic growth and speech intelligibility, including total number of words used, number of different words used, mean length of utterances, and others (**Appendix E Table 2**).

Three other RCTs assessed various interventions for slightly older children with language delay (mean age ranged from 49.5 to 59.6 months).[65, 75, 77] Interventions differed in terms of setting. Two individual interventions found improvement on some outcome measures but not others. One RCT (n=20) evaluated an intervention providing individual home-based therapy delivered by trained assistants to promote narrative skills, vocabulary, grammar, phonological awareness, and preliteracy skills (18 1-hour sessions in total).[77] One year after enrollment, children in the intervention group had a significantly higher improvements from baseline in terms of phonological awareness than the control group (between-group difference in Comprehensive Test of Phonological Processing score change: 5.0; 95% CI, 2.2 to 7.8) but not other measures, including expressive and receptive language and pragmatic language skills (**Appendix E Table 2**). The second RCT (n=29) evaluated two versions of individual therapy for bilingual children (set in Canada) compared with a wait-list control.[65] Both active interventions included individual treatment plans based on targets set by SLPs, vocabulary training, and activities involving retelling stories as well as homework assignments delivered over 16 weekly individual sessions (50 minutes each). In the monolingual treatment arm, the intervention was delivered by French SLPs with no parental participation. In the bilingual treatment arm, the SLP collaborated with home-speaking parents who helped provide models of therapy targets in their respective languages (with instruction by SLPs for how to participate and demonstrate goals). Results were mixed. Significantly greater gains in French vocabulary were seen in both treatment groups compared with the control group, but no statistically significant differences were seen between groups on formal language test measures, such as the Expressive One-Word Picture Vocabulary Test and Reynell Developmental Language Scales (**Appendix E Table 2**).

Finally, one RCT (n=20) evaluated an intervention that focused on pairing children with specific language impairment (SLI) with a peer who had typical language development in a research setting designed for an interactive plan.[75] Verbal scripts for playing house were elicited from children at baseline and at followup by investigators who told the children they were trying to teach younger children how to play house and encouraged the children to tell what they knew using prompting questions (e.g., "What do you do when you play house?"). During the intervention, children with SLI were paired with a different peer for four 15-minute play sessions. At 3 weeks, based on transcripts from play scripts, children in the intervention group had a statistically significant increase in the number of words used, the number of different words used, and the number of linguistic markers used (terms indicating temporal sequence) compared with the control group (authors report p-values only).[75]

School-Based Curriculum Interventions

Two RCTs delivered interventions featuring school-based whole-class curriculum components (or Tier 1 interventions) designed to advance language and literary skills over the course of an academic school year.[67, 69] Curriculum components focus on story retelling and generation supported by activities and resources provided by research staff. Although all children in the intervention schools received the curriculum, outcomes were measured in children with developmental speech and/or language impairment. Both RCTs demonstrated improved receptive and expressive language outcomes in favor of the intervention; however, one found improvement for some measures but not others.[69] One RCT (n=50) reported F-ratios from analysis of variance measures and p-values only (no pre-post means or differences between groups in score changes). The authors report statistically significant differences in favor of the intervention for measures of oral comprehension, verbal working memory, and semantic fluency (**Appendix E Table 3**).[67] The second RCT (n=289) found significant improvements in favor of the intervention group on a receptive and expressive one-word picture vocabulary test that assessed higher-level receptive and expressive vocabulary targeted by the intervention that were measured pre- vs. post-intervention each fall and spring school session.[69]

Clinic-Based Speech-Language Interventions

Two RCTs evaluated the benefit of clinic-based individualized speech-language treatment among referred children with SLD with mixed results.[63, 72] Both RCTs focus on the benefit of available treatment in community clinics for children recently referred from primary care for speech and/or language problems. The intervention strategies are not clearly defined; however, they reflect usual care for children recently identified with speech or language concerns who have no specific criteria in terms of the type of disorder or whether they met specific diagnostic criteria prior to starting therapy. One RCT (n=159) enrolled children referred to 16 speech-language clinics in the United Kingdom and found benefit for auditory comprehension at 12 months among the intervention group compared with controls (difference in means on the age-adjusted Preschool Language Scale, auditory comprehension subscale: 4.1; 95% confidence interval [CI], 0.5 to 7.6; p=0.025) but not for measures of expressive language or phonological error rate.[72] Of note, children received relatively few contact hours of intervention over the 12-month study period (mean=6.2 hours; range 1 to 15 hours).[72] The second RCT (n=101) compared individual therapy offered at two Australian community-based centers for speech and/or language problems with two control groups involving brief advice or referral to a website for resources (both groups were on a wait-list). The treatment consisted of 12 weekly 45-minute individualized speech-language therapy sessions. There were statistically significant improvements in child speech as measured by the mean percent of consonants correct, among the intervention group (7.40) compared with the advice control (-4.72) and device control (-3.57) at 6 months ($p<0.001$), but no difference between groups for measures of intelligibility or language outcomes.[63]

Speech Sound Interventions

Three RCTs assessed the benefit of treatments specific to speech sound disorders.[64, 68, 70] One RCT set in schools delivered a software-based intervention with assistance from teachers,[64] and two were clinic-based treatments delivered by SLPs.[68, 70]

The intervention set in schools was a cluster RCT assessing an individual customizable software-based intervention for children diagnosed with a speech disorder who had no difficulty with receptive language over 9 weeks in 18 individual sessions.[64] The software included seven interactive games that could be customized based on the speech sound targets of a specific child. Children listened and responded to auditory and visual cues, and teachers provided technical support when needed. No difference was found between groups in change from baseline at 6 to 8 weeks post-intervention on the percentage of correct consonants spoken (measured using the Diagnostic Evaluation of Articulation and Phonology); similar improvement was seen in the intervention and control groups (+6.15 versus +5.43, respectively; p=0.874).[64] Similarly, no significant between-group difference was seen for speech intelligibility (measured by a validated parent-reported instrument, the Intelligibility in Context Scale) in the intervention group (+0.22) versus the control group (+0.11) at 6 to 8 weeks post-intervention (p=0.726).

The two RCTs assessing an intervention delivered by SLPs in a clinical setting differed in terms of the specific type of speech disorder targeted. One RCT (n=26), which compared individual phonological therapy and was administered by an SLP twice weekly in a clinical setting for 4 months, compared with a no treatment control group of children with a severe phonological disorder who had normal receptive language function.[70] At 4 months, the intervention group had statistically significant lower phonological processing errors than the control group, as well as statistically significant improvements across multiple measures of speech articulation (**Appendix E Table 3**). The second RCT (n=45) examined the efficacy of the Prompts for Restructuring Oral Muscular Phonetic Targets intervention for children with severe speech motor delay.[68] Following twice weekly 45-minute sessions over 10 weeks, statistically significant improvements were seen in speech motor control, articulation, and word-level speech intelligibility associated with the intervention, but no significant differences between groups was seen for measures of sentence-level speech intelligibility or functional communication compared with the control group (**Appendix E Table 3**).

Fluency Interventions

Two RCTs assessed fluency treatment for young children, with both studies focusing on the Lidcombe Program of Early Stuttering Intervention.[73, 74] This intervention is led by an SLP who trains parents to provide verbal contingencies for stutter-free speech (e.g., "that was smooth talking") and stuttering (e.g., "that was a bit bumpy"), and requests for self-evaluation and self-correction (e.g., "can you say that again?"). The treatment starts at a high intensity of daily parent-implemented sessions and weekly meetings with the SLP and is systematically withdrawn as the child's fluency improves. In one RCT, the intervention was delivered in a face-to-face format in a clinical setting[73] and in the other it was delivered via telehealth.[74] Results were consistent in showing a statistically significant improvement in stuttering fluency associated with the intervention. In the face-to-face intervention, children in the intervention group had a 2.3 percent lower proportion of syllables stuttered than children in the control group (95% CI, 0.8 to 3.9) at 9 months. Per the authors, this is above the minimum clinically important difference of 1.0 percent of syllables stuttered (the minimum difference that a listener would be able to distinguish).[73] However, no reference or clear rationale was provided to support this threshold. In the RCT using telehealth delivery of the intervention, the difference between the intervention and control group in change from baseline mean number of syllables stuttered was -3.0% (p=0.02) at 9 months.[74]

KQ 5. Do Interventions for Speech and Language Delay or Disorders in Children Age 6 Years or Younger Improve School Performance, Function, or Quality-of-Life Outcomes?

Summary

Eight RCTs reported on one or more outcomes specific to school performance, function, or quality of life using heterogeneous measures. No studies of the same intervention reported on similar measures of school performance, behavior, or well-being.[62-64, 68, 69, 72, 76, 77] No two studies assessing a similar intervention type reported on the same outcome domain. In four RCTs reporting on a measure of early literacy, three found no significant difference between groups and one RCT assessing a home-based language delay intervention delivered by trained assistants found benefit for improving letter knowledge associated with the intervention.[77] No study reported benefit for improving function or quality of life among children; one individual intervention for language delay found significant improvement favoring the intervention for improving socialization and parental stress levels.[76]

Detailed Evidence

Eight RCTs reported on one or more outcomes specific to school performance, function, or quality of life using heterogeneous measures.[62-64, 68, 69, 72, 76, 77] Characteristics are described above in KQ 4 and detailed results are shown in **Appendix E Table 4**.

Function

Two RCTs of different intervention types measured functional communication, including participation and function in contexts of speech, language use, play, and socialization; neither of the trials found a statistically significant difference between intervention and control groups at followup.[63, 68]

Academic Performance

Four RCTs collected data on early academic skills, specifically early or emergent literacy skills.[63, 64, 69, 77] Of these, one RCT of individual home-based therapy for children with language delay found improved letter knowledge among the intervention group compared with children in the control group at 52 weeks.[77] No significant difference was seen on measures of emergent literacy skills in three other RCTs, including one assessing a preschool classroom-based language and literacy intervention one cluster RCT of a school-based individual intervention for children with a speech disorder,[64] and one community-based clinical intervention for children referred from primary care (**Appendix E Table 4**).[63]

Attention/Behavior/Socialization or Play Skills

Three studies reported on attention, behavior, social, or play outcomes of intervention in children with SLD.[62, 72, 76] In one RCT of speech-language treatment in the United Kingdom, no significant differences between groups were found for measures of child attention, socialization, and play at one year following a low-intensity individual treatment with community-based

SLPs.[72] One RCT featuring a 12-week clinician-implemented language intervention program for late talkers found a significant increase in child socialization skills among the intervention group compared with the wait-list control group as measured by the Socialization Domain of the Vineland Adaptive Behavior Scales (p=0.003).[76] Finally, no difference was seen on measures of child behavior in an RCT comparing a 6-week parent training program on naturalistic language strategies and control at 1 and 2 years post-intervention.[62]

Well-Being

Two RCTs reporting on child well-being using different measures and assessing different intervention types found no significant difference between intervention and control groups (**Appendix E Table 4**).[64, 72] One RCT reported on change in parental stress following a 12-week individual clinician-implemented language intervention and reported significant reductions in stress among the intervention group parents compared with the control group parents.[76]

KQ 6. What Are the Harms of Interventions for Speech and Language Delay or Disorders?

We found no eligible study that addressed this question.

Chapter 4. Discussion

Summary of Evidence

Table 4 provides a summary of the main findings in this evidence review organized by KQ along with a description of consistency, precision, quality, limitations, strength of evidence, and applicability.

Evidence on the Benefit and Harms of Screening

We did not find direct evidence on the benefits and harms of screening. Potential harms include false-positive screening results that can lead to unnecessary referrals (and the associated time and economic burden), labeling or stigma, parent anxiety, and other psychosocial harms. Other harms of screening are likely to be minimal because screening is noninvasive.

Accuracy of Screening Questionnaires

Included studies of screening test accuracy assessed 23 different tools that varied in terms of whether the tools were completed by parents vs. trained examiners and whether they were designed to detect global speech or language problems vs. problems related to specific language skills or articulation (**Table 2**). Some available screening tools for clinical practice may reasonably identify children who have a speech or language disorder; however, overall evidence was mixed and few screening tools were assessed by more than one study each, limiting our ability to make stronger conclusions about the accuracy of specific tools. Parent-reported screening instruments designed to assess expressive language skills displayed consistently high sensitivity and specificity, although precision varied by instrument. Given the pattern of results, we graded the overall strength of evidence of the accuracy of these screening tools as moderate. In contrast, accuracy of the parent-reported instruments for global language was inconsistent, and precision of the accuracy measures varied by instrument.

Overall, the accuracy of examiner-administered screening instruments varied, particularly for instruments designed to assess specific language skills. Accuracy of trained examiner instruments of global language were mostly consistent, with some instruments showing both high sensitivity and specificity. Due to imprecision and study limitations, we rated the overall strength of evidence as low. Finally, the accuracy of trained examiner instruments for specific language skills varied by tool and was generally imprecise. Included studies assessed tools designed to detect different types of speech or language skills among heterogeneous populations. Given the inability to compare tools designed to detect similar speech or language problems, we rated the strength of evidence as insufficient.

Benefits and Harms of Treatment

Few studies of interventions for speech and language delay or disorder enrolled similar populations and evaluated similar types of interventions. Although two RCTs of treatment enrolled children who were newly referred from primary care, it is not clear whether the children were identified via routine screening vs. case finding. In addition, the two RCTs differed in

setting, mean age of enrolled children, and other factors. Other included studies enrolled children referred or recruited via advertisements, and most focused on a specific type of speech delay or disorder. Given these factors, the included body of evidence on treatment may not be applicable to the type and severity of disorders that would be detected via routine screening in primary care settings. For children with language delay and no obvious speech-sound or fluency disorder, evidence suggests that group training interventions offering at least 22 hours of parent training improve expressive language outcomes. In addition, school-based whole-class curriculum components (or Tier 1 interventions) designed to advance language and literary skills over the course of an academic year improve receptive and expressive language outcomes in favor of the intervention. For children identified with stuttering, the Lidcombe Program of Early Stuttering Intervention delivered by SLPs improves stuttering fluency at 9 months, when delivered either in person or via telehealth. Three RCTs assessed interventions for three different types of speech-sound disorders and reported on various measures of speech-sound; results were generally inconsistent across different measures of speech. Eight RCTs reported on one or more outcomes specific to school performance or early literacy, health-related quality of life, function, behavior, or socialization. No studies assessing the same type of intervention among similar groups of children reported on similar outcomes; most studies found no difference between groups for measures of early literacy, function, and quality of life. However, most trials may not have followed children for a long enough duration to detect an improvement in quality of life or function that could result from early treatment of a speech and language delay or disorder. No RCTs reported on the harms of interventions.

Limitations

The limitations of the included studies are discussed above in Results and Summary of Evidence sections. Here we focus on the limitations of this review. We excluded studies that were limited to children who had a condition known to cause a speech or language problem (e.g., hearing loss). We also excluded head-to-head comparisons of different interventions because the scope was designed to provide evidence on the benefits of treatments compared with no treatment rather than to assess the comparative effectiveness of interventions. Finally, we excluded studies that assessed primary prevention strategies to promote speech and language development (e.g., among groups considered “at risk” or school-based curricula emphasizing language development among children with no developmental delay or disorder). Our aim was to limit the review to interventions relevant to children who are screen-detected and that are appropriate to deliver in primary care settings or refer to from primary care.

Future Research Needs

Trials directly assessing the benefit of screening specifically for speech and language problems compared with no screening (or routine screening for general developmental delay, with no separate score for speech and language problems) and enrolling asymptomatic or unselected populations from general primary care are needed, as are studies on the potential harms of screening, such as labeling, and harms from false-positive results (with the burden on parents due to unnecessary referrals). Such studies would also inform the potential for overdiagnosis associated with routine screening, given that many children who have a speech delay may

recover without intervention. Similarly, studies assessing the accuracy of screening tools among unselected populations, who are ideally recruited through primary care settings, are needed because the prevalence of speech and language problems may vary compared to populations enrolled via advertisements or specialty settings. Specifically, studies that assess the accuracy of existing tools, compared with similar reference standards, would help determine the consistency of findings; because few included studies evaluated the same instrument, our ability to make a strong conclusion about accuracy was limited. Trials of treatment that are applicable to U.S. populations would inform future recommendations based on the benefit of screening; for example, trials enrolling populations recruited from primary care settings, using brief screening questionnaires to assess interventions specific to the variety and severity of conditions likely to be detected by routine screening. Trials that follow children for a sufficiently long duration to detect improvement in academic performance, function, and quality of life would help in the understanding of whether immediate changes in speech and language outcomes (e.g., short-term expansion of vocabulary words) translate into benefit for health and social outcomes. Finally, future studies that utilize similar measures of speech and language outcomes across studies would help assess the consistency of findings. Future studies on this topic should aim to enroll children representative of the diversity of families served in U.S. primary care settings, including those who speak languages other than English at home.

Conclusion

We found no eligible studies that reported on benefits directly arising from screening when compared with usual care or no screening. Parent-reported screening tools of emerging expressive language skills had reasonable accuracy for detecting expressive language delay; however, the accuracy of global language instruments based on parent reports was inconsistent. Accuracy of examiner-administered instruments was also variable, especially for examiner-administered instruments of specific language skills. Existing evidence supports the benefit of group parent training programs for speech delay that provide at least 11 parental training sessions for improving receptive language skills, as well as the Lidcombe Program of Early Stuttering Intervention delivered by SLPs for reducing stuttering frequency.

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Figure 1. Analytic Framework

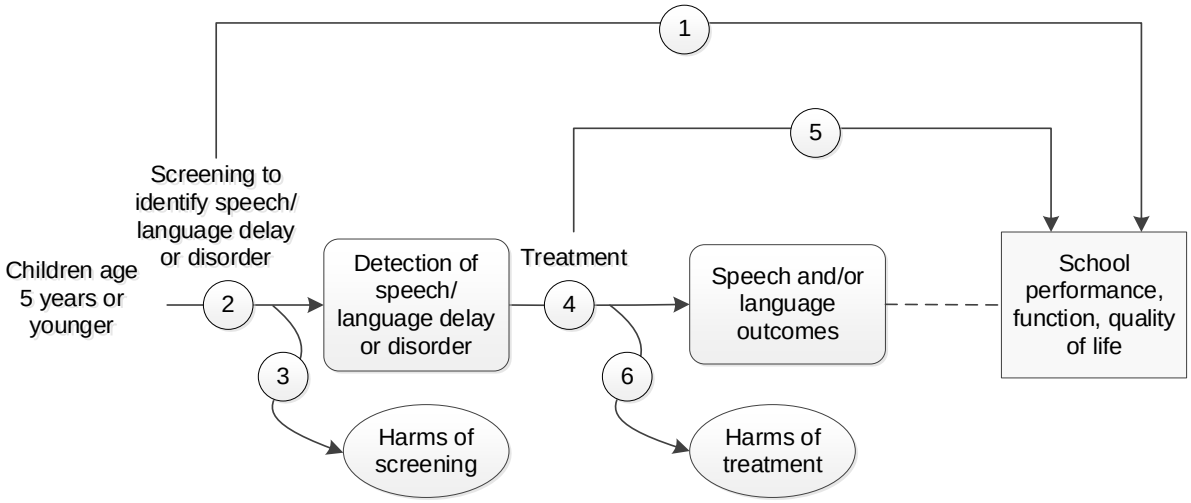
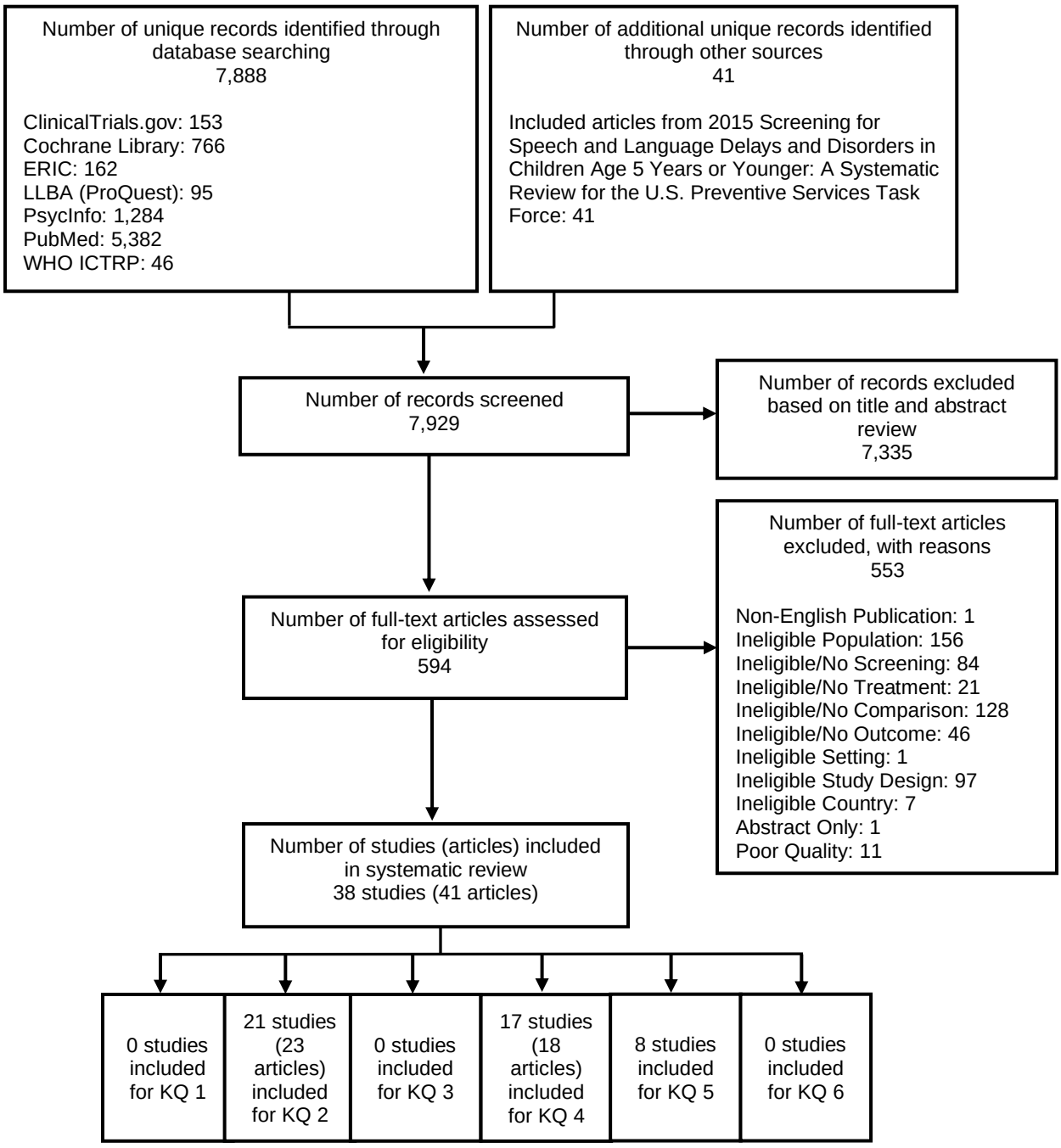


Figure 2. Summary of Evidence Search and Selection



Note: The sum of the number of studies per KQ exceeds the total number of studies because some studies were applicable to multiple KQs.

Abbreviations: ERIC=Education Resources Information Center; KQ=key question; LLBA=Linguistics and Language Behavior Abstracts; WHO ICTRP=World Health Organization International Clinical Trials Registry Platform.

Table 1. Characteristics of Included Studies of Diagnostic Accuracy (KQ 2)

First Author, Year, Country	N	Study Design	Study Quality	Screening Tool	Recruitment Setting	Mean Age Months/Range	% F
Alberts, 1995[46] United States	59	Cross-sectional	Fair	DOCT	Head Start centers in Central Texas	48 52–67	51
Allen, 1987[47] United States	182	Cross-sectional	Fair	FPST, NSST	Childcare centers in suburban Dallas	36–47	NR
Bliss, 1984[48] United States	602	Cross-sectional	Fair	SKOLD, SKOLDBE	Childcare centers in metropolitan Detroit	40 30–48	48
Drumwright, 1973[49] United States	150	Prospective cohort	Fair	DASE	Head Start, public and private childcare centers, schools, and pediatric clinics in Denver	30–72	NR
Frisk, 2009[42] Canada	110	Prospective cohort	Fair	ASQ-CD, BDIST-CD, BPS, ESP	Programs providing early intervention services to at-risk children in Ontario	54	32
Holzinger, 2021[40] Austria	2,044*	Prospective cohort	Fair	SPES-3	Pediatric medical practices in Upper Austria	36 34–38†	49
Klee, 1998[50] (Study 2); Klee, 2000[51] United States	64	Prospective cohort	Fair	LDS	Birth announcements, and local physicians, health departments, and WIC offices in Laramie and Casper, Wyoming	25 24–26	39
Kok, 2019[37] Hong Kong	789	Cross-sectional	Fair	ICS-TC	11 community kindergartens in Hong Kong	53 28–81	47
Laing, 2002[52] United Kingdom	458	Cross-sectional	Good	SST	Health center in London	30	44
Law, 1994[53] United Kingdom	189	Prospective cohort	Good	HELST	Pediatric practice in London	30	NR
Nayeb, 2019[39] Sweden	105‡	Prospective cohort	Fair	Nurse Screening (Swedish and maternal language)	Child health centers in Gävle Sweden	30	47
Nayeb, 2021[41] Sweden	111§	Prospective cohort	Fair	Nurse Screening	Child health centers in Gävle, Sweden	30 29–33	51
Pace, 2022[58] (Study 2 only) United States	126	Cross-sectional	Fair	QUILS	University SH clinic; inclusive public preschool and kindergarten classrooms; Head Start centers	56 38–70	50
Sachse, 2008[43]; Sachse, 2009[44] Germany	117	Prospective cohort	Good	ELFRA-2 (German version of CDI Words and Sentences)	Birth announcements in Germany	25 24–26	33

Table 1. Characteristics of Included Studies of Diagnostic Accuracy (KQ 2)

First Author, Year, Country	N	Study Design	Study Quality	Screening Tool	Recruitment Setting	Mean Age Months/Range	% F
Stokes, 1997[54] Australia	398	Prospective cohort	Good	DNS, Parent Questionnaire	Child Health centres in metropolitan Perth	37 34–40	51
Stott, 2002[55] United Kingdom	596	Prospective cohort	Fair	GLS	Mailed invitations to children born within Cambridge Health Authority	36	NR
Sturner, 1993[56] United States	Study 1: 51 Study 2: 147	Prospective cohort	Fair	FPSLST	Schools in a rural county in North Carolina	Study 1: 61 53–68 Study 2: 62 55–69	Study 1: 54 Study 2: 48
Sturner, 1996[57] United States	337†	Prospective cohort	Fair	SRST	Schools in a rural county in North Carolina	60 54–66	52
Visser-Bochane, 2021[38] Netherlands	265	Prospective cohort	Fair	ELS	Well-child clinics, kindergartens, and schools in the Netherlands	44 15–72	51
Wetherby, 2003[45] (Study 1) United States	232	Prospective cohort	Fair	ITC from CSBS	Public announcements, healthcare providers, childcare providers, and a public healthcare agency	12–24	NR
Wilson, 2022[59] United Kingdom	357	Propsective cohort	Fair	ASQ SSLM	Mailed invitations to parents of children who were due to receive their universal developmental assessment	26 23–30	47

* Full sample size, based on multiple imputation.

‡ Includes 11 children (10.5%) who did not cooperate during screening and were considered screen positive.

§ Includes 11 children who were noncooperative during screening. For Model 4, parents of 10 children did not complete parental information.

† Based on full sample.

Abbreviations: ASQ-CD=Ages and Stages Questionnaire-Communication Domain; BDIST-CD=Battelle Developmental Inventory Screening Test-Communication Domain; BPS=Brigance Preschool Screen; CDI=MacArthur-Bates Communicative Development Inventory; CSBS=Communication and Symbolic Behavior Scales; DASE=Denver Articulation Screening Exam; DNS=Developmental Nurse Screen; DOCT=Davis Observation Checklist for Texas; ELFRA-2=Elternfragebogen für die Fruberkennung von Riskokindern; ELS=Early Language Scale; ESP=Early Screening Profiles; F=female; FPSLST=Fluharty Preschool Speech and Language Screening Test; FPST=Fluharty Preschool Screening Test; GLS=General Language Screen; HELST=Hackney Early Language Screening Test; ICS-TC=Intelligibility in Context Scale–Traditional Chinese; ITC=Infant-Toddler Checklist; LDS=Language Development Survey; NR=not reported; NSST=Northwestern Syntax Screening Test; QUILS=Quick Interactive Language Screening; SH=speech and hearing; SKOLD=Screening Kit of Language Development; SKOLDBE=Screening Kit of Language Development Black English; SPES-3=Sprachentwicklungsscreening; SRST=Sentence Repetition Screening Test; SSLM=Sure Start Language Measure; SST=Structured Screening Test; WIC=Women, Infants, and Children.

Table 2. Instruments Examined in KQ 2 Studies

Instrument	Screening Source	Appropriate Ages	Domains/Skills Assessed	Summary Scores	Number of Items
Ages and Stages Questionnaire – Communication Domain[42, 59]	Parent reported	Ages 4 to 60 months	Broad communication skills	Communication	6 at each age level
Battelle Developmental Inventory Screening Test – Communication Domain[42]	Trained examiner	Ages 1 to 8 years	Receptive and expressive language skills*	Receptive language Expressive language	9 per each subtest
Brigance Preschool Screen[42]	Trained examiner	Ages 45 to 56 months	Receptive and expressive language skills	Understanding reading (i.e., receptive language) Expressive language	Receptive: 2 Expressive: 4
Davis Observation Checklist for Texas[46]	Trained examiner	Ages 4 to 5 years	Speaking, understanding, speech fluency, voice, and hearing	Communication	2–5 behaviors in each of 6 areas
Denver Articulation Screening Exam[49]	Trained examiner	Ages 2.5 to 7 years	Articulation skills	Articulation	34 sound elements
Developmental Nurse Screen[54]	Trained examiner	Ages 34 to 40 months	Broad language skills	Global language	NR
Early Language Scale[38]	Parent reported	Ages 1 to 6 years	Vocabulary, syntax, morphology, and pragmatics	Global language	26
Early Screening Profiles[42]	Trained examiner	Ages 2 years and 0 months to 6 years and 11 months	Word comprehension and production	Verbal concepts	25
ELFRA-2; German version of MacArthur CDI Words and Sentences[43, 44]	Parent reported	Ages 16 to 30 months	German expressive vocabulary, morphology, and grammar	Expressive language	Vocabulary: 260 Syntax: 25 Morphology: 11
Fluharty Preschool Screening Test[47]/Fluharty Preschool Speech and Language Screening Test[56]	Trained examiner	Ages 2 to 5 years	Articulation, and expressive and receptive language skills	Articulation Language	35
General Language Screen[55]	Parent reported	Age 36 months	Comprehension, expression, articulation, and pragmatics	Global language	11
Hackney Early Language Screening Test/Structured Screening Test[52, 53]	Trained examiner	Age 30 months	Expressive and receptive language skills	Global language	20
Infant-Toddler Checklist from CSBS[45]	Parent reported	Ages 6 to 24 months	Emotion and use of eye gaze, communication, gestures, sound use, word use, word understanding, and object use	Social, Speech, and Symbolic composites Total score	24

Table 2. Instruments Examined in KQ 2 Studies

Instrument	Screening Source	Appropriate Ages	Domains/Skills Assessed	Summary Scores	Number of Items
Intelligibility in Context Scale–Traditional Chinese[37]	Parent reported	Ages 28 to 71 months	Functional intelligibility	Articulation	7
Language Development Survey[50, 51]	Parent reported	Ages 18 to 35 months	Expressive vocabulary and word combinations	Expressive language	310
Northwestern Syntax Screening Test[47]	Trained examiner	Ages 3 to 8 years	Expressive and receptive knowledge of syntactic forms	Syntactic expression Syntactic comprehension	20 per each subtest
Nurse Screening[39, 41]	Trained examiner	Age 2.5 years	Language comprehension and language production	Global language	5 and observation
Parent Questionnaire[54]	Parent reported	Ages 34 to 40 months	Sentence use, comprehension, articulation, and global problems	Global language	4
Quick Interactive Language Screener[58]	Trained examiner	Ages 3 years through 6 years and 11 months	Comprehension of vocabulary (nouns, verbs, prepostions, conjuncutions), syntax (WH questions, past tense, prepostional phrases, embedded clauses), and language learning (noun learning, adjective learning, verb learning, converting active to passive)	Vocabulary, syntax, process, and overall (composite) scores	48
Screening Kit of Language Development/Screening Kit of Language Development Black English[48]	Trained examiner	Ages 54 to 66 months	Vocabulary comprehension, story completion, sentence completion, paired sentence repetition, individual sentence repetition with and without pictures, and comprehension of commands	Global language	20–50 items per each of 7 subtests
Sentence Repetition Screening Test[57]	Trained examiner	Ages 54 to 66 months	Expressive morphology and articulation	Global language articulation	15
SPES-3[40]	Parent reported[‡]	Age 3 years	Expressive vocabulary, expressive grammar	Expressive language	113
Sure Start Language Measure[59]	Parent reported to examiner	Ages 2 to 2.5 years	Expressive vocabulary	Expressive vocabulary	50

[*] Only the Battelle Developmental Inventory Test Receptive Language Scale is included in accuracy analyses.

[‡] Although the SPES-3 was designed as both a parent-reported and trained examiner instrument, the authors recommended that only the parent-reported subscales be included as a screen for language delay; therefore, we have classified the SPES-3 as a parent-reported instrument.

Abbreviations: CSBS=Communication and Symbolic Behavior Scales; ELFRA-2=Elternfragebogen für die Fruberkennung von Riskokindern; NR=not reported; NSST=Northwestern Syntax Screening Test; SPES-3=Sprachentwicklungsscreening; WH questions=who, when, where, why, what, and how.

Table 3. Accuracy of Screening Instruments to Detect Speech and Language Disorders

Instruments (Cut Point)	Screening Subtest	N	Reference Standard	Prevalence (%)	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	PPV (%)	NPV (%)	LR+	LR-
Parent Reported										
Global Language Instruments										
ASQ-CD[42] (“recommended cutoff”)		110	PLS-4-C	4	67 (45 to 88)*	73 (64 to 82)*	32*	92*	2.4*	0.46*
		110	PLS-4-E	7	73 (54 to 91)*	76 (67 to 85)*	43*	92*	3.0*	0.36*
ASQ-CD[59] Full sample (37.5)†		357	PLS-5 Total Language	23	55 (44 to 66)	95 (91 to 97)	53	95	10.0	0.48
English-only sample (47.5)†		248	PLS-5 Total Lanugage	NR‡	85 (70 to 94)	84 (78 to 88)	37	98	5.2	0.18
ELS[38] (15)		265	Composite based on LS, CCC-2, LLC, LLP, SLC, SWP, SSP	11	62 (44 to 77)*	93 (89 to 96)*	53	95	9.2	0.41
GLS[55] (≥2 failures)		596	DP-II	18§	75 (67 to 83)*	81 (77 to 84)*	47	94	3.9	0.31*
ITC (Study 1)[45] (NR)	Ages 12 to 17 months version	151	CSBS Behavior Sample	35	89 (80 to 97)*	74 (66 to 83)*	65	92	3.5*	0.15*
	Ages 19 to 24 months version	81	CSBS Behavior Sample	52	86 (75 to 96)*	77 (64 to 90)*	80	83	3.7*	0.19*
Parent Questionnaire[54] (≥1 abnormal response)		381	SLP rating using language sample, RDLS, Comprehension Scale	13	78 (66 to 89)†	91 (88 to 94)*	56	96	8.3*	0.24*
Specific Language Instruments										
ELFRA-2 (CDI Words and Sentences)[43, 44] (<50 words or 50–80 words and scores for syntax <7 and morphology <2)		117	SETK-2	59	93 (87 to 99)*	88 (78 to 97)*	91	89	7.3*	0.08*
LDS[50] (Study 2); (<50 words or no word combinations)		64	Clinical judgment on infant MSEL language scales, MLU	17	91 (74 to 100)*	87 (78 to 96)*	59	98	6.9*	0.10*
LDS[51] (>28 screening score)		64			91 (74 to 100)*	96 (91 to 100)*	83	98	24.1*	0.09*

Table 3. Accuracy of Screening Instruments to Detect Speech and Language Disorders

Instruments (Cut Point)	Screening Subtest	N	Reference Standard	Prevalence (%)	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	PPV (%)	NPV (%)	LR+	LR-
SPES-3[40] (<41.69)		2,044‖	Composite of SETK-3, AWST-R, language sample	10¶	88 (77 to 98)	88 (86 to 90)	44	98	7.1	0.14
SSLM[59]		357	PLS-5	23	83 (74 to 91)	81 (76 to 85)	33	98	4.4	0.21
Full sample (19.5)†										
English-only sample (16.5)†		248	PLS-5	NR‡	80 (64 to 91)	87 (82 to 91)	41	98	6.2	0.23
Articulation										
ICS-TC[37] (4.29)		789	HKCAT	19*	86 (79 to 90)*	32 (28 to 36)*	22*	91*	1.3*	0.45*
Trained Examiner										
Global Language Instruments										
DOCT[46] (NR)		59	Composite of MSCA, GFTA, informal language sample	17	80 (55 to 100)*	98 (94 to 100)*	89*	96*	39.2*	0.20*
DNS[54] (NR)		378	SLP rating using language sample and RDLS, Comprehension Scale	NR	76	97	80	96	NR	NR
FPST[47] (≥1 subtest)		182	SICD	14	60 (41 to 79)*	81 (75 to 87)*	33*	93*	3.1*	0.49*
FPSLST[56] (NR)	Language Study 1	51	TACL-R	17	38	85	42	NR	NR	NR
	Language Study 2	147	TOLD-P	22¶	17	97	50	NR	NR	NR
HELST[53] (≤10)		189	RDLS	26	98 (94 to 100)*	69 (61 to 77)*	53	98	3.1*	0.03*
SST[52] (<10)		282	RDLS	23	66 (53 to 76)*	89 (85 to 93)*	65*	90*	6.2*	0.38*

Table 3. Accuracy of Screening Instruments to Detect Speech and Language Disorders

Instruments (Cut Point)	Screening Subtest	N	Reference Standard	Prevalence (%)	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	PPV (%)	NPV (%)	LR+	LR-
Nurse Screening[39] (<3 words)		105[#]	RDLS, Comprehension Scale and spontaneous language observation	10	100 (72 to 100)	81 (71 to 88)	38	100	5.2	0
Nurse Screening[39] (≥3 comprehension questions and ≥2 word combinations)		105[#]	RDLS, Comprehension Scale and spontaneous language observation	10	91 (71 to 88)	91 (59 to 100)	56	99	19.7	0.1
Nurse Screening[41] (≥3 comprehension questions and ≥2 word combinations)	Model 3 – screening in Swedish and maternal language	111[#]	RDLS, Comprehension Scale and spontaneous language observation	29	88 (71 to 96)	82 (72 to 90)	67	94	4.9	0.15
SKOLD/SKOLDBE[48] (<11)	S30	47	SICD	6	100 (100 to 100)[*]	98 (93 to 100)[*]	75[*]	100[*]	44.0[*]	0[*]
(<10)	S37	93	SICD	11	100 (100 to 100)[*]	91 (85 to 97)[*]	33[*]	100[*]	11.1[*]	0
(<19)	S43	100	SICD	9	100 (100 to 100)[*]	93 (88 to 98)[*]	60[*]	100[*]	15.2[*]	0[*]
(<9)	B30	75	SICD	12	89 (68 to 100)[*]	86 (78 to 95)[*]	47[*]	98[*]	6.5[*]	0.13[*]
(<14)	B27	91	SICD	9	88 (65 to 100)[*]	86 (78 to 92)[*]	37[*]	99[*]	6.0[*]	0.15[*]
(<19)	B43	54	SICD	33	94 (84 to 100)[*]	78 (64 to 91)[*]	68[*]	97[*]	4.2[*]	0.07[*]
SRST[57] (<20th percentile)	SRST Language	323[**]	ITPA/BLST	11	62 (45 to 78)[*]	91 (87 to 94)[*]	44	95[*]	6.6[*]	0.42[*]

Table 3. Accuracy of Screening Instruments to Detect Speech and Language Disorders

Instruments (Cut Point)	Screening Subtest	N	Reference Standard	Prevalence (%)	Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	PPV (%)	NPV (%)	LR+	LR-
Specific Language Instruments										
BDIST-CD[42] (ROC optimal cutoff)	Receptive††	110	PLS-4-C	4	56 (33 to 78)*	70 (60 to 79)*	26*	89*	1.8*	0.89*
BPS[42] (ROC optimal cutoff)	Receptive	110	PLS-4-C	4	61 (39 to 84)*	60 (50 to 70)*	23*	89*	1.5*	0.65*
	Expressive	110	PLS-4-E	7	91 (79 to 100)*	78 (70 to 87)*	51*	97*	4.2*	0.12*
ESP[42] (>1 SD below mean)	Verbal concepts	110	PLS-4-C	4	94 (84 to 100)*	68 (59 to 78)*	40*	98*	3.0*	0.08*
	Verbal concepts	110	PLS-4-E	7	86 (72 to 100)*	81 (72 to 89)*	53*	96*	4.5*	0.17*
NSST[47] (Failure ≥1 subtest)		182	SICD	14	92 (81 to 100)*	48 (41 to 56)*	22*	97*	1.8*	0.16*
QUILS[58] (Study 2 only) (<25th percentile)	Composite	126	PLS-5 Auditory Comprehension	20	60 (51 to 69)*	90 (70 to 96)*	95*	35*	6.0	0.66
Articulation Instruments										
DASE[49] (<15th percentile)		150	HAT	NR	92	97	NR	NR	NR	NR
FPSLST[56] (NR)	Articulation Study 1	51	AAPS-R	4¶	74	96	50	NR	NR	NR
	Articulation Study 2	147	TD	5¶	43	93	26	NR	NR	NR
SRST[57] (<20th percentile)	SRST Articulation	325**	AAPS-R	19	57 (45 to 69)*	95 (93 to 98)*	75	90*	12.5*	.045*

* Calculated by the EPC.

† Optimal cut point using Youden's index

‡ Prevalence was not reported for this subsample. Median for sensitivity/specificity includes full sample only and not the English-speaking subsample.

§ Prevalence for screen failures >1.5 SD below the mean is 18 percent; study calculated accuracy using this value as well as prevalence using cut point of >2 SD below the mean, which was 6 percent. We only include data for the former prevalence.

‖ Sample size and prevalence based on imputed sample, which corrected for oversampling of children with positive screening.

¶ Prevalence data provided by study authors.

Includes 11 children who were noncooperative during screening.

** The study investigators weighted the n's based on a stratified sample of 69.

†† Only the BDIST-CD Receptive Scale is included in accuracy analyses.

Table 3. Accuracy of Screening Instruments to Detect Speech and Language Disorders

Abbreviations: AAPS-R=Arizona Articulation Proficiency Scale-Revised; ASQ-CD=Ages and Stages Questionnaire-Communication Domain; AWST-R=Aktiver Wortschatztest für 3-bis 5-jährige Kinder; BDIST-CD=Battelle Developmental Inventory Screening Test-Communication Domain; BLST=Bankson Language Screening Test; BPS=Brigance Preschool Screen; BPVS=British Picture Vocabulary Scale; CCC-2=Children's Communication Checklist, 2nd Edition-Netherlands; CI=confidence interval; CSBS=Communication and Symbolic Behavior Scales; DASE=Denver Articulation Screening Exam; DNS=Developmental Nurse Screen; DOCT=Davis Observational Checklist for Texas; DP-II=Developmental Profile-II; EAT=Edinburgh Articulation Test; ELFRA-2=Elternfragebogen für die Fruberkennung von Riskokindern; ELS=Early Language Scale; EPC=Evidence-based Practice Center; ESP=Early Screening Profiles; FPSLST=Fluharty Preschool Speech and Language Screening Test; FPST=Fluharty Preschool Screening Test; GFTA=Goldman-Fristoe Test of Articulation; GLS=General Language Screen; HAT=Henja Articulation Test; HELST=Hackney Early Language Screening Test; HKCAT=Hong Kong Cantonese Articulation Test; ICS-TC=Intelligibility in Context Scale-Traditional Chinese; ITPA=Illinois Test of Psycholinguistic Abilities; LDS=Language Development Survey; LLC=Lexilist Comprehension; LLP=Lexilist Production; LR+=positive likelihood ratio; LR=negative likelihood ratio; LS=Language Standard; MLU=Mean Length of Utterance; MSCA=McCarthy Scales of Children's Abilities; MSEL=Mullen Scales of Early Learning; NPV=negative predictive value; NR=not reported; NSST=Northwestern Syntax Screening Test; PLS-4-C=Preschool Language Scale, Fourth Edition-Comprehension, PLS-4-E=Preschool Language Scale, Fourth Edition-Expression; PLS-5=Preschool Language Scale, Fifth Edition; PPV=positive predictive value; QUILS=Quick Interactive Language Screener; RDLS=Reynell Developmental Language Scales; SD=standard deviation; SETK-2=Sprachentwicklungstest für zweijahrige Kinder; SETK-3=Sprachentwicklungstest für zweijahrige Kinder; SICD=Sequenced Inventory of Communication Development; SKOLD=Screening Kit of Language Development; SKOLDBE=Screening Kit of Language Development Black English; SLC=Schlichting Tests for Language Comprehension; SLP=speech-language pathologist; SPES-3=Sprachentwicklungsscreening; SSP=Schlichting Tests for Sentence Production; SRST=Sentence Repetition Screening Test; SSLM=Sure Start Language Measure; SST=Structured Screening Test; SWP=Schlichting Tests for Word Production; TACL-R=Test for Auditory Comprehension of Language–Revised; TD=Templin-Darley Tests of Articulation Consonant Singles Subtest; TOLD-P=Test of Language Development Primary.

Table 4. Summary of Evidence for Screening and Treatment of Speech and Language Delay and Disorders in Children Age 5 Years or Younger

Key Question and Topic	No. of Studies; No. of Participants (n)	Summary of Findings	Consistency and Precision	Study Quality	Limitations (Including Reporting Bias)	Overall Strength of Evidence	Applicability
KQ 1. Benefits of Screening	No eligible study identified	NA	NA	NA	NA	Insufficient	NA
KQ 2. Accuracy of Screening	Parent-reported global language: 6 studies[38, 42, 45, 54, 55, 59] (1,941)	Sensitivity median: 74%; range: 55% to 89%. Specificity median: 79%; range: 73% to 95%. The Infant-Toddler Checklist had the highest sensitivity at 89% and 86% for each of its two age groups. The ELS and the ASQ with toddlers[59] had the highest specificity at 93% and 95%, respectively.	Mostly consistent and imprecise (for both sensitivity and specificity).	1 Good, 5 Fair	Only one instrument (ASQ) was included in more than one study. Reference measures differed across studies. One study included all screen failures and a random sample of those who passed. Not all studies indicated criteria for screen failure. Studies had a wide age range.	Low	North American and European parents of infants, toddlers, and preschool children.
	Parent-reported specific language skills: 4 studies [40, 43, 44, 59] (3,245)	Sensitivity median: 91%; range: 83% to 93%; specificity: 88%; range: 81% to 96%. The LDS (revised scoring) displayed a large positive LR and a large negative LR; the ELFRA-2 had a large negative LR.	Sensitivity: fairly consistent; specificity: fairly consistent; sensitivity: imprecise. Specificity varies by instrument; the SPES-3 is precise.	1 Good, 3 Fair	Different reference measures were used. Small sample size in one study. Three of the studies included all screen failures and a random sample of those who passed.	Moderate	American and European parents of 2- and 3-year-old children.
	Parent-reported articulation: 1 study[37] (780)	Sensitivity: 86%; specificity: 32%	Consistency: sensitivity, and specificity: unknown; sensitivity: imprecise; specificity: precise	1 Fair	There was only one study of Chinese children. Studies had a wide age range. May only be appropriate for 4-year-old children.	Insufficient	Although the study included parents of children who were speakers of traditional Chinese in Hong Kong and was applicable for them, the instrument would not be applicable to English-speaking children.

Table 4. Summary of Evidence for Screening and Treatment of Speech and Language Delay and Disorders in Children Age 5 Years or Younger

Key Question and Topic	No. of Studies; No. of Participants (n)	Summary of Findings	Consistency and Precision	Study Quality	Limitations (Including Reporting Bias)	Overall Strength of Evidence	Applicability
	Examiner-reported global language; 10 studies[39, 41, 46-48, 52-54, 56, 57] (2,287)	Sensitivity median: 88%; range: 17% to 100%; specificity median: 89%; range: 69% to 98%	Mostly consistent, with some instruments showing high (>90%) sensitivity and/or specificity and others showing low or moderate values. Precision is inconsistent, varying by instrument. The HELST and SKOLD are precise for sensitivity; the DOCT, SST, two of the three age levels of the SKOLD, and the SRST are precise for specificity.	2 Good, 8 Fair	Three instruments were examined in one study each; three instruments were examined in two studies. The reference measure varied. Criteria for screening failure was not always indicated.	Low	Children seen in medical practices in the United Kingdom, Sweden, and Australia and in schools in the United States. One instrument was used with bilingual children.
	Examiner-reported specific language: 3 studies[42, 47, 58] (418)*	Sensitivity median: 86%; range: 56% to 94%. Specificity median: 70%; range: 58% to 90%	Unclear; both sensitivity and specificity are inconsistent and imprecise; however, tools assess different types of language problems across heterogeneous populations.	3 Fair	One study included three instruments, accounting for five of the seven accuracy indices.	Insufficient	Children at risk for developmental delays in Canada and childcare centers in the United States.
	Examiner-reported articulation: 3 studies[49, 56, 57] (673)	Sensitivity median: 66%; range: 43% to 92%; specificity median: 96%; range: 93% to 97%	Sensitivity is inconsistent; specificity is consistent; precision is unknown (two studies do not report CIs).	3 Fair	Studies had a wide age range.	Low	Children in schools in the United States.
KQ 3. Harms of Screening	No eligible study identified	NA	NA	NA	NA	Insufficient	NA

Table 4. Summary of Evidence for Screening and Treatment of Speech and Language Delay and Disorders in Children Age 5 Years or Younger

Key Question and Topic	No. of Studies; No. of Participants (n)	Summary of Findings	Consistency and Precision	Study Quality	Limitations (Including Reporting Bias)	Overall Strength of Evidence	Applicability
KQ 4. Speech and Language Outcomes of Intervention	Language delay (parent delivered); 4 RCTs (378 participants)[60-62, 66]	Parent-delivered, group training interventions: two RCTs assessing interventions delivered over a longer duration (11 bimonthly 60- to 75-minute sessions[60] and 11 weekly 2.5-hour sessions plus 3 weekly home visits[61]) found benefit in expressive language outcomes; one shorter intervention (6 weekly 2-hour sessions) found no significant difference between groups.[62] One RCT of individual home-based parental training intervention found mixed results.	Parent-delivered, group training interventions: inconsistent; precise Individual home-based parent training: unknown consistency; imprecise	2 Good, 2 Fair	Studies of parental group training differed in duration, intensity, content, and timing of outcome assessment.	Parent-delivered, group training interventions: Low Parent-delivered individual training: Insufficient	Parental group-based training trials that showed benefit enrolled children and parents in the 1990s, results may not be applicabile to current practice.
	Language delay (SLP or trained staff delivered): 4 RCTs (270 participants)[65, 75-77]	One RCT enrolling toddlers (mean age 21 to 30 months) found benefit associated with an individual intervention delivered by an SLP over 12 weeks on multiple measures of expressive language;[76] three other RCTs assessed different interventions among older children (mean age 49.5 to 59.6 months) found inconsistent results.[65, 75, 77]	Unknown consistency; mostly imprecise	4 Fair	All studies focused on children with language delay and interventions delivered by an SLP or trained staff; however, populations, settings, and outcome measures were heterogeneous.	Insufficient	Children with language delay, who were identified via referrals or advertisements
	School-based (Tier 1) interventions: 2 cluster RCTs (339 participants)[67, 69]	Both found improved receptive and expressive language outcomes associated with the intervention over 52 weeks; however, 1 found benefit in some measures (receptive and expressive 1-word picture vocabulary tests focused on vocabulary) but not others (no improvement on standardized measures of oral language).[69]	Mostly consistent; imprecise	2 Fair	One RCT reported only F-statistics from ANOVA analyses and p-values, limiting the ability to determine the magnitude of effect; one RCT found benefit in some measures of oral language and literacy but not others.	Low	Unclear applicability to current preschool curricula in the United States; one study was set in Spain and one in the United States.
	Community-based speech and language disorders; 2 RCTs (260 participants)[63, 72]	Studies found mixed results with improvement on some domains of speech and language but not others, and no consistent benefit on similar measures or outcome domains.	Inconsistent; imprecise	1 Good, 1 Fair	Studies both focus on children newly referred from primary care for any speech and language disorder, but differ in country setting (United Kingdom and Australia), mean age of enrolled children (34 vs. 53 months), and outcome measures reported.	Insufficient	Children newly referred from primary care to existing community-based treatment for speech and language problems in the United Kingdom and Australia

Table 4. Summary of Evidence for Screening and Treatment of Speech and Language Delay and Disorders in Children Age 5 Years or Younger

Key Question and Topic	No. of Studies; No. of Participants (n)	Summary of Findings	Consistency and Precision	Study Quality	Limitations (Including Reporting Bias)	Overall Strength of Evidence	Applicability
	Fluency disorders (Lidcombe Program of Early Stuttering Intervention); 2 RCTs (76 participants)[73, 74]	Both RCTs found benefit for stuttering fluency associated with the intervention at 9 months; one found a 2.3% reduction in the percentage of syllables stuttered among the intervention vs. control group, and the second found the mean number of syllables in the intervention group was significantly lower than the control group (-3.0; p=0.02).	Consistent; precise	2 Fair	One RCT delivered the intervention via face-to-face visits, and one delivered the intervention via telehealth.	Moderate	Children ages 42 to 56 months identified with stuttering
	Speech-sound disorders; 3 RCTs (194 participants)[64, 68, 70]	One RCT enrolling children with a severe phonological disorder but normal receptive language function found improvement associated with an individual SLP intervention at 16 weeks for multiple speech and sound outcomes; one RCT assessing an intervention for children with speech motor delay found mixed results; one RCT assessing a software-based intervention set in schools for children identified with a speech-sound disorder found no improvement on measures of speech production and speech intelligibility.	Unknown; imprecise	3 Fair	Studies focus on children with different types of speech-sound disorders and assess different interventions.	Insufficient	Unclear; RCTs are set in different countries and enroll heterogeneous populations of children who differ in age, spoken language, and type of speech disorder.
KQ 5. Health Outcomes of Intervention (school performance, function, or quality-of-life outcomes)	8 RCTs (1,239 participants) report on one or more outcomes specific to school performance (or early literacy), function, and QOL[62-64, 68, 69, 72, 76, 77]	No two studies assessing a similar intervention type reported on the same outcome domain; in four RCTs assessing a measure of early literacy, three found no significant difference between groups and one RCT assessing a home-based language delay intervention delivered by trained assistants found benefit for improving letter knowledge associated with the intervention[77] No study reported benefit for improving function or QOL; one individual intervention for language delay found significant improvement favoring the intervention for improving socialization and parental stress level.[76]	Unknown; imprecise	2 Good, 6 Fair	No two studies assessing the same type of intervention reported on a similar outcome measure, limiting the ability to assess consistency of findings.	Insufficient	Unclear; RCTs are set in different countries and assess different outcomes among different groups of children, who vary in terms of setting and type of speech and language disorder.
KQ 6. Harms of Intervention	No eligible study identified	NA	NA	NA	NA	Insufficient	NA

Table 4. Summary of Evidence for Screening and Treatment of Speech and Language Delay and Disorders in Children Age 5 Years or Younger

* Frisk, 2009[42] examined three instruments and included separate accuracy calculations for the expressive and receptive PLS-4 reference measure. We omitted the accuracy outcomes for the Battelle Developmental Inventory Screening Test with the PLS-4 Expressive Communication Scale due to a possible reporting error in the study.

Abbreviations: ANOVA=analysis of variance; DOCT=Davis Observational Checklist for Texas; ELFRA-2=Elternfragebogen für die Fruberkennung von Riskokindern; ELS=Early Language Scale; GLS=General Language Screen; HELST=Hackney Early Language Screening Test; LDS=Language Development Survey; LR=likelihood ratio; NA=not applicable; PLS-4=Preschool Language Scale, Fourth Edition; QOL=quality of life; RCT=randomized, controlled trial; SKOLD=Screening Kit of Language Development; SKOLDBE=Screening Kit of Language Development Black English; SLP=speech-language pathologist; SPES-3=Sprachentwicklungsscreening; SRST=Sentence Repetition Screening Test; SST=Structured Screening Test.

Contextual Questions

CQ 1. Are There Disparities in the Prevalence of Speech and Language Delay or Disorders Among Specific Populations of Children? If So, What Factors Contribute to These Disparities?

Three studies addressed Contextual Question (CQ) 1 by describing disparities in the prevalence of speech and language delay or disorders based on groups defined by sex, race/ethnicity, and other social and economic factors (**Appendix A Table 1**). The studies were published across two decades (2002–2022). One study recruited from a single city[78] and two studies used nationally representative data.[21, 79] Study sample size ranged from 278 to 2,070,541 participants.[21, 78, 79] Demographic data was available for two of the studies.[21, 79] The studies generally enrolled an equal number of boys and girls. One study presented data on race/ethnicity. The majority of the children enrolled in the study were identified as non-Hispanic White, 22 percent were identified as African American, 13 percent as Hispanic, and 9 percent as other.[79] For indicators of socioeconomic status, one study used a publicly and privately insured cohort of children (Medicaid Analytic eXtract (MAX) and IBM MarketScan Research Database, respectively).[21] An additional study enrolled a sample in which 18 percent of the sample were categorized as having a low socioeconomic status (SES), 45 percent as middle SES, and 31 percent as upper SES.[79]

Disparities in the prevalence of speech and language delay were found based on child SES,[21, 78, 79] sex/gender,[21, 78] family history,[78] maternal education,[78] and child race/ethnicity.[79] Using data on publicly and privately insured children, a higher prevalence of speech and/or language delay was observed among children who had public insurance: 8.4 percent vs. 4.5 percent.[21] A similar finding was observed in the study by Campbell et al, where a higher prevalence of speech delay was associated with enrollment in Medicaid.[78] Rescorla et al, using SES, found that as the level of SES increased, the prevalence of speech delay was lower, ranging from 21 percent for the lowest level of SES to 6 percent at the highest level.[79] Disparities in prevalence of speech and/or language delay was seen by gender. In the study by Straub et al, male children had a higher prevalence of speech and/or language delay compared with female children in the MAX and MarketScan datasets (66.47% vs. 32.01% and 69.68% vs. 27.68%, respectively). Campbell et al also found that among children with speech delay, males represented 70 percent of the children compared with 48 percent in the cohort of children without speech delay.[78] One study found an increased prevalence of speech and language delay among children identified as African American compared with children who identify as non-Hispanic White (29% vs. 4%, respectively).[79] One study found a higher prevalence of speech delay among children who had a positive family history of developmental communication disorder and low maternal educational level.[78]

CQ 2. Are There Disparities in the Detection of Speech and Language Delay or Disorders in Clinical Practice and Referral for Diagnostic Evaluation Among Specific Populations of Children? If So, What Factors Contribute to These Disparities?

One study addressed CQ 2 (**Appendix A Table 2**). Straub et al, using data from public and private insurance databases (MAX and MarketScan, respectively), found a statistically significant difference in the age of detection of language and/or speech delay by insurance type: MAX mean age 4.96 (95% confidence interval [CI], 4.91 to 5.01) compared with

MarketScan mean age 3.53 (95% CI, 3.42 to 3.65).[21] Disparities in the age of detection was observed in both the MAX and MarketScan datasets, where boys were diagnosed at a younger age compared with girls. (Absolute difference was 0.25 years and 0.34 years, respectively.) Disparities in the age of diagnosis was observed based on a child's race/ethnicity in the MAX dataset. Relative to the children identified as White (reference group), statistically significant differences in the age of diagnosis were found among children who identified as Asian/Pacific Islander (absolute difference -1.67 (-1.95 to -1.39), Hispanic (absolute difference -0.71 (-0.88 to -0.55), and Other/Unknown (absolute difference -1.03 (-1.21 to -0.84). No statistically significant difference in age of diagnosis was observed among individuals identifying as Black. An additional disparity observed was based on maternal age. Relative to mothers who were age 24 years or younger, the only statistically significant difference in child age of diagnosis was seen for mothers who were age 35 years or older (absolute difference -0.48 (-0.68 to -0.28) in the MAX dataset.

CQ 3. Are There Disparities in the Provision and Utilization of Treatment for Speech and Language Delay or Disorders Among Specific Populations of Children? If So, What Factors Contribute to These Disparities?

Two studies addressed CQ 3 using data from different population cohort studies (**Appendix A Table 3**). One used data from the Early Childhood Longitudinal Study–Birth Cohort to assess the association of speech services at 24, 48, and 60 months.[80] The sample was racially and ethnically diverse with approximately 50 percent of children identifying as White. Males represented half of the sample. SES was evenly distributed across the five quintiles (lowest to highest). At 24 months, children who identified as Black (OR 0.43), children from the lowest SES, middle or second highest SES (OR 0.42, 0.45, and 0.52, respectively), and having a mother who was socially isolated (OR 0.56) had statistically significant decreased odds of reporting speech/language therapy at 24 months. At 48 months, a child identified as Black (OR 0.50) or Other race (OR 0.47), a single mother (OR 0.43), and having a primary language other than English had (OR 0.40) a statistically significant decreased odds of parental report of speech/language therapy. When examined at 60 months, statistically significant odds remained for children identified as Black (OR 0.59), having a lower SES, or having a non-English primary language.

The second study used data from the 2012 National Health Interview Survey (N=824) to assess children's access to services for speech and language disorders during their lifetimes, including differences by race/ethnicity and insurance type.[81] The sample included children ranging from ages 3 years to 17 years and 11 months, and grouped children into categories based on whether they had a speech or language disorder. Most children included in the study were younger than age 10 years and were male (approximately 33% were female). In both the speech disorder and language disorder categories, approximately 50 percent of children identified as Non-Hispanic White, and the proportion who identified as non-Hispanic Black and Hispanic in each category were similar, ranging from 16 to 27 percent. Most children had public insurance only or any private insurance, and 4 percent of children were uninsured. Overall, 75 percent of children had ever received services for their speech or language disorder. Privately insured children were more likely to receive services than children who were uninsured, both for speech disorders (47% vs. 84%; $p<0.001$) and for language disorders (40% vs. 83%; $p=0.006$). Children who were White and Other, non-Hispanic more frequently received services for both speech disorders (83% and 94%, respectively) and language disorders (81% and 77%, respectively) than children who were Black, non-Hispanic

or Hispanic for speech (approximately 64% for both; $p<0.001$) and language disorders (70% and 61%, respectively; $p=0.029$).

Appendix A Table 1. CQ 1 Study Characteristics and Outcomes

First Author, Year	N	Demographics	Source	Outcome
Campbell, 2003[78]	639	Randomized trial participants: Sex: 57.3% male; 42.7% female Insurance: 65.1% Medicaid; 34.9% private Race/ethnicity: 38.5% African American; 61.5% White Non-trial participants: Sex: 49.8% male; 50.2% female Insurance: 32.5% Medicaid; 67.5% private Race/ethnicity: 16.4% African American; 83.6% White	Participants in trial set in Pittsburgh, PA	Prevalence of speech delay (delay % vs. no delay) Low maternal education: 22% vs. 10% Male sex: 70% vs. 52% Positive family history: 36% vs. 25% Medicaid: 63% vs. 51%
Rescorla, 2002[79]	278	Sex: 51% female Race/ethnicity: 57% NHW; 22% African American; 13% Hispanic; 9% Other Age of child: 18 to 23 months: 101 24 to 29 months: 90 30 to 35 months:87 Lower SES: 18% Middle SES: 45% Upper SES: 31%	1999 National Survey of Children, Youths, and Adults	Prevalence of speech delay among children ages 24 to 35 months Lower SES: 21% Middle SES: 14% Upper SES: 6% 4% NHW 29% African American 24% Other
Straub, 2022[21]	2,070,541 total: 1,045,426 (MAX dataset); 1,309,900 privately insured children (MarketScan dataset)	50.5% boys in publicly insured cohort 51% boys in privately insured cohort	2000–2014 MAX and 2003–2015 IBM MarketScan Research Database	Prevalence of speech and/or language delay (MAX vs MarketScan): 8.4% vs. 4.5% Disparities in prevalence by child sex (male vs. female) MAX: 66.47% vs. 32.01% MarketScan: 69.68% vs. 27.68%

Abbreviations: MAX=Medicaid Analytic eXtract; NHW=non-Hispanic White; SES=socioeconomic status.

Appendix A Table 2. CQ 2 Study Characteristics and Outcomes

First Author, Year	N	Demographics	Source	Outcome
Straub, 2022[21]	1,045,426 publicly insured children; 1,309,900 privately insured children	51% boys in publicly insured cohort 51% boys in privately insured cohort	MAX and MarketScan data	Age at diagnosis of speech and/or language delays (MAX vs. MarketScan) 4.96 (4.91 to 5.01) vs. 3.53 (3.42 to 3.65) Disparities in detection by child sex (boys vs. girls [reference]) MAX Absolute difference: -0.25 (-0.36 to -0.14) 4.88 (4.81 to 4.95) vs. 5.12 (5.04 to 5.21) MarketScan Absolute difference: -0.34 (-0.57 to -0.11) 3.41 (3.29 to 3.54) vs. 3.75 (2.85 to 3.60) Disparities in age of detection by child race/ethnicity in MAX (White is reference) Asian/Pacific Islander: absolute difference: -1.67 (-1.95 to -1.39) 3.49 (3.22 to 3.76) Black: absolute difference: 0.00 (-0.12 to – 0.13) 5.16 (5.06 to 5.26) Hispanic/Latino: absolute difference: -0.71 (-0.88 to -0.55) 4.44 (4.30 to 4.59) Other/Unknown: absolute difference: -1.03 _-1.21 to -0.84) 4.13 (3.96 to 4.30) White: absolute difference: ref 5.16 (5.08 to 5.23) Disparities in age of detection by maternal age (maternal age 24 years or younger is reference) MAX Maternal age 35 years or older: absolute difference: -0.48 (-0.68 to -0.28) 4.54 (4.35 to 4.73) Maternal age 25 to 34 years: absolute difference: -0.07 (-0.18 to 0.05) 4.95 (4.86 to 5.05) Maternal age 24 years or younger: 5.02 (4.96 to 5.09) MarketScan Maternal age 35 years or older: absolute difference: 0.04 (-0.40 to 0.48) 3.40 (3.28 to 3.51) Maternal age 25 to 34 years: 3.62 (3.45) absolute difference: 0.26 (-0.19 to 0.72) Maternal age 24 years or younger: absolute difference: 3.35 (2.93 to 3.78)

Abbreviations: MAX=Medicaid Analytic eXtract.

Appendix A Table 3. CQ 3 Study Characteristics and Outcomes

First Author, Year	N	Demographics	Source	Outcome
Morgan, 2016[80]	9,500 (weighted)	Race/ethnicity: White: 53.1%; African American: 13.8%; Hispanic: 25.6%; Other: 7.3% Sex: 51.3% male SES quintile at 24 months: Lowest: 20.1%, Second lowest: 20.1% Middle: 20.1% Second highest: 20.0% Highest: 19.8%	Early Childhood Longitudinal Study, Birth Cohort	Receipt of services at ages 24, 48, and 60 months At age 24 months: Low total word score aOR (16.51 to 17.85); African American children (reference White children) aOR range (0.42 to 0.55); middle SES quintile aOR range (0.45 to 0.54); family member with mental illness aOR range (2.14 to 2.15); family member with learning disability aOR (2.16 to 2.18); Socially isolated mother aOR (0.56) At age 48 months: Low total word score at 24 months aOR (9.12 to 11.74); low receptive vocabulary at 48 months aOR range (2.13 to 2.37); African American children (reference White) aOR (0.48 to 0.54); male aOR range (1.65 to 1.74); non-English primary language at 24 months aOR (0.40 to 0.43); maternal behavioral risk factor at birth aOR (1.65 to 2.02); family with learning disability at 24 months aOR (1.73 to 1.74); household person with special needs at 9 months aOR (1.81 to 1.84); child behaviors—externalizing problems at 24 months aOR (1.86) At age 60 months: Low total word score at 24 months aOR (4.32 to 6.10); low receptive vocabulary score at 48 months aOR (2.10 to 2.37); maternal depression at 9 months aOR (1.58 to 1.65); child behaviors—externalizing problems at 24 months aOR (2.26)

Appendix A Table 3. CQ 3 Study Characteristics and Outcomes

First Author, Year	N	Demographics	Source	Outcome
Davidson, 2022[81]	824 total; 491 with speech disorders and 333 with language disorders	Age range: 3.0 to 17.11 (years, months) % by age range (years), speech disorder sample: 3–6: 46 7–10: 34 11–17: 20 % by age range (years), language disorder sample: 3–6: 33 7–10: 40 11–17: 27 Sex (% female): Speech disorder sample: 32 Language disorder sample: 33 % Race/ethnicity: Speech disorder sample: White, non-Hispanic: 54; Black, non-Hispanic:19; Other, non-Hispanic: 6; Hispanic: 21 Language disorder sample: White, non-Hispanic: 51; Black, non-Hispanic:16; Other, non-Hispanic: 6; Hispanic: 27 Health insurance type: Speech disorder sample: Uninsured: 4; Public only: 49; Any private: 47 Language disorder sample: Uninsured: 4; Public only: 58; Any private: 38	2012 National Health Interview Survey	Proportion of all children who had ever received services for speech and language disorders: Total (overall, both samples): 75% Proportion by race/ethnicity: Speech disorder sample (%): White, non-Hispanic: 83 Black, non-Hispanic: 64 Other, non-Hispanic: 94 Hispanic: 64 Language disorder sample (%): White, non-Hispanic: 81 Black, non-Hispanic: 70 Other, non-Hispanic: 77 Hispanic: 61 Proportion by health insurance type: Speech disorder sample (%): Uninsured: 47 Public only: 70 Any private: 84 Language disorder sample (%): Uninsured: 40 Public only: 71 Any private: 83

Abbreviations: aOR=adjusted odds ratio; SES=socioeconomic status.

Appendix B1. Original Search Strategies

PubMed, Screening, March 4, 2022

Search Number	Query	Filters	Results
1	"Communication Disorders/classification"[Mesh] OR "Communication Disorders/diagnosis"[Mesh]		18,784
2	"communication disorder*"[tiab] OR dysarthria[tw] OR "developmental language disorder*"[All Fields] OR DLD[tiab] OR "language development disorder*"[All Fields] OR "language impairment"[All Fields] OR (receptive[tiab] AND expressive[tiab] AND delay[tiab]) OR ((speech*[tiab] OR language*[tiab]) AND (disorder*[tiab] OR delay*[tiab] OR patholog*[tiab])) OR "speech impairment"[All Fields]		65,576
3	#1 OR #2		77,181
4	"Diagnostic Techniques and Procedures"[Mesh] OR "Language Tests"[Mesh] OR "Mass Screening"[Mesh] OR "Psychological Tests"[Mesh] OR "case finding"[tiab] OR casefinding[tiab] OR instrument[tiab] OR inventory[tiab] OR questionnaire[tw] OR scale[tiab] OR screening[tiab] OR screened[tiab] OR screens[tiab] OR screen*[tiab] OR Surveillance[tw] OR Survey[tw] OR Test[tiab] OR tests[tiab] OR testing[tiab] OR Ages and Stages Questionnaire[Title/Abstract] OR Battelle Developmental Inventory Screening Test[Title/Abstract] OR Clinical Adaptive Test[Title/Abstract] OR "Clinical Linguistic and Auditory Milestone Scale"[All Fields] OR Denver Developmental Screening Test[Title/Abstract] OR Early Language Milestone Scale[Title/Abstract] OR Fluharty Preschool Speech[Title/Abstract] OR Infant-Toddler Checklist[Title/Abstract] OR Language Development Survey[Title/Abstract] OR McArthur-Bates Communicative Development Inventory[Title/Abstract] OR WILSTAAR[Title/Abstract] OR Preschool Language Scale[title/abstract] OR "Brigance Preschool Screen"[All Fields] OR "Denver Articulation Screening Exam"[All Fields] OR "Early Screening Profiles"[All Fields] OR "Northwestern Syntax Screening Test"[All Fields] OR "Sure Start Language Measure"[All Fields]		11,206,743
5	#3 AND #4		43,411
6	#3 AND #4	English	39,535
7	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case control"[tw] OR "case report"[tw] OR "case reports"[tw] OR "case series"[tw] OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "cross-sectional"[tw] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR letter[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt] OR ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] OR cow[tw] OR cows[tw] OR chicken[tw] OR chickens[tw] OR horse[tw] OR horses[tw] OR mice[tw] OR mouse[tw] OR bovine[tw] OR sheep OR ovine OR murine OR murinae		11,854,622
8	#6 NOT #7		29,174
9	#6 NOT #7	Infant: 1-23 months	2,379
10	#6 NOT #7	Infant: 1-23 months, Preschool Child: 2-5 years	6,543
11	#9 AND (boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR "first grade"[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		2,379
12	#10 OR #11		6,543

Appendix B1. Original Search Strategies

Search Number	Query	Filters	Results
13	#12 AND ("2014/01/01"[Date - Publication] : "3000"[Date - Publication])		2,463
14	"systematic review"[ti] OR "meta-analysis"[pt] OR "meta-analysis"[ti] OR "systematic literature review"[ti] OR "this systematic review"[tw] OR ("systematic review"[tiab] AND review[pt]) OR meta synthesis[ti] OR "cochrane database syst rev"[ta] OR "Umbrella Review"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab]		334,342
15	#13 AND #14		90
16	randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized [tiab] OR randomly [tiab] OR trial [tiab] OR groups [tiab]		3,390,517
17	#13 AND #16		700
18	(cohort[all] OR (control[all] AND study[all]) OR (control[tw] AND group*[tw]) OR epidemiologic studies[mh] OR program[tw] OR clinical trial[pt] OR comparative stud*[all] OR evaluation studies[all] OR statistics as topic[mh] OR survey*[tw] OR follow-up*[all] OR time factors[all] OR ci[tw]) NOT ((animals[mh:noexp] NOT humans[mh:noexp]) OR comment[pt] OR editorial[pt] OR review[pt] OR meta analysis[pt] OR case report[tw] OR consensus[mh] OR guideline[pt] OR history[sh])		8,562,725
19	#13 AND #18		1,732
20	#15 NOT (#17 OR #19)		48
21	#20 NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		41
22	#17 NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		545
23	#19 NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		1,430

Appendix B1. Original Search Strategies

PubMed, Diagnostic Accuracy, March 4, 2022

Search Number	Query	Filters	Results
1	"Communication Disorders"[Mesh] OR "Rehabilitation of Speech and Language Disorders"[Mesh]		73,124
2	"communication disorder*"[tiab] OR dysarthria[tw] OR "developmental language disorder*"[All Fields] OR DLD[tiab] OR "language development disorder*"[All Fields] OR "language impairment"[All Fields] OR (receptive[tiab] AND expressive[tiab] AND delay[tiab]) OR ((speech*[tiab] OR language*[tiab]) AND (disorder*[tiab] OR delay*[tiab] OR patholog*[tiab])) OR "speech impairment"[All Fields]		65,576
3	(#1 OR #2) NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		111,701
4	(#1 OR #2) NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])	English	98,216
5	#4 AND ("2014/01/01"[Date - Publication] : "3000"[Date - Publication])		34,689
6	"Diagnostic Techniques and Procedures"[Mesh] OR "Language Tests"[Mesh] OR "Mass Screening"[Mesh] OR "Psychological Tests"[Mesh] OR "case finding"[tiab] OR casefinding[tiab] OR instrument[tiab] OR inventory[tiab] OR questionnaire[tw] OR scale[tiab] OR screening[tiab] OR screened[tiab] OR screens[tiab] OR screen*[tiab] OR Surveillance[tw] OR Survey[tw] OR Test[tiab] OR tests[tiab] OR testing[tiab]		11,206,737
7	#5 AND #6		19,259
8	"Risk"[Mesh]		1,328,346
9	#5 AND #8		1,438
10	#7 OR #9		19,793
11	"Area Under Curve"[Mesh] OR "Diagnosis, Differential"[Mesh] OR "Diagnostic Techniques and Procedures"[Mesh] OR "False Negative Reactions"[Mesh] OR "False Positive Reactions"[Mesh] OR "Likelihood Functions"[Mesh] OR "Predictive Value of Tests"[Mesh] OR "Reproducibility of Results"[Mesh] OR "ROC Curve"[Mesh] OR "Sensitivity and Specificity"[Mesh] OR accuracy[tw] OR "false positive"[tw] OR "false negative"[tw] OR "likelihood ratio"[tw] OR "predictive value"[tw] OR reproducib*[tw] OR ROC[tw] OR sensitivity[tw] OR specificity[tw]		9,536,790
12	#10 AND #11		10,072
13	#10 AND #11	Infant: birth-23 months	704
14	#10 AND #11	Infant: birth-23 months, Preschool Child: 2-5 years	1,736
15	#12 AND (boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR "first grade"[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		3,456
16	#14 OR #15		3,456

Appendix B1. Original Search Strategies

Search Number	Query	Filters	Results
17	Ages and Stages Questionnaire[Title/Abstract] OR Battelle Developmental Inventory Screening Test[Title/Abstract] OR Clinical Adaptive Test[Title/Abstract] OR "Clinical Linguistic and Auditory Milestone Scale"[All Fields] OR Denver Developmental Screening Test[Title/Abstract] OR Early Language Milestone Scale[Title/Abstract] OR Fluharty Preschool Speech[Title/Abstract] OR Infant-Toddler Checklist[Title/Abstract] OR Language Development Survey[Title/Abstract] OR McArthur-Bates Communicative Development Inventory[Title/Abstract] OR WILSTAAR[Title/Abstract] OR Preschool Language Scale[title/abstract]		1,036
18	"Brigance Preschool Screen"[All Fields] OR "Denver Articulation Screening Exam"[All Fields] OR "Early Screening Profiles"[All Fields] OR "Northwestern Syntax Screening Test"[All Fields] OR "Sure Start Language Measure"[All Fields]		25
19	#17 OR #18		1,059
20	#19 AND #11		391
21	#19 AND #11	English	381
22	#19 AND #11	English, Infant: birth-23 months	262
23	#19 AND #11	English, Infant: birth-23 months, Preschool Child: 2-5 years	331
24	#21 AND (boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		381
25	#23 OR #24		381
26	#16 OR #25		3,810
27	#26 AND ("2014/01/01"[Date - Publication] : "3000"[Date - Publication])		3,601
28	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case control" OR "case report*" OR "case series" OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "cross-sectional"[tw] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR letter[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt] OR ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] OR cow[tw] OR cows[tw] OR chicken[tw] OR chickens[tw] OR horse[tw] OR horses[tw] OR mice[tw] OR mouse[tw] OR bovine[tw] OR sheep OR ovine OR murine OR murinae		11,863,695
29	#27 NOT #28		2,627
30	"systematic review"[ti] OR "meta-analysis"[pt] OR "meta-analysis"[ti] OR "systematic literature review"[ti] OR "this systematic review"[tw] OR ("systematic review"[tiab] AND review[pt]) OR meta synthesis[ti] OR "cochrane database syst rev"[ta] OR "Umbrella Review"[tiab] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab]		356,885
31	#29 AND #30		129
32	#29 NOT #31		2,498

Appendix B1. Original Search Strategies

PubMed, Interventions and Harms of Interventions, March 4, 2022

Search Number	Query	Filters	Results
1	"Communication Disorders"[Mesh] OR "Rehabilitation of Speech and Language Disorders"[Mesh]		73,124
2	"communication disorder*"[tiab] OR dysarthria[tw] OR "developmental language disorder*"[All Fields] OR DLD[tiab] OR "language development disorder*"[All Fields] OR "language impairment"[All Fields] OR (receptive[tiab] AND expressive[tiab] AND delay[tiab]) OR ((speech*[tiab] OR language*[tiab]) AND (disorder*[tiab] OR delay*[tiab] OR patholog*[tiab])) OR "speech impairment"[All Fields]		65,576
3	(#1 OR #2) NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		111,701
4	"Communication Aids for Disabled"[Mesh] OR "Comparative Study" [Publication Type] OR "Early Medical Intervention"[Mesh] OR "Evaluation Studies" [Publication Type] OR "Evaluation Studies as Topic"[Mesh] OR "Epidemiologic Studies"[Mesh] OR Gestures[Mesh] OR Multilingualism[Mesh] OR "Outcome and Process Assessment, Health Care"[Mesh] OR "Rehabilitation of Speech and Language Disorders"[Mesh] OR "Therapy, Computer-Assisted"[Mesh] OR therapeutics[Mesh] OR therapy[subheading] OR treatment[sh] OR "intervention*"[tiab] OR "language facilitation"[tiab] OR "speech therapy"[tiab]		12,933,833
5	#3 AND #4		61,268
6	#3 AND #4	English	54,517
7	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case control"[tw] OR "case report"[tw] OR "case reports"[tw] OR "case series"[tw] OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "cross-sectional"[tw] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR letter[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt] OR ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] OR cow[tw] OR cows[tw] OR chicken[tw] OR chickens[tw] OR horse[tw] OR horses[tw] OR mice[tw] OR mouse[tw] OR bovine[tw] OR sheep OR ovine OR murine OR murinae		11,854,622
8	#6 NOT #7		39,161
9	#6 NOT #7	Infant: birth-23 months	3,523
10	#6 NOT #7	Infant: birth-23 months, Preschool Child: 2-5 years	8,284
11	#6 NOT #7	Infant: birth-23 months, Child: 6-12 years, Preschool Child: 2-5 years	15,825
12	(boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		3,456,813
13	#8 AND #12		17,391
14	#11 OR #13		17,391

Appendix B1. Original Search Strategies

Search Number	Query	Filters	Results
15	#14 AND ("2014/01/01"[Date - Publication] : "3000"[Date - Publication])		5,346
16	randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized [tiab] OR randomly [tiab] OR trial [tiab] OR groups [tiab]		3,390,517
17	#15 AND #16		1,522
18	"systematic review"[ti] OR "meta-analysis"[pt] OR "meta-analysis"[ti] OR "systematic literature review"[ti] OR "this systematic review"[tw] OR ("systematic review"[tiab] AND review[pt]) OR meta synthesis[ti] OR "cochrane database syst rev"[ta] OR "Umbrella Review"[tiab] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab]		356,885
19	#15 AND #18		448
20	#19 NOT #17		255
21	"Diagnostic Errors"[Mesh] OR "Stress, Physiological"[Mesh] OR "Life Change Events"[Mesh] OR "Prejudice"[Mesh] OR "Stereotyping"[Mesh] OR "Self Concept"[Mesh] OR "adverse effect*" OR harm* OR labeling OR overdiagnos* OR stigma*		3,391,991
22	#15 AND #21		549
23	(cohort[all] OR (control[all] AND study[all]) OR (control[tw] AND group*[tw]) OR epidemiologic studies[mh] OR program[tw] OR clinical trial[pt] OR comparative stud*[all] OR evaluation studies[all] OR statistics as topic[mh] OR survey*[tw] OR follow-up*[all] OR time factors[all] OR ci[tw]) NOT ((animals[mh:noexp] NOT humans[mh:noexp]) OR comment[pt] OR editorial[pt] OR review[pt] OR meta analysis[pt] OR case report[tw] OR consensus[mh] OR guideline[pt] OR history[sh])		8,562,725
24	#22 AND #23		324

Appendix B1. Original Search Strategies

Cochrane Library, Screening, March 4, 2022

ID	Search	Hits
#1	[mh "Communication Disorders"]	1,911
#2	(("communication" NEXT disorder*):ti,ab OR dysarthria:ti,ab,kw OR ("developmental language" NEXT disorder*) OR DLD:ti,ab OR ("language development" NEXT disorder*) OR "language impairment" OR (receptive:ti,ab AND expressive:ti,ab AND delay:ti,ab) OR ((speech*:ti,ab OR language*:ti,ab) AND (disorder*:ti,ab OR delay*:ti,ab OR pathology*:ti,ab)) OR “speech impairment”)	6,320
#3	(#1 OR #2) NOT (autism:ti OR "down syndrome":ti OR "fragile syndrome":ti OR craniofacial:ti OR "cleft palate":ti)	7,313
#4	[mh "Diagnostic Techniques and Procedures"] OR [mh "Language Tests"] OR [mh "Mass Screening"] OR [mh "Psychological Tests"] OR "case finding":ti,ab OR casefinding:ti,ab OR instrument:ti,ab OR inventory:ti,ab OR questionnaire:ti,ab,kw OR scale:ti,ab OR screening:ti,ab OR screened:ti,ab OR screens:ti,ab OR screen*:ti,ab OR Surveillance:ti,ab,kw OR Survey:ti,ab,kw OR Test:ti,ab OR tests:ti,ab OR testing:ti,ab OR “Ages and Stages Questionnaire”:ti,ab OR “Battelle Developmental Inventory Screening Test”:ti,ab OR “Clinical Adaptive Test”:ti,ab OR "Clinical Linguistic and Auditory Milestone Scale" OR “Denver Developmental Screening Test”:ti,ab OR “Early Language Milestone Scale”:ti,ab OR “Fluharty Preschool Speech”:ti,ab OR “Infant Toddler Checklist”:ti,ab OR “Language Development Survey”:ti,ab OR “McArthur Bates Communicative Development Inventory”:ti,ab OR WILSTAAR:ti,ab OR “Preschool Language Scale”:ti,ab OR "Brigance Preschool Screen" OR "Denver Articulation Screening Exam" OR "Early Screening Profiles" OR "Northwestern Syntax Screening Test" OR "Sure Start Language Measure"	744,746
#5	#3 AND #4	4,654
#6	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR "case control":ti,ab,kw OR "case report":ti,ab,kw OR "case reports":ti,ab,kw OR "case series":ti,ab,kw OR comment:pt OR "comment on" OR congress:pt OR cross-sectional:ti,ab,kw OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR letter:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt OR ([mh Animals] NOT [mh Humans]) OR rats:ti,ab,kw OR cow:ti,ab,kw OR cows:ti,ab,kw OR chicken:ti,ab,kw OR chickens:ti,ab,kw OR horse:ti,ab,kw OR horses:ti,ab,kw OR mice:ti,ab,kw OR mouse:ti,ab,kw OR bovine:ti,ab,kw OR sheep OR ovine OR murine OR murinae	85,514
#7	#5 NOT #6	3,416
#8	#7 AND (boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR ”first grade”:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	1,162
#9	#8 Limited to Years First Published between 2014 to 2022	665 (all results are trials)

Appendix B1. Original Search Strategies

Cochrane Library, Diagnostic Accuracy, March 4, 2022

ID	Search	Hits
#1	[mh "Communication Disorders"] OR [mh "Rehabilitation of Speech and Language Disorders"]	2,181
#2	("communication" NEXT disorder*):ti,ab OR dysarthria:ti,ab,kw OR ("developmental language" NEXT disorder*) OR DLD:ti,ab OR ("language development" NEXT disorder*) OR "language impairment" OR (receptive:ti,ab AND expressive:ti,ab AND delay:ti,ab) OR ((speech*:ti,ab OR language*:ti,ab) AND (disorder*:ti,ab OR delay*:ti,ab OR pathology*:ti,ab)) OR “speech impairment”	6,787
#3	(#1 OR #2) NOT (autism:ti OR "down syndrome":ti OR "fragile syndrome":ti OR craniofacial:ti OR "cleft palate":ti)	7,871
#4	[mh "Diagnostic Techniques and Procedures"] OR [mh "Language Tests"] OR [mh "Mass Screening"] OR [mh "Psychological Tests"] OR "case finding":ti,ab OR casefinding:ti,ab OR instrument:ti,ab OR inventory:ti,ab OR questionnaire:ti,ab,kw OR scale:ti,ab OR screening:ti,ab OR screened:ti,ab OR screens:ti,ab OR screen*:ti,ab OR Surveillance:ti,ab,kw OR Survey:ti,ab,kw OR Test:ti,ab OR tests:ti,ab OR testing:ti,ab	744,743
#5	#3 AND #4	4,969
#6	[mh "Risk"]	39,301
#7	#3 AND #6	106
#8	#5 OR #7	5,013
#9	[mh "Area Under Curve"] OR [mh "Diagnosis, Differential"] OR [mh "Diagnostic Techniques and Procedures"] OR [mh "False Negative Reactions"] OR [mh "False Positive Reactions"] OR [mh "Likelihood Functions"] OR [mh "Predictive Value of Tests"] OR [mh "Reproducibility of Results"] OR [mh "ROC Curve"] OR [mh "Sensitivity and Specificity"] OR accuracy:ti,ab,kw OR "false positive":ti,ab,kw OR "false negative":ti,ab,kw OR "likelihood ratio":ti,ab,kw OR "predictive value":ti,ab,kw OR reproducib*:ti,ab,kw OR ROC:ti,ab,kw OR sensitivity:ti,ab,kw OR specificity:ti,ab,kw	325,179
#10	#8 AND #9	1,289
#11	#10 AND (boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	478
#12	"Ages and Stages Questionnaire":ti,ab OR "Battelle Developmental Inventory Screening Test":ti,ab OR "Clinical Adaptive Test":ti,ab OR "Clinical Linguistic and Auditory Milestone Scale" OR "Denver Developmental Screening Test":ti,ab OR "Early Language Milestone Scale":ti,ab OR "Fluharty Preschool Speech":ti,ab OR "Infant Toddler Checklist":ti,ab OR "Language Development Survey":ti,ab OR "McArthur Bates Communicative Development Inventory":ti,ab OR "WILSTAAR":ti,ab OR "Preschool Language Scale":ti,ab	228
#13	"Brigance Preschool Screen" OR "Denver Articulation Screening Exam" OR "Early Screening Profiles" OR "Northwestern Syntax Screening Test" OR "Sure Start Language Measure"	1
#14	#12 OR #13	229
#15	#14 AND #9	32
#16	#15 AND (boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	32
#17	#11 OR #16	509
#18	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR comment:pt OR "comment on" OR congress:pt OR cross-sectional:ti,ab,kw OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR letter:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt OR ([mh Animals] NOT [mh Humans]) OR rats:ti,ab,kw OR cow:ti,ab,kw OR cows:ti,ab,kw OR chicken:ti,ab,kw OR chickens:ti,ab,kw OR horse:ti,ab,kw OR horses:ti,ab,kw OR mice:ti,ab,kw OR mouse:ti,ab,kw OR bovine:ti,ab,kw OR sheep OR ovine OR murine OR murinae	62,926
#19	#17 NOT #18	353
#20	#19 Limited to Years First Published between 2014 to 2022	132 (all results are trials)

Appendix B1. Original Search Strategies

Cochrane Library, Interventions and Harms of Interventions, March 4, 2022

ID	Search	Hits
#1	[mh "Communication Disorders"] OR [mh "Rehabilitation of Speech and Language Disorders"]	2,181
#2	(("communication" NEXT disorder*):ti,ab OR dysarthria:ti,ab,kw OR ("developmental language" NEXT disorder*) OR DLD:ti,ab OR ("language development" NEXT disorder*) OR "language impairment" OR (receptive:ti,ab AND expressive:ti,ab AND delay:ti,ab) OR ((speech*:ti,ab OR language*:ti,ab) AND (disorder*:ti,ab OR delay*:ti,ab OR pathology*:ti,ab)) OR “speech impairment”)	6,320
#3	(#1 OR #2) NOT (autism:ti OR "down syndrome":ti OR "fragile syndrome":ti OR craniofacial:ti OR "cleft palate":ti)	7,538
#4	[mh "Communication Aids for Disabled"] OR "Comparative Study":pt OR [mh "Early Medical Intervention"] OR "Evaluation Studies":pt OR [mh "Evaluation Studies as Topic"] OR [mh "Epidemiologic Studies"] OR [mh Gestures] OR [mh Multilingualism] OR [mh "Outcome and Process Assessment, Health Care"] OR [mh "Rehabilitation of Speech and Language Disorders"] OR [mh "Therapy, Computer-Assisted"] OR [mh therapeutics] OR [mh /TH] OR treatment:kw OR intervention*:ti,ab OR "language facilitation":ti,ab OR "speech therapy":ti,ab	929,743
#5	#3 AND #4	5,841
#6	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR "case control":ti,ab,kw OR "case report":ti,ab,kw OR "case reports":ti,ab,kw OR "case series":ti,ab,kw OR comment:pt OR "comment on" OR congress:pt OR cross-sectional:ti,ab,kw OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR letter:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt OR ([mh Animals] NOT [mh Humans]) OR rats:ti,ab,kw OR cow:ti,ab,kw OR cows:ti,ab,kw OR chicken:ti,ab,kw OR chickens:ti,ab,kw OR horse:ti,ab,kw OR horses:ti,ab,kw OR mice:ti,ab,kw OR mouse:ti,ab,kw OR bovine:ti,ab,kw OR sheep OR ovine OR murine OR murinae	85,514
#7	#5 NOT #6	3,984
#8	(boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	218,689
#9	#7 AND #8	1,463
#10	#9 Limited to Years First Published between 2014 to 2022	791 (all results are trials)

Appendix B1. Original Search Strategies

APA PsycInfo, Screening, March 4, 2022

#	Query	Limiters/Expanders	Results
1	DE "Communication Disorders" OR DE "Language Disorders" OR DE "Speech Disorders" OR DE "Language Delay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	18,682
2	TI "communication disorder*" OR AB "communication disorder*" OR DE "Dysarthria" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	45,495
3	(S1 OR S2) NOT ((TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate"))	Expanders - Apply equivalent subjects Search modes - Find all my search terms	48,331
4	DE "Diagnostic Criteria" OR DE "Screening" OR DE "Screening Tests" OR DE "Questionnaires" OR DE "Testing" OR DE "Surveys" OR TI "case finding" OR AB "case finding" OR TI casefindng OR AB casefinding OR TI instrument OR AB instrument OR TI inventory OR AB inventory OR TI questionnaire OR AB questionnaire OR TI scale OR AB scale OR TI screening OR AB screening OR TI screened OR AB screened OR TI screens OR TI screens OR TI screen* OR AB screen* OR TX surveillance OR TX survey OR TI test OR AB test OR TI tests OR AB tests OR TI testing OR AB testing	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,550,448
5	TX “Ages and Stages Questionnaire” OR TX “Battelle Developmental Inventory Screening Test” OR TX “Clinical Adaptive Test” OR TX "Clinical Linguistic and Auditory Milestone Scale" OR TX “Denver Developmental Screening Test” OR TX “Early Language Milestone Scale” OR TX “Fluharty Preschool Speech” OR TX “Infant-Toddler Checklist” OR TX “Language Development Survey” OR TX “McArthur-Bates Communicative Development Inventory” OR TX WILSTAAR OR TX “Preschool Language Scale” OR TX "Brigance Preschool Screen" OR TX "Denver Articulation Screening Exam" OR TX "Early Screening Profiles" OR TX "Northwestern Syntax Screening Test" OR TX "Sure Start Language Measure"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,785
6	S4 OR S5	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,551,065
7	S3 AND S6	Expanders - Apply equivalent subjects Search modes - Find all my search terms	15,793
8	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Expanders - Apply equivalent subjects Search modes - Find all my search terms	662,492
9	S7 NOT S8	Expanders - Apply equivalent subjects Search modes - Find all my search terms	14,581
10	S9	Limiters - English; Language: English; Population Group: Human Expanders - Apply equivalent subjects Search modes - Find all my search terms	12,939

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
11	S10	Limiters - Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders - Apply equivalent subjects Search modes - Find all my search terms	2,904
12	TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI “first grade” OR AB “first grade” OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*	Limiters - Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders - Apply equivalent subjects Search modes - Find all my search terms	143,616
13	S10 AND S12	Expanders - Apply equivalent subjects Search modes - Find all my search terms	2,707
14	S11 OR S13	Expanders - Apply equivalent subjects Search modes - Find all my search terms	2,904
15	S14	Limiters - Published Date: 20140101-20221231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,042
16	S15	Limiters - Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders - Apply equivalent subjects Search modes - Find all my search terms	11
17	“randomized controlled trial” OR “controlled clinical trial” OR TI randomized OR AB randomized OR TI randomly OR AB randomly OR TI trial OR AB trial OR TI groups OR AB groups	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,121,985
18	S15 AND S17	Expanders - Apply equivalent subjects Search modes - Find all my search terms	462
19	(TX cohort OR (TX control AND TX study) OR (TX control AND TX group*) OR TX “epidemiologic stud*” OR TX program OR MR "clinical trial" OR TX “comparative stud*” OR TX “evaluation stud*” OR TX survey* OR DE "Followup Studies" OR TX “follow-up*” OR TX “time factors”) NOT ((PO Animal NOT PO Human) OR TI editorial OR AB editorial OR DE "Literature Review” OR MR “meta analysis” OR TI consensus OR AB consensus OR TI guideline OR AB guideline)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,517,702
20	S15 AND S19	Expanders - Apply equivalent subjects Search modes - Find all my search terms	493

Appendix B1. Original Search Strategies

APA PsycInfo, Diagnostic Accuracy, March 4, 2022

#	Query	Limiters/Expanders	Results
1	DE "Communication Disorders" OR DE "Language Disorders" OR DE "Speech Disorders" OR DE "Language Delay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	18,682
2	TI "communication disorder*" OR AB "communication disorder*" OR DE "Dysarthria" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	45,495
3	(S1 OR S2) NOT (TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate")	Expanders - Apply equivalent subjects Search modes - Find all my search terms	48,331
4	S3	Limiters - English; Language: English Expanders - Apply equivalent subjects Search modes - Find all my search terms	45,057
5	S4	Limiters - Published Date: 20140101-20221231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	14,042
6	DE "Diagnostic Criteria" OR DE "Screening" OR DE "Screening Tests" OR DE "Questionnaires" OR DE "Testing" OR DE "Surveys" OR TI "case finding" OR AB "case finding" OR TI casefindng OR AB casefinding OR TI instrument OR AB instrument OR TI inventory OR AB inventory OR TI questionnaire OR AB questionnaire OR TI scale OR AB scale OR TI screening OR AB screening OR TI screened OR AB screened OR TI screens OR TI screens OR TI screen* OR AB screen* OR TX surveillance OR TX survey OR TI test OR AB test OR TI tests OR AB tests OR TI testing OR AB testing	Limiters - Published Date: 20140101-20221231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	529,268
7	S5 AND S6	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5,510
8	DE "Risk Assessment" OR DE "Risk Factors"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	162,786
9	S5 AND S8	Expanders - Apply equivalent subjects Search modes - Find all my search terms	468
10	S7 OR S9	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5,735
11	TX accuracy OR TX "Area Under Curve" OR DE "Differential Diagnosis" OR TX "Diagnostic Technique*" OR TX “Diagnostic Procedur*” OR TX "False Negative" OR TX "False Positive" OR TX "likelihood function*” OR TX "likelihood ratio" OR DE "Predictive Validity" OR TX "predictive value" OR TX reproducib* OR TX ROC OR TX sensitivity OR TX specificity	Expanders - Apply equivalent subjects Search modes - Find all my search terms	311,227
12	S10 AND S11	Expanders - Apply equivalent subjects Search modes - Find all my search terms	943
13	S12	Limiters - Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders - Apply equivalent subjects	235

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
		Search modes - Find all my search terms	
14	S12 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	422
15	S13 OR S14	Expanders - Apply equivalent subjects Search modes - Find all my search terms	431
16	TX “Ages and Stages Questionnaire” OR TX “Battelle Developmental Inventory Screening Test” OR TX “Clinical Adaptive Test” OR TX "Clinical Linguistic and Auditory Milestone Scale" OR TX “Denver Developmental Screening Test” OR TX “Early Language Milestone Scale” OR TX “Fluharty Preschool Speech” OR TX “Infant-Toddler Checklist” OR TX “Language Development Survey” OR TX “McArthur-Bates Communicative Development Inventory” OR TX WILSTAAR OR TX “Preschool Language Scale” OR TX	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,669
17	"Brigance Preschool Screen" OR TX "Denver Articulation Screening Exam" OR TX "Early Screening Profiles" OR TX "Northwestern Syntax Screening Test" OR TX "Sure Start Language Measure"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	98
18	S16 OR S17	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,785
19	S18	Limiters - English; Language: English; Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,312
20	S19 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,212
21	S19 OR S20	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,312
22	S21	Limiters - Published Date: 20140101-20221231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	2,429
23	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX “case stud*” OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Expanders - Apply equivalent subjects Search modes - Find all my search terms	822,360

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
24	S22 NOT S23	Expanders - Apply equivalent subjects Search modes - Find all my search terms	528
25	S15 OR S24	Expanders - Apply equivalent subjects Search modes - Find all my search terms	996
26	S25 AND PO Human	Expanders - Apply equivalent subjects Search modes - Find all my search terms	960
27	S26	Limiters - Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders - Apply equivalent subjects Search modes - Find all my search terms	13
28	S26 NOT S27	Expanders - Apply equivalent subjects Search modes - Find all my search terms	947

Appendix B1. Original Search Strategies

APA PsycInfo, Interventions and Harms of Interventions, March 4, 2022

#	Query	Limiters/Expanders	Results
1	DE "Communication Disorders" OR DE "Language Disorders" OR DE "Speech Disorders" OR DE "Language Delay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	18,682
2	TI "communication disorder*" OR AB "communication disorder*" OR DE "Dysarthria" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	45,495
3	(S1 OR S2) NOT (TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate")	Expanders - Apply equivalent subjects Search modes - Find all my search terms	48,331
4	DE “Speech Therapy” OR DE "Language Therapy" OR DE "Treatment" OR DE "Adjunctive Treatment" OR DE "Anxiety Management" OR DE "Behavior Modification" OR DE "Cognitive Techniques" OR DE "Computer Assisted Therapy" OR DE "Counseling" OR DE "Culturally Adapted Interventions" OR DE "Habilitation" OR DE "Interdisciplinary Treatment Approach" OR DE "Intervention" OR DE "Early Intervention" OR DE "Multimodal Treatment Approach" OR DE "Outpatient Treatment" OR DE "Personal Therapy" OR DE "Physical Treatment Methods" OR DE "Psychoeducation" OR DE "Psychotherapy" OR DE "Rehabilitation" OR DE "Self-Help Techniques" OR DE "Symptoms Based Treatment" OR DE "Therapeutic Processes" OR DE "Video-Based Interventions" OR DE "Gestures" OR DE "Multilingualism" OR DE "Bilingualism" OR TX “communication aids” OR TX “comparative stud*” OR TX “early medical intervention*” OR TX “evaluation stud*” OR TX “epidemiologic stud*” OR TI treatment OR AB treatment OR TI “language facilitation” OR AB “language facilitation” OR TI “speech therapy” OR AB “speech therapy”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	913,902
5	S3 AND S4	Expanders - Apply equivalent subjects Search modes - Find all my search terms	14,490
6	S5	Limiters - English Expanders - Apply equivalent subjects Search modes - Find all my search terms	13,484
7	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Limiters - English Expanders - Apply equivalent subjects Search modes - Find all my search terms	639,200
8	S6 NOT S7	Limiters - English Expanders - Apply equivalent subjects Search modes - Find all my search terms	12,244
9	S8 AND PO Human	Limiters - English Expanders - Apply equivalent subjects Search modes - Find all my search terms	11,759

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
10	S9	Limiters - Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs), School Age (6-12 yrs) Expanders - Apply equivalent subjects Search modes - Find all my search terms	3,087
11	S9 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5,280
12	S10 OR S11	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5,565
13	S12	Limiters - Published Date: 20140101-20221231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,710
14	“randomized controlled trial” OR “controlled clinical trial” OR TI randomized OR AB randomized OR TI randomly OR AB randomly OR TI trial OR AB trial OR TI groups OR AB groups	Limiters - Published Date: 20140101-20221231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	370,374
15	S13 AND S14	Expanders - Apply equivalent subjects Search modes - Find all my search terms	660
16	S13	Limiters - Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders - Apply equivalent subjects Search modes - Find all my search terms	67
17	S16 NOT S15	Limiters - Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders - Apply equivalent subjects Search modes - Find all my search terms	38
18	TI "Diagnostic Errors" OR AB “Diagnostic Errors” OR DE "Psychological Stress" OR DE "Life Changes" OR DE "Prejudice" OR DE "Stereotyped Attitudes" OR DE "Self-Concept" OR DE "Academic Self Concept" OR DE "Self-Confidence" OR DE "Self-Congruence" OR DE "Self-Esteem" OR DE "Self-Forgiveness" OR DE "Self-Regard" OR DE "Self-Worth" OR DE "Sense of Coherence" OR DE "Patient Safety" OR TX harm* OR DE "Labeling" OR TX overdiagnos* OR DE "Stigma" OR DE "Self-Stigma"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	214,341
19	S13 AND S18	Expanders - Apply equivalent subjects Search modes - Find all my search terms	19
20	(TX cohort OR (TX control AND TX study) OR (TX control AND TX group*) OR TX “epidemiologic stud*” OR TX program OR MR "clinical trial" OR TX “comparative stud*” OR TX “evaluation stud*” OR TX survey* OR DE "Followup Studies" OR TX “follow-up*” OR TX “time factors”) NOT ((PO Animal NOT PO Human) OR TI editorial OR AB editorial OR DE "Literature Review” OR MR “meta analysis” OR TI consensus OR AB consensus OR TI guideline OR AB guideline)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,517,702

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
21	S19 AND S20	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5

Appendix B1. Original Search Strategies

ERIC, Interventions and Harms of Interventions, March 4, 2022

#	Query	Limiters/Expanders	Results
1	DE "Aphasia" OR DE "Articulation Impairments" OR DE "Communication Disorders" OR DE "Delayed Speech" OR DE "Language Impairments" OR OR DE "Receptive Language" OR DE "Speech Impairments" OR DE "Speech Language Pathology"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	6,425
2	TI "communication disorder*" OR AB "communication disorder*" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	10,756
3	S1 OR S2	Expanders - Apply equivalent subjects Search modes - Find all my search terms	13,917
4	(S1 OR S2) NOT (TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate")	Expanders - Apply equivalent subjects Search modes - Find all my search terms	12,462
5	DE “Speech Therapy” OR DE "Behavior Modification" OR DE "Applied Behavior Analysis" OR DE "Contingency Management" OR DE "Positive Behavior Supports" OR DE "Counseling" OR OR DE "Family Counseling" OR DE "Individual Counseling" OR DE "Parent Counseling" OR DE "School Counseling" OR DE "Intervention" OR DE "Early Intervention" OR DE "Prereferral Intervention" OR DE "Response to Intervention" OR DE "Personal Therapy" OR DE "Psychotherapy" OR DE "Rehabilitation" OR DE "Therapy" OR DE "Educational Therapy" OR DE "Therapeutic Recreation" OR DE "Multilingualism" OR DE "Bilingualism" OR TX “communication aids” OR TX “comparative stud*” OR TX “early medical intervention*” OR TX “evaluation stud*” OR TX “epidemiologic stud*” OR TI treatment OR AB treatment OR TI “language facilitation” OR AB “language facilitation” OR TI “speech therapy” OR AB “speech therapy”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	140,078
6	S4 AND S5	Expanders - Apply equivalent subjects Search modes - Find all my search terms	4,437
7	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Expanders - Apply equivalent subjects Search modes - Find all my search terms	102,375
8	S6 NOT S7	Expanders - Apply equivalent subjects Search modes - Find all my search terms	4,240
9	S8	Limiters - Published Date: 20140101-20221231; Language: English Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,174
10	S9	Limiters - Education Level: Early Childhood Education, Elementary Education, Grade 1 Expanders - Apply equivalent subjects Search modes - Find all my search terms	195

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
11	S9 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	716
12	S10 OR S11	Expanders - Apply equivalent subjects Search modes - Find all my search terms	758
13	“randomized controlled trial” OR “controlled clinical trial” OR TI randomized OR AB randomized OR TI randomly OR AB randomly OR TI trial OR AB trial OR TI groups OR AB groups	Expanders - Apply equivalent subjects Search modes - Find all my search terms	283,136
14	S12 AND S13	Expanders - Apply equivalent subjects Search modes - Find all my search terms	294
15	TX “systematic literature review” OR TX “systematic review” OR TX “meta-analysis” OR TX "meta-analyses" OR TX “meta synthesis” OR TX "Umbrella Review"	Limiters - Publication Type: Journal Articles, Reports - Evaluative, Reports - Research Expanders - Apply equivalent subjects Search modes - Find all my search terms	9,129
16	S12 AND S15	Expanders - Apply equivalent subjects Search modes - Find all my search terms	38
17	TI "Diagnostic Errors" OR AB “Diagnostic Errors” OR DE "Psychological Stress" OR DE "Life Changes" OR DE "Prejudice" OR DE "Stereotyped Attitudes" OR DE "Self-Concept" OR DE "Academic Self Concept" OR DE "Self-Confidence" OR DE "Self-Congruence" OR DE "Self-Esteem" OR DE "Self-Forgiveness" OR DE "Self-Regard" OR DE "Self-Worth" OR DE "Sense of Coherence" OR DE "Patient Safety" OR TX harm* OR DE "Labeling" OR TX overdiagnos* OR DE "Stigma" OR DE "Self-Stigma"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	11,539
18	S12 AND S17	Expanders - Apply equivalent subjects Search modes - Find all my search terms	3

Linguistic and Language Behavior Abstracts (ProQuest), March 4, 2022

Linguistic and Language Behavior Abstracts Interventions and Harms of Interventions
SRs + MAs = 56; 45 imported
RCTs = 54; 19 imported
Harms = 55; 19 imported

All searches were done in Advanced Search limited to Specific date range Start January 1, 2014 End December 31, 2022.
Limited to these Source Types:
Scholarly Journals
Working Papers
Limited to these Document Types:
Article
Evidence Based Healthcare
Fund/Grant/Fellowship/Award
Report
Limited to Language: English

Search for Systematic Reviews:
(((((MAINSUBJECT.EXPLODE("Communication Disorders") OR AB,TI("communication disorder*")) AND (dysarthria OR "developmental language disorder*" OR DLD OR "language development disorder*" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) NOT TI(autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND (MAINSUBJECT("Bilingualism") OR MAINSUBJECT("Multilingualism") OR MAINSUBJECT("Communication Aids") OR MAINSUBJECT("Therapy") OR AB,TI(intervention*) OR treatment OR AB,TI("language facilitation") OR AB,TI(speech therapy) OR AB,TI(evaluation))) AND (boys OR child OR children* OR childhood OR girls OR infant* OR Kindergarten* OR neonat* OR newborn* OR pediatric* OR paediatric* OR Prekindergarten* OR Pre-kindergarten* OR Pre-k OR Preschool* OR Pre-school* OR Toddler*)) AND ("systematic literature review" OR "systematic review" OR "meta-analysis" OR "meta-analyses" OR "meta synthesis" OR "Umbrella Review")

Search for RCTs:
(((((MAINSUBJECT.EXPLODE("Communication Disorders") OR AB,TI("communication disorder*")) AND (dysarthria OR "developmental language disorder*" OR DLD OR "language development disorder*" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) NOT TI(autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND (MAINSUBJECT("Bilingualism") OR MAINSUBJECT("Multilingualism") OR MAINSUBJECT("Communication Aids") OR MAINSUBJECT("Therapy") OR AB,TI(intervention*) OR treatment OR AB,TI("language facilitation") OR AB,TI(speech therapy) OR AB,TI(evaluation))) AND (boys OR child OR children* OR childhood OR girls OR infant* OR Kindergarten* OR neonat* OR newborn* OR pediatric* OR paediatric* OR Prekindergarten* OR Pre-kindergarten* OR Pre-k OR Preschool*

OR Pre-school* OR Toddler*)) AND ("randomized controlled trial" OR "controlled clinical trial" OR TI(randomized) OR AB(randomized) OR TI(randomly) OR AB(randomly) OR TI(trial) OR AB(trial) OR TI(groups) OR AB(groups))

Search for Harms:
(((((MAINSUBJECT.EXPLODE("Communication Disorders") OR AB,TI("communication disorder*")) AND (dysarthria OR "developmental language disorder*" OR DLD OR "language development disorder*" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) NOT TI(autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND (MAINSUBJECT("Bilingualism") OR MAINSUBJECT("Multilingualism") OR MAINSUBJECT("Communication Aids") OR MAINSUBJECT("Therapy") OR AB,TI(intervention*) OR treatment OR AB,TI("language facilitation") OR AB,TI(speech therapy) OR AB,TI(evaluation))) AND (boys OR child OR children* OR childhood OR girls OR infant* OR Kindergarten* OR neonat* OR newborn* OR pediatric* OR paediatric* OR Prekindergarten* OR Pre-kindergarten* OR Pre-k OR Preschool* OR Pre-school* OR Toddler*)) AND ("Diagnostic Errors" OR Stress OR "Life Change Events" OR "Prejudice" OR "Stereotyping" OR "Self Concept" OR "adverse effect*" OR harm* OR labeling OR overdiagnos* OR stigma*)

Appendix B1. Original Search Strategies

PubMed, Screening, January 17, 2023

Search Number	Query	Filters	Results
1	"Communication Disorders/classification"[Mesh] OR "Communication Disorders/diagnosis"[Mesh]		19,192
2	"communication disorder*"[tiab] OR dysarthria[tw] OR "developmental language disorder*"[All Fields] OR DLD[tiab] OR "language development disorder*"[All Fields] OR "language impairment"[All Fields] OR (receptive[tiab] AND expressive[tiab] AND delay[tiab]) OR ((speech*[tiab] OR language*[tiab]) AND (disorder*[tiab] OR delay*[tiab] OR patholog*[tiab])) OR "speech impairment"[All Fields]		70,075
3	#1 OR #2		81,862
4	"Diagnostic Techniques and Procedures"[Mesh] OR "Language Tests"[Mesh] OR "Mass Screening"[Mesh] OR "Psychological Tests"[Mesh] OR "case finding"[tiab] OR casefinding[tiab] OR instrument[tiab] OR inventory[tiab] OR questionnaire[tw] OR scale[tiab] OR screening[tiab] OR screened[tiab] OR screens[tiab] OR screen*[tiab] OR Surveillance[tw] OR Survey[tw] OR Test[tiab] OR tests[tiab] OR testing[tiab] OR Ages and Stages Questionnaire[Title/Abstract] OR Battelle Developmental Inventory Screening Test[Title/Abstract] OR Clinical Adaptive Test[Title/Abstract] OR "Clinical Linguistic and Auditory Milestone Scale"[All Fields] OR Denver Developmental Screening Test[Title/Abstract] OR Early Language Milestone Scale[Title/Abstract] OR Fluharty Preschool Speech[Title/Abstract] OR Infant-Toddler Checklist[Title/Abstract] OR Language Development Survey[Title/Abstract] OR McArthur-Bates Communicative Development Inventory[Title/Abstract] OR WILSTAAR[Title/Abstract] OR Preschool Language Scale[title/abstract] OR "Brigance Preschool Screen"[All Fields] OR "Denver Articulation Screening Exam"[All Fields] OR "Early Screening Profiles"[All Fields] OR "Northwestern Syntax Screening Test"[All Fields] OR "Sure Start Language Measure"[All Fields]		11,658,446
5	#3 AND #4		43,486
6	#3 AND #4	English	41,908
7	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case control"[tw] OR "case report"[tw] OR "case reports"[tw] OR "case series"[tw] OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "cross-sectional"[tw] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR letter[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt] OR ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] OR cow[tw] OR cows[tw] OR chicken[tw] OR chickens[tw] OR horse[tw] OR horses[tw] OR mice[tw] OR mouse[tw] OR bovine[tw] OR sheep OR ovine OR murine OR murinae		12,223,188
8	#6 NOT #7		31,069
9	#6 NOT #7	Infant: 1-23 months	2,479
10	#6 NOT #7	Infant: 1-23 months, Preschool Child: 2-5 years	6,773

Appendix B1. Original Search Strategies

Search Number	Query	Filters	Results
11	#9 AND (boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR "first grade"[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		14,426
12	#10 OR #11		14,426
13	#12 AND ("2021/10/04"[Date - Publication] : "3000"[Date - Publication])		1,039
14	"systematic review"[ti] OR "meta-analysis"[pt] OR "meta-analysis"[ti] OR "systematic literature review"[ti] OR "this systematic review"[tw] OR ("systematic review"[tiab] AND review[pt]) OR meta synthesis[ti] OR "cochrane database syst rev"[ta] OR "Umbrella Review"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab]		377,106
15	#13 AND #14		82
16	randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized [tiab] OR randomly [tiab] OR trial [tiab] OR groups [tiab]		3,590,536
17	#13 AND #16		302
18	(cohort[all] OR (control[all] AND study[all]) OR (control[tw] AND group*[tw]) OR epidemiologic studies[mh] OR program[tw] OR clinical trial[pt] OR comparative stud*[all] OR evaluation studies[all] OR statistics as topic[mh] OR survey*[tw] OR follow-up*[all] OR time factors[all] OR ci[tw]) NOT ((animals[mh:noexp] NOT humans[mh:noexp]) OR comment[pt] OR editorial[pt] OR review[pt] OR meta analysis[pt] OR case report[tw] OR consensus[mh] OR guideline[pt] OR history[sh])		8,982,150
19	#13 AND #18		529
20	#15 NOT (#17 OR #19)		44
21	#20 NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		36
22	#17 NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		246
23	#19 NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		455

Appendix B1. Original Search Strategies

PubMed, Diagnostic Accuracy, January 17, 2023

Search Number	Query	Filters	Results
1	"Communication Disorders"[Mesh] OR "Rehabilitation of Speech and Language Disorders"[Mesh]		74,707
2	"communication disorder*"[tiab] OR dysarthria[tw] OR "developmental language disorder*"[All Fields] OR DLD[tiab] OR "language development disorder*"[All Fields] OR "language impairment"[All Fields] OR (receptive[tiab] AND expressive[tiab] AND delay[tiab]) OR ((speech*[tiab] OR language*[tiab]) AND (disorder*[tiab] OR delay*[tiab] OR patholog*[tiab])) OR "speech impairment"[All Fields]		70,075
3	(#1 OR #2) NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		116,717
4	(#1 OR #2) NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])	English	103,113
5	#4 AND ("2021/10/04"[Date - Publication] : "3000"[Date - Publication])		7,634
6	"Diagnostic Techniques and Procedures"[Mesh] OR "Language Tests"[Mesh] OR "Mass Screening"[Mesh] OR "Psychological Tests"[Mesh] OR "case finding"[tiab] OR casefinding[tiab] OR instrument[tiab] OR inventory[tiab] OR questionnaire[tw] OR scale[tiab] OR screening[tiab] OR screened[tiab] OR screens[tiab] OR screen*[tiab] OR Surveillance[tw] OR Survey[tw] OR Test[tiab] OR tests[tiab] OR testing[tiab]		11,658,439
7	#5 AND #6		3,785
8	"Risk"[Mesh]		1,363,961
9	#5 AND #8		90
10	#7 OR #9		3,825
11	"Area Under Curve"[Mesh] OR "Diagnosis, Differential"[Mesh] OR "Diagnostic Techniques and Procedures"[Mesh] OR "False Negative Reactions"[Mesh] OR "False Positive Reactions"[Mesh] OR "Likelihood Functions"[Mesh] OR "Predictive Value of Tests"[Mesh] OR "Reproducibility of Results"[Mesh] OR "ROC Curve"[Mesh] OR "Sensitivity and Specificity"[Mesh] OR accuracy[tw] OR "false positive"[tw] OR "false negative"[tw] OR "likelihood ratio"[tw] OR "predictive value"[tw] OR reproducib*[tw] OR ROC[tw] OR sensitivity[tw] OR specificity[tw]		9,812,102
12	#10 AND #11		1,401
13	#10 AND #11	Infant: 1-23 months	60
14	#10 AND #11	Infant: 1-23 months, Preschool Child: 2-5 years	133
15	#12 AND (boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR "first grade"[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		377
16	#14 OR #15		377
17	Ages and Stages Questionnaire[Title/Abstract] OR Battelle Developmental Inventory Screening Test[Title/Abstract] OR Clinical Adaptive Test[Title/Abstract] OR "Clinical Linguistic and Auditory Milestone Scale"[All Fields] OR Denver Developmental Screening Test[Title/Abstract] OR Early Language Milestone		1,115

Appendix B1. Original Search Strategies

Search Number	Query	Filters	Results
	Scale[Title/Abstract] OR Fluharty Preschool Speech[Title/Abstract] OR Infant-Toddler Checklist[Title/Abstract] OR Language Development Survey[Title/Abstract] OR McArthur-Bates Communicative Development Inventory[Title/Abstract] OR WILSTAAR[Title/Abstract] OR Preschool Language Scale[title/abstract]		
18	"Brigance Preschool Screen"[All Fields] OR "Denver Articulation Screening Exam"[All Fields] OR "Early Screening Profiles"[All Fields] OR "Northwestern Syntax Screening Test"[All Fields] OR "Sure Start Language Measure"[All Fields]		26
19	#17 OR #18		1,138
20	#19 AND #11		412
21	#19 AND #11	English	401
22	#19 AND #11	English, Infant: 1-23 months	245
23	#19 AND #11	English, Infant: 1-23 months, Preschool Child: 2-5 years	333
24	#21 AND (boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		401
25	#23 OR #24		401
26	#16 OR #25		775
27	#26 AND ("2021/10/04"[Date - Publication] : "3000"[Date - Publication])		402
28	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case control" OR "case report*" OR "case series" OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "cross-sectional"[tw] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR letter[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt] OR ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] OR cow[tw] OR cows[tw] OR chicken[tw] OR chickens[tw] OR horse[tw] OR horses[tw] OR mice[tw] OR mouse[tw] OR bovine[tw] OR sheep OR ovine OR murine OR murinae		12,232,385
29	#27 NOT #28		341
30	"systematic review"[ti] OR "meta-analysis"[pt] OR "meta-analysis"[ti] OR "systematic literature review"[ti] OR "this systematic review"[tw] OR ("systematic review"[tiab] AND review[pt]) OR meta synthesis[ti] OR "cochrane database syst rev"[ta] OR "Umbrella Review"[tiab] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab]		400,644
31	#29 AND #30		24
32	#29 NOT #31		317

Appendix B1. Original Search Strategies

PubMed, Interventions and Harms of Interventions, January 17, 2023

Search Number	Query	Filters	Results
1	"Communication Disorders"[Mesh] OR "Rehabilitation of Speech and Language Disorders"[Mesh]		74,707
2	"communication disorder*"[tiab] OR dysarthria[tw] OR "developmental language disorder*"[All Fields] OR DLD[tiab] OR "language development disorder*"[All Fields] OR "language impairment"[All Fields] OR (receptive[tiab] AND expressive[tiab] AND delay[tiab]) OR ((speech*[tiab] OR language*[tiab]) AND (disorder*[tiab] OR delay*[tiab] OR patholog*[tiab])) OR "speech impairment"[All Fields]		70,075
3	(#1 OR #2) NOT (autism[ti] OR "down syndrome"[ti] OR "fragile syndrome"[ti] OR craniofacial[ti] OR "cleft palate"[ti])		116,717
4	"Communication Aids for Disabled"[Mesh] OR "Comparative Study" [Publication Type] OR "Early Medical Intervention"[Mesh] OR "Evaluation Studies" [Publication Type] OR "Evaluation Studies as Topic"[Mesh] OR "Epidemiologic Studies"[Mesh] OR Gestures[Mesh] OR Multilingualism[Mesh] OR "Outcome and Process Assessment, Health Care"[Mesh] OR "Rehabilitation of Speech and Language Disorders"[Mesh] OR "Therapy, Computer-Assisted"[Mesh] OR therapeutics[Mesh] OR therapy[subheading] OR treatment[sh] OR "intervention*"[tiab] OR "language facilitation"[tiab] OR "speech therapy"[tiab]		13,439,535
5	#3 AND #4		63,783
6	#3 AND #4	English	56,966
7	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case control"[tw] OR "case report"[tw] OR "case reports"[tw] OR "case series"[tw] OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "cross-sectional"[tw] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR letter[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt] OR ("Animals"[Mesh] NOT "Humans"[Mesh]) OR rats[tw] OR cow[tw] OR cows[tw] OR chicken[tw] OR chickens[tw] OR horse[tw] OR horses[tw] OR mice[tw] OR mouse[tw] OR bovine[tw] OR sheep OR ovine OR murine OR murinae		12,223,188
8	#6 NOT #7		41,099
9	#6 NOT #7	Infant: 1-23 months	3,072
10	#6 NOT #7	Infant: 1-23 months, Preschool Child: 2-5 years	8,106
11	#6 NOT #7	Child: 6-12 years, Infant: 1-23 months, Preschool Child: 2-5 years	16,103
12	(boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR Kindergarten*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR Prekindergarten*[tw] OR Pre-kindergarten*[tw] OR Pre-k[tw] OR Preschool*[tw] OR Pre-school*[tw] OR Toddler*[tw])		3,569,712
13	#8 AND #12		18,066

Appendix B1. Original Search Strategies

Search Number	Query	Filters	Results
14	#11 OR #13		18,066
15	#11 OR #13	from 2021/10/4 - 3000/12/12	938
16	randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized [tiab] OR randomly [tiab] OR trial [tiab] OR groups [tiab]		3,590,538
17	#15 AND #16		263
18	"systematic review"[ti] OR "meta-analysis"[pt] OR "meta-analysis"[ti] OR "systematic literature review"[ti] OR "this systematic review"[tw] OR ("systematic review"[tiab] AND review[pt]) OR meta synthesis[ti] OR "cochrane database syst rev"[ta] OR "Umbrella Review"[tiab] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab]		400,644
19	#15 AND #18		94
20	#19 NOT #17		60
21	"Diagnostic Errors"[Mesh] OR "Stress, Physiological"[Mesh] OR "Life Change Events"[Mesh] OR "Prejudice"[Mesh] OR "Stereotyping"[Mesh] OR "Self Concept"[Mesh] OR "adverse effect*" OR harm* OR labeling OR overdiagnos* OR stigma*		3,535,850
22	#15 AND #21		69
23	(cohort[all] OR (control[all] AND study[all]) OR (control[tw] AND group*[tw]) OR epidemiologic studies[mh] OR program[tw] OR clinical trial[pt] OR comparative stud*[all] OR evaluation studies[all] OR statistics as topic[mh] OR survey*[tw] OR follow-up*[all] OR time factors[all] OR ci[tw]) NOT ((animals[mh:noexp] NOT humans[mh:noexp]) OR comment[pt] OR editorial[pt] OR review[pt] OR meta analysis[pt] OR case report[tw] OR consensus[mh] OR guideline[pt] OR history[sh])		8,982,150
24	#22 AND #23		37

Appendix B1. Original Search Strategies

Cochrane Library, Screening, January 17, 2023

ID	Search	Hits
#1	[mh "Communication Disorders"]	1,983
#2	(("communication" NEXT disorder*):ti,ab OR dysarthria:ti,ab,kw OR ("developmental language" NEXT disorder*) OR DLD:ti,ab OR ("language development" NEXT disorder*) OR "language impairment" OR (receptive:ti,ab AND expressive:ti,ab AND delay:ti,ab) OR ((speech*:ti,ab OR language*:ti,ab) AND (disorder*:ti,ab OR delay*:ti,ab OR pathology*:ti,ab)) OR “speech impairment”)	6,883
#3	(#1 OR #2) NOT (autism:ti OR "down syndrome":ti OR "fragile syndrome":ti OR craniofacial:ti OR "cleft palate":ti)	7,896
#4	[mh "Diagnostic Techniques and Procedures"] OR [mh "Language Tests"] OR [mh "Mass Screening"] OR [mh "Psychological Tests"] OR "case finding":ti,ab OR casefinding:ti,ab OR instrument:ti,ab OR inventory:ti,ab OR questionnaire:ti,ab,kw OR scale:ti,ab OR screening:ti,ab OR screened:ti,ab OR screens:ti,ab OR screen*:ti,ab OR Surveillance:ti,ab,kw OR Survey:ti,ab,kw OR Test:ti,ab OR tests:ti,ab OR testing:ti,ab OR “Ages and Stages Questionnaire”:ti,ab OR “Battelle Developmental Inventory Screening Test”:ti,ab OR “Clinical Adaptive Test”:ti,ab OR "Clinical Linguistic and Auditory Milestone Scale" OR “Denver Developmental Screening Test”:ti,ab OR “Early Language Milestone Scale”:ti,ab OR “Fluharty Preschool Speech”:ti,ab OR “Infant Toddler Checklist”:ti,ab OR “Language Development Survey”:ti,ab OR “McArthur Bates Communicative Development Inventory”:ti,ab OR WILSTAAR:ti,ab OR “Preschool Language Scale”:ti,ab OR "Brigance Preschool Screen" OR "Denver Articulation Screening Exam" OR "Early Screening Profiles" OR "Northwestern Syntax Screening Test" OR "Sure Start Language Measure"	791,611
#5	#3 AND #4	5,106
#6	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR "case control":ti,ab,kw OR "case report":ti,ab,kw OR "case reports":ti,ab,kw OR "case series":ti,ab,kw OR comment:pt OR "comment on" OR congress:pt OR cross-sectional:ti,ab,kw OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR letter:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt OR ([mh Animals] NOT [mh Humans]) OR rats:ti,ab,kw OR cow:ti,ab,kw OR cows:ti,ab,kw OR chicken:ti,ab,kw OR chickens:ti,ab,kw OR horse:ti,ab,kw OR horses:ti,ab,kw OR mice:ti,ab,kw OR mouse:ti,ab,kw OR bovine:ti,ab,kw OR sheep OR ovine OR murine OR murinae	88,533
#7	#5 NOT #6	3,826
#8	#7 AND (boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR ”first grade”:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	1,278
#9	#8 Limited to Years First Published between 2021 to 2023	191 (all results are trials)

Appendix B1. Original Search Strategies

Cochrane Library, Diagnostic Accuracy, January 17, 2023

ID	Search	Hits
#1	[mh "Communication Disorders"] OR [mh "Rehabilitation of Speech and Language Disorders"]	2,267
#2	("communication" NEXT disorder*):ti,ab OR dysarthria:ti,ab,kw OR ("developmental language" NEXT disorder*) OR DLD:ti,ab OR ("language development" NEXT disorder*) OR "language impairment" OR (receptive:ti,ab AND expressive:ti,ab AND delay:ti,ab) OR ((speech*:ti,ab OR language*:ti,ab) AND (disorder*:ti,ab OR delay*:ti,ab OR pathology*:ti,ab)) OR “speech impairment”	7,366
#3	(#1 OR #2) NOT (autism:ti OR "down syndrome":ti OR "fragile syndrome":ti OR craniofacial:ti OR "cleft palate":ti)	8,483
#4	[mh "Diagnostic Techniques and Procedures"] OR [mh "Language Tests"] OR [mh "Mass Screening"] OR [mh "Psychological Tests"] OR "case finding":ti,ab OR casefinding:ti,ab OR instrument:ti,ab OR inventory:ti,ab OR questionnaire:ti,ab,kw OR scale:ti,ab OR screening:ti,ab OR screened:ti,ab OR screens:ti,ab OR screen*:ti,ab OR Surveillance:ti,ab,kw OR Survey:ti,ab,kw OR Test:ti,ab OR tests:ti,ab OR testing:ti,ab	791,608
#5	#3 AND #4	5,439
#6	[mh "Risk"]	39,729
#7	#3 AND #6	105
#8	#5 OR #7	5,483
#9	[mh "Area Under Curve"] OR [mh "Diagnosis, Differential"] OR [mh "Diagnostic Techniques and Procedures"] OR [mh "False Negative Reactions"] OR [mh "False Positive Reactions"] OR [mh "Likelihood Functions"] OR [mh "Predictive Value of Tests"] OR [mh "Reproducibility of Results"] OR [mh "ROC Curve"] OR [mh "Sensitivity and Specificity"] OR accuracy:ti,ab,kw OR "false positive":ti,ab,kw OR "false negative":ti,ab,kw OR "likelihood ratio":ti,ab,kw OR "predictive value":ti,ab,kw OR reproducib*:ti,ab,kw OR ROC:ti,ab,kw OR sensitivity:ti,ab,kw OR specificity:ti,ab,kw	333,608
#10	#8 AND #9	1,343
#11	#10 AND (boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	487
#12	"Ages and Stages Questionnaire":ti,ab OR "Battelle Developmental Inventory Screening Test":ti,ab OR "Clinical Adaptive Test":ti,ab OR "Clinical Linguistic and Auditory Milestone Scale" OR "Denver Developmental Screening Test":ti,ab OR "Early Language Milestone Scale":ti,ab OR "Fluharty Preschool Speech":ti,ab OR "Infant Toddler Checklist":ti,ab OR "Language Development Survey":ti,ab OR "McArthur Bates Communicative Development Inventory":ti,ab OR "WILSTAAR":ti,ab OR "Preschool Language Scale":ti,ab	258
#13	"Brigance Preschool Screen" OR "Denver Articulation Screening Exam" OR "Early Screening Profiles" OR "Northwestern Syntax Screening Test" OR "Sure Start Language Measure"	1
#14	#12 OR #13	259
#15	#14 AND #9	37
#16	#15 AND (boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	37
#17	#11 OR #16	522
#18	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR comment:pt OR "comment on" OR congress:pt OR cross-sectional:ti,ab,kw OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR letter:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt OR ([mh Animals] NOT [mh Humans]) OR rats:ti,ab,kw OR cow:ti,ab,kw OR cows:ti,ab,kw OR chicken:ti,ab,kw OR chickens:ti,ab,kw OR horse:ti,ab,kw OR horses:ti,ab,kw OR mice:ti,ab,kw OR mouse:ti,ab,kw OR bovine:ti,ab,kw OR sheep OR ovine OR murine OR murinae	64,226
#19	#17 NOT #18	366
#20	#19 Limited to Years First Published between 2021 to 2023	27 (all results are trials)

Appendix B1. Original Search Strategies

Cochrane Library, Interventions and Harms of Interventions, January 17, 2023

ID	Search	Hits
#1	[mh "Communication Disorders"] OR [mh "Rehabilitation of Speech and Language Disorders"]	2,267
#2	(("communication" NEXT disorder*):ti,ab OR dysarthria:ti,ab,kw OR ("developmental language" NEXT disorder*) OR DLD:ti,ab OR ("language development" NEXT disorder*) OR "language impairment" OR (receptive:ti,ab AND expressive:ti,ab AND delay:ti,ab) OR ((speech*:ti,ab OR language*:ti,ab) AND (disorder*:ti,ab OR delay*:ti,ab OR pathology*:ti,ab)) OR “speech impairment”)	6,883
#3	(#1 OR #2) NOT (autism:ti OR "down syndrome":ti OR "fragile syndrome":ti OR craniofacial:ti OR "cleft palate":ti)	8,135
#4	[mh "Communication Aids for Disabled"] OR "Comparative Study":pt OR [mh "Early Medical Intervention"] OR "Evaluation Studies":pt OR [mh "Evaluation Studies as Topic"] OR [mh "Epidemiologic Studies"] OR [mh Gestures] OR [mh Multilingualism] OR [mh "Outcome and Process Assessment, Health Care"] OR [mh "Rehabilitation of Speech and Language Disorders"] OR [mh "Therapy, Computer-Assisted"] OR [mh therapeutics] OR [mh /TH] OR treatment:kw OR intervention*:ti,ab OR "language facilitation":ti,ab OR "speech therapy":ti,ab	954,578
#5	#3 AND #4	6,287
#6	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR "case control":ti,ab,kw OR "case report":ti,ab,kw OR "case reports":ti,ab,kw OR "case series":ti,ab,kw OR comment:pt OR "comment on" OR congress:pt OR cross-sectional:ti,ab,kw OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR letter:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt OR ([mh Animals] NOT [mh Humans]) OR rats:ti,ab,kw OR cow:ti,ab,kw OR cows:ti,ab,kw OR chicken:ti,ab,kw OR chickens:ti,ab,kw OR horse:ti,ab,kw OR horses:ti,ab,kw OR mice:ti,ab,kw OR mouse:ti,ab,kw OR bovine:ti,ab,kw OR sheep OR ovine OR murine OR murinae	88,533
#7	#5 NOT #6	4,391
#8	(boys:ti,ab,kw OR child:ti,ab,kw OR children*:ti,ab,kw OR childhood:ti,ab,kw OR girls:ti,ab,kw OR infant*:ti,ab,kw OR Kindergarten*:ti,ab,kw OR neonat*:ti,ab,kw OR newborn*:ti,ab,kw OR pediatric*:ti,ab,kw OR paediatric*:ti,ab,kw OR Prekindergarten*:ti,ab,kw OR Pre-kindergarten*:ti,ab,kw OR Pre-k:ti,ab,kw OR Preschool*:ti,ab,kw OR Pre-school*:ti,ab,kw OR Toddler*:ti,ab,kw)	230,223
#9	#7 AND #8	1,579
#10	#9 Limited to Years First Published between 2022 to 2023	239 (all results are trials)

Appendix B1. Original Search Strategies

APA PsycInfo, Screening, January 17, 2023

#	Query	Limiters/Expanders	Results
1	DE “Communication Disorders” OR DE “Language Disorders” OR DE “Speech Disorders” OR DE “Language Delay”	Expanders – Apply equivalent subjects Search modes – Find all my search terms	19,031
2	TI “communication disorder*” OR AB “communication disorder*” OR DE “Dysarthria” OR TX dysarthria OR TX “developmental language disorder*” OR TI DLD OR AB DLD OR TX “language development disorder*” OR TX “language impairment” OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI 86athology*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB 86athology*)) OR TX “speech impairment”	Expanders – Apply equivalent subjects Search modes – Find all my search terms	47,386
3	(S1 OR S2) NOT ((TI autism OR TI “down syndrome” OR TI “fragile syndrome” OR TI craniofacial OR TI “cleft palate”))	Expanders – Apply equivalent subjects Search modes – Find all my search terms	50,061
4	DE “Diagnostic Criteria” OR DE “Screening” OR DE “Screening Tests” OR DE “Questionnaires” OR DE “Testing” OR DE “Surveys” OR TI “case finding” OR AB “case finding” OR TI casefindng OR AB casefinding OR TI instrument OR AB instrument OR TI inventory OR AB inventory OR TI questionnaire OR AB questionnaire OR TI scale OR AB scale OR TI screening OR AB screening OR TI screened OR AB screened OR TI screens OR TI screens OR TI screen* OR AB screen* OR TX surveillance OR TX survey OR TI test OR AB test OR TI tests OR AB tests OR TI testing OR AB testing	Expanders – Apply equivalent subjects Search modes – Find all my search terms	1,611,251
5	TX “Ages and Stages Questionnaire” OR TX “Battelle Developmental Inventory Screening Test” OR TX “Clinical Adaptive Test” OR TX “Clinical Linguistic and Auditory Milestone Scale” OR TX “Denver Developmental Screening Test” OR TX “Early Language Milestone Scale” OR TX “Fluharty Preschool Speech” OR TX “Infant-Toddler Checklist” OR TX “Language Development Survey” OR TX “McArthur-Bates Communicative Development Inventory” OR TX WILSTAAR OR TX “Preschool Language Scale” OR TX “Brigance Preschool Screen” OR TX “Denver Articulation Screening Exam” OR TX “Early Screening Profiles” OR TX “Northwestern Syntax Screening Test” OR TX “Sure Start Language Measure”	Expanders – Apply equivalent subjects Search modes – Find all my search terms	1,848
6	S4 OR S5	Expanders – Apply equivalent subjects Search modes – Find all my search terms	1,611,884
7	S3 AND S6	Expanders – Apply equivalent subjects Search modes – Find all my search terms	16,529
8	DE “Autobiography” OR DE “Biography” OR DE “Case Report” OR DE “Newspapers” (DE “Biography” OR DE “Newspapers” OR TX “comment on” OR TW “case report*” OR TX “case series” OR TX congress OR TX “cross-sectional” OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX “legal case” OR TX legislation OR TX “patient education handout” OR TX “periodical index” OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Expanders – Apply equivalent subjects Search modes – Find all my search terms	680,692
9	S7 NOT S8	Expanders – Apply equivalent subjects Search modes – Find all my search terms	15,247
10	S9	Limiters – English; Language: English; Population Group: Human Expanders – Apply equivalent subjects	13,586

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
		Search modes – Find all my search terms	
11	S10	Limiters – Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders – Apply equivalent subjects Search modes – Find all my search terms	3,031
12	TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI "first grade" OR AB "first grade" OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*	Limiters – Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders – Apply equivalent subjects Search modes – Find all my search terms	149,226
13	S10 AND S12	Expanders – Apply equivalent subjects Search modes – Find all my search terms	2,828
14	S11 OR S13	Expanders – Apply equivalent subjects Search modes – Find all my search terms	3,031
15	S14	Limiters – Published Date: 20211001-20231231 Expanders – Apply equivalent subjects Search modes – Find all my search terms	91
16	S15	Limiters – Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders – Apply equivalent subjects Search modes – Find all my search terms	4
17	"randomized controlled trial" OR "controlled clinical trial" OR TI randomized OR AB randomized OR TI randomly OR AB randomly OR TI trial OR AB trial OR TI groups OR AB groups	Expanders – Apply equivalent subjects Search modes – Find all my search terms	1,163,206
18	S15 AND S17	Expanders – Apply equivalent subjects Search modes – Find all my search terms	37
19	(TX cohort OR (TX control AND TX study) OR (TX control AND TX group*) OR TX "epidemiologic stud*" OR TX program OR MR "clinical trial" OR TX "comparative stud*" OR TX "evaluation stud*" OR TX survey* OR DE "Followup Studies" OR TX "follow-up*" OR TX "time factors") NOT ((PO Animal NOT PO Human) OR TI editorial OR AB editorial OR DE "Literature Review" OR MR "meta analysis" OR TI consensus OR AB consensus OR TI guideline OR AB guideline)	Expanders – Apply equivalent subjects Search modes – Find all my search terms	1,578,343
20	S15 AND S19	Expanders – Apply equivalent subjects Search modes – Find all my search terms	44

APA PsycInfo, Diagnostic Accuracy, January 17, 2023

#	Query	Limiters/Expanders	Results
1	DE "Communication Disorders" OR DE "Language Disorders" OR DE "Speech Disorders" OR DE "Language Delay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	19,031
2	TI "communication disorder*" OR AB "communication disorder*" OR DE "Dysarthria" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	47,386
3	(S1 OR S2) NOT ((TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate"))	Expanders - Apply equivalent subjects Search modes - Find all my search terms	50,061
4	S3	Limiters - English; Language: English; Population Group: Human Expanders - Apply equivalent subjects Search modes - Find all my search terms	44,071
5	S4	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,246
6	DE "Diagnostic Criteria" OR DE "Screening" OR DE "Screening Tests" OR DE "Questionnaires" OR DE "Testing" OR DE "Surveys" OR TI "case finding" OR AB "case finding" OR TI casefindng OR AB casefinding OR TI instrument OR AB instrument OR TI inventory OR AB inventory OR TI questionnaire OR AB questionnaire OR TI scale OR AB scale OR TI screening OR AB screening OR TI screened OR AB screened OR TI screens OR TI screens OR TI screen* OR AB screen* OR TX surveillance OR TX survey OR TI test OR AB test OR TI tests OR AB tests OR TI testing OR AB testing	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	67,035
7	S5 AND S6	Expanders - Apply equivalent subjects Search modes - Find all my search terms	559
8	DE "Risk Assessment" OR DE "Risk Factors"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	169,152
9	S5 AND S8	Expanders - Apply equivalent subjects Search modes - Find all my search terms	32
10	S7 OR S9	Expanders - Apply equivalent subjects Search modes - Find all my search terms	575
11	TX accuracy OR TX "Area Under Curve" OR DE "Differential Diagnosis" OR TX "Diagnostic Technique*" OR TX “Diagnostic Procedur*” OR TX "False Negative" OR TX "False Positive" OR TX "likelihood function*” OR TX "likelihood ratio" OR DE "Predictive Validity" OR TX "predictive value" OR TX reproducib* OR TX ROC OR TX sensitivity OR TX specificity	Expanders - Apply equivalent subjects Search modes - Find all my search terms	322,459
12	S10 AND S11	Expanders - Apply equivalent subjects Search modes - Find all my search terms	100

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
13	S12	Limiters - Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders - Apply equivalent subjects Search modes - Find all my search terms	15
14	S12 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	25
15	S13 OR S14	Expanders - Apply equivalent subjects Search modes - Find all my search terms	27
16	TX “Ages and Stages Questionnaire” OR TX “Battelle Developmental Inventory Screening Test” OR TX “Clinical Adaptive Test” OR TX "Clinical Linguistic and Auditory Milestone Scale" OR TX “Denver Developmental Screening Test” OR TX “Early Language Milestone Scale” OR TX “Fluharty Preschool Speech” OR TX “Infant-Toddler Checklist” OR TX “Language Development Survey” OR TX “McArthur-Bates Communicative Development Inventory” OR TX WILSTAAR OR TX “Preschool Language Scale”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,762
17	"Brigance Preschool Screen" OR TX "Denver Articulation Screening Exam" OR TX "Early Screening Profiles" OR TX "Northwestern Syntax Screening Test" OR TX "Sure Start Language Measure"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	98
18	S16 OR S17	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,848
19	S18	Limiters - English; Language: English; Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs); Population Group: Human Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,354
20	S19 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,250
21	S19 OR S20	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,354
22	S21	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	43

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
23	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX “case stud*” OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	25,742
24	S22 NOT S23	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	38
25	S15 OR S24	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	65
26	S25 AND PO Human	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	65
27	S26	Limiters - Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders - Apply equivalent subjects Search modes - Find all my search terms	1
28	S26 NOT S27	Expanders - Apply equivalent subjects Search modes - Find all my search terms	64

APA PsycInfo, Interventions and Harms of Interventions, January 17, 2023

#	Query	Limiters/Expanders	Results
1	DE "Communication Disorders" OR DE "Language Disorders" OR DE "Speech Disorders" OR DE "Language Delay"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	19,031
2	TI "communication disorder*" OR AB "communication disorder*" OR DE "Dysarthria" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	47,386
3	(S1 OR S2) NOT (TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate")	Expanders - Apply equivalent subjects Search modes - Find all my search terms	50,061
4	DE “Speech Therapy” OR DE "Language Therapy" OR DE "Treatment" OR DE "Adjunctive Treatment" OR DE "Anxiety Management" OR DE "Behavior Modification" OR DE "Cognitive Techniques" OR DE "Computer Assisted Therapy" OR DE "Counseling" OR DE "Culturally Adapted Interventions" OR DE "Habilitation" OR DE "Interdisciplinary Treatment Approach" OR DE "Intervention" OR DE "Early Intervention" OR DE "Multimodal Treatment Approach" OR DE "Outpatient Treatment" OR DE "Personal Therapy" OR DE "Physical Treatment Methods" OR DE "Psychoeducation" OR DE "Psychotherapy" OR DE "Rehabilitation" OR DE "Self-Help Techniques" OR DE "Symptoms Based Treatment" OR DE "Therapeutic Processes" OR DE "Video-Based Interventions" OR DE "Gestures" OR DE "Multilingualism" OR DE "Bilingualism" OR TX “communication aids” OR TX “comparative stud*” OR TX “early medical intervention*” OR TX “evaluation stud*” OR TX “epidemiologic stud*” OR TI treatment OR AB treatment OR TI “language facilitation” OR AB “language facilitation” OR TI “speech therapy” OR AB “speech therapy”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	947,464
5	S3 AND S4	Expanders - Apply equivalent subjects Search modes - Find all my search terms	15,098
6	S5	Limiters - English; Language: English Expanders - Apply equivalent subjects Search modes - Find all my search terms	14,075
7	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Limiters - English; Language: English Expanders - Apply equivalent subjects Search modes - Find all my search terms	657,094
8	S6 NOT S7	Limiters - English; Language: English Expanders - Apply equivalent subjects Search modes - Find all my search terms	12,793
9	S8 AND PO Human	Limiters - English; Language: English Expanders - Apply equivalent subjects Search modes - Find all my search terms	12,291

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
10	S9	Limiters - Age Groups: Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs) Expanders - Apply equivalent subjects Search modes - Find all my search terms	2,102
11	S9 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5,478
12	S10 OR S11	Expanders - Apply equivalent subjects Search modes - Find all my search terms	5,595
13	S12	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	163
14	“randomized controlled trial” OR “controlled clinical trial” OR TI randomized OR AB randomized OR TI randomly OR AB randomly OR TI trial OR AB trial OR TI groups OR AB groups	Limiters - Published Date: 20211001-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	46,365
15	S13 AND S14	Expanders - Apply equivalent subjects Search modes - Find all my search terms	60
16	S13	Limiters - Methodology: -Systematic Review, META ANALYSIS, METASYNTHESIS Expanders - Apply equivalent subjects Search modes - Find all my search terms	9
17	S16 NOT S15	Expanders - Apply equivalent subjects Search modes - Find all my search terms	4
18	TI "Diagnostic Errors" OR AB “Diagnostic Errors” OR DE "Psychological Stress" OR DE "Life Changes" OR DE "Prejudice" OR DE "Stereotyped Attitudes" OR DE "Self-Concept" OR DE "Academic Self Concept" OR DE "Self-Confidence" OR DE "Self-Congruence" OR DE "Self-Esteem" OR DE "Self-Forgiveness" OR DE "Self-Regard" OR DE "Self-Worth" OR DE "Sense of Coherence" OR DE "Patient Safety" OR TX harm* OR DE "Labeling" OR TX overdiagnos* OR DE "Stigma" OR DE "Self-Stigma"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	224,271
19	S13 AND S18	Expanders - Apply equivalent subjects Search modes - Find all my search terms	3
20	(TX cohort OR (TX control AND TX study) OR (TX control AND TX group*) OR TX “epidemiologic stud*” OR TX program OR MR "clinical trial" OR TX “comparative stud*” OR TX “evaluation stud*” OR TX survey* OR DE "Followup Studies" OR TX “follow-up*” OR TX “time factors”) NOT ((PO Animal NOT PO Human) OR TI editorial OR AB editorial OR DE "Literature Review” OR MR “meta analysis” OR TI consensus OR AB consensus OR TI guideline OR AB guideline)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	1,578,343
21	S19 AND S20	Expanders - Apply equivalent subjects Search modes - Find all my search terms	2

Appendix B1. Original Search Strategies

ERIC, Interventions and Harms of Interventions, January 18, 2023

#	Query	Limiters/Expanders	Results
1	DE "Aphasia" OR DE "Articulation Impairments" OR DE "Communication Disorders" OR DE "Delayed Speech" OR DE "Language Impairments" OR OR DE "Receptive Language" OR DE "Speech Impairments" OR DE "Speech Language Pathology"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	6,770
2	TI "communication disorder*" OR AB "communication disorder*" OR TX dysarthria OR TX "developmental language disorder*" OR TI DLD OR AB DLD OR TX "language development disorder*" OR TX "language impairment" OR (TI receptive AND TI expressive AND TI delay) OR (AB receptive AND AB expressive AND AB delay) OR ((TI speech* OR TI language*) AND (TI disorder* OR TI delay* OR TI patholog*)) OR ((AB speech* OR AB language*) AND (AB disorder* OR AB delay* OR AB patholog*)) OR TX “speech impairment”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	11,294
3	S1 OR S2	Expanders - Apply equivalent subjects Search modes - Find all my search terms	14,583
4	(S1 OR S2) NOT (TI autism OR TI "down syndrome" OR TI "fragile syndrome" OR TI craniofacial OR TI "cleft palate")	Expanders - Apply equivalent subjects Search modes - Find all my search terms	13,033
5	DE “Speech Therapy” OR DE "Behavior Modification" OR DE "Applied Behavior Analysis" OR DE "Contingency Management" OR DE "Positive Behavior Supports" OR DE "Counseling" OR OR DE "Family Counseling" OR DE "Individual Counseling" OR DE "Parent Counseling" OR DE "School Counseling" OR DE "Intervention" OR DE "Early Intervention" OR DE "Prereferral Intervention" OR DE "Response to Intervention" OR DE "Personal Therapy" OR DE "Psychotherapy" OR DE "Rehabilitation" OR DE "Therapy" OR DE "Educational Therapy" OR DE "Therapeutic Recreation" OR DE "Multilingualism" OR DE "Bilingualism" OR TX “communication aids” OR TX “comparative stud*” OR TX “early medical intervention*” OR TX “evaluation stud*” OR TX “epidemiologic stud*” OR TI treatment OR AB treatment OR TI “language facilitation” OR AB “language facilitation” OR TI “speech therapy” OR AB “speech therapy”	Expanders - Apply equivalent subjects Search modes - Find all my search terms	144,877
6	S4 AND S5	Expanders - Apply equivalent subjects Search modes - Find all my search terms	4,665
7	DE "Autobiography" OR DE "Biography" OR DE "Case Report" OR DE "Newspapers" (DE "Biography" OR DE "Newspapers" OR TX "comment on" OR TW "case report*" OR TX "case series" OR TX congress OR TX "cross-sectional" OR TX dictionary OR TX directory OR TX editorial OR TX festschrift OR TX "legal case" OR TX legislation OR TX "patient education handout" OR TX "periodical index" OR TX rats OR TX cow OR TX cows OR TX chicken OR TX chickens OR TX horse OR TX horses OR TX mice OR TX mouse OR TX bovine OR TX sheep OR TX ovine OR TX murine OR TX murinae	Expanders - Apply equivalent subjects Search modes - Find all my search terms	102,447
8	S6 NOT S7	Expanders - Apply equivalent subjects Search modes - Find all my search terms	4,461
9	S8	Limiters - Published Date: 20210101-20231231 Expanders - Apply equivalent subjects Search modes - Find all my search terms	373

Appendix B1. Original Search Strategies

#	Query	Limiters/Expanders	Results
10	S9	Limiters - Education Level: Early Childhood Education, Elementary Education, Grade 1 Expanders - Apply equivalent subjects Search modes - Find all my search terms	63
11	S9 AND (TI boys OR AB boys OR TI child OR AB child OR TI Children* OR AB Children* OR TI childhood OR AB childhood OR TI girls OR AB girls OR TI Kindergarten* OR AB Kindergarten* OR TO Prekindergarten* OR AB Prekindergarten* OR TI Pre-k OR AB Pre-k OR TI Pre-kindergarten* OR AB Pre-kindergarten* OR TI Preschool* OR AB Preschool* OR TI Pre-school* OR AB Pre-school* OR TI pediatric* OR AB pediatric* OR TI paediatric* OR AB paediatric* OR TI Toddler* OR AB Toddler*)	Expanders - Apply equivalent subjects Search modes - Find all my search terms	211
12	S10 OR S11	Expanders - Apply equivalent subjects Search modes - Find all my search terms	224
13	“randomized controlled trial” OR “controlled clinical trial” OR TI randomized OR AB randomized OR TI randomly OR AB randomly OR TI trial OR AB trial OR TI groups OR AB groups	Expanders - Apply equivalent subjects Search modes - Find all my search terms	293,396
14	S12 AND S13	Expanders - Apply equivalent subjects Search modes - Find all my search terms	99
15	TX “systematic literature review” OR TX “systematic review” OR TX “meta-analysis” OR TX "meta-analyses" OR TX “meta synthesis” OR TX "Umbrella Review"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	11,006
16	S12 AND S15	Expanders - Apply equivalent subjects Search modes - Find all my search terms	16
17	TI "Diagnostic Errors" OR AB “Diagnostic Errors” OR DE "Psychological Stress" OR DE "Life Changes" OR DE "Prejudice" OR DE "Stereotyped Attitudes" OR DE "Self-Concept" OR DE "Academic Self Concept" OR DE "Self-Confidence" OR DE "Self-Congruence" OR DE "Self-Esteem" OR DE "Self-Forgiveness" OR DE "Self-Regard" OR DE "Self-Worth" OR DE "Sense of Coherence" OR DE "Patient Safety" OR TX harm* OR DE "Labeling" OR TX overdiagnos* OR DE "Stigma" OR DE "Self-Stigma"	Expanders - Apply equivalent subjects Search modes - Find all my search terms	12,029
18	S12 AND S17	Expanders - Apply equivalent subjects Search modes - Find all my search terms	2

Linguistic and Language Behavior Abstracts (ProQuest), January 18, 2023

Linguistic and Language Behavior Abstracts Interventions and Harms of Interventions
SRs + MAs = 14; 13 imported
RCTs = 10; 2 imported
Harms = 10; 2 imported

All searches were done in Advanced Search limited to Specific date range Start October 4, 2021; End December 31, 2023.
Limited to these Source Types:
Scholarly Journals
Working Papers
Limited to these Document Types:
Article
Evidence Based Healthcare
Fund/Grant/Fellowship/Award
Report
Limited to Language: English

Search for Systematic Reviews:
(((((MAINSUBJECT.EXPLODE("Communication Disorders") OR AB,TI("communication disorder*")) AND (dysarthria OR "developmental language disorder*" OR DLD OR "language development disorder*" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) NOT TI(autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND (MAINSUBJECT("Bilingualism") OR MAINSUBJECT("Multilingualism") OR MAINSUBJECT("Communication Aids") OR MAINSUBJECT("Therapy") OR AB,TI(intervention*) OR treatment OR AB,TI("language facilitation") OR AB,TI(speech therapy) OR AB,TI(evaluation))) AND (boys OR child OR children* OR childhood OR girls OR infant* OR Kindergarten* OR neonat* OR newborn* OR pediatric* OR paediatric* OR Prekindergarten* OR Pre-kindergarten* OR Pre-k OR Preschool* OR Pre-school* OR Toddler*)) AND ("systematic literature review" OR "systematic review" OR "meta-analysis" OR "meta-analyses" OR "meta synthesis" OR "Umbrella Review")

Search for RCTs:
(((((MAINSUBJECT.EXPLODE("Communication Disorders") OR AB,TI("communication disorder*")) AND (dysarthria OR "developmental language disorder*" OR DLD OR "language development disorder*" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) NOT TI(autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND (MAINSUBJECT("Bilingualism") OR MAINSUBJECT("Multilingualism") OR MAINSUBJECT("Communication Aids") OR MAINSUBJECT("Therapy") OR AB,TI(intervention*) OR treatment OR AB,TI("language facilitation") OR AB,TI(speech therapy) OR AB,TI(evaluation))) AND (boys OR child OR children* OR childhood OR girls OR infant* OR Kindergarten* OR neonat* OR newborn* OR pediatric* OR paediatric* OR Prekindergarten* OR Pre-kindergarten* OR Pre-k OR Preschool*

OR Pre-school* OR Toddler*)) AND ("randomized controlled trial" OR "controlled clinical trial" OR TI(randomized) OR AB(randomized) OR TI(randomly) OR AB(randomly) OR TI(trial) OR AB(trial) OR TI(groups) OR AB(groups))

Search for Harms:
(((((MAINSUBJECT.EXPLODE("Communication Disorders") OR AB,TI("communication disorder*")) AND (dysarthria OR "developmental language disorder*" OR DLD OR "language development disorder*" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) NOT TI(autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND (MAINSUBJECT("Bilingualism") OR MAINSUBJECT("Multilingualism") OR MAINSUBJECT("Communication Aids") OR MAINSUBJECT("Therapy") OR AB,TI(intervention*) OR treatment OR AB,TI("language facilitation") OR AB,TI(speech therapy) OR AB,TI(evaluation))) AND (boys OR child OR children* OR childhood OR girls OR infant* OR Kindergarten* OR neonat* OR newborn* OR pediatric* OR paediatric* OR Prekindergarten* OR Pre-kindergarten* OR Pre-k OR Preschool* OR Pre-school* OR Toddler*)) AND ("Diagnostic Errors" OR Stress OR "Life Change Events" OR "Prejudice" OR "Stereotyping" OR "Self Concept" OR "adverse effect*" OR harm* OR labeling OR overdiagnos* OR stigma*)

Grey Literature

ClinicalTrials.gov Advanced/Expert Search, January 18, 2023

Screening and Diagnostic Accuracy: 40 results; 40 imported to EndNote

Condition box:
"Developmental Language Disorder" OR "Developmental Language Disorders" OR "Developmental Language Disorder and Language Impairment" OR Dysarthria OR "Language Development Disorders" OR "Language Delay" OR "Language Development" OR "Language; Developmental Disorder, Expressive" OR "Language Disorder" OR "Language Disorders" OR "Language Impairment" OR "Specific Language Impairment" OR "Speech and Language Disorder" OR "Speech Articulation Disorder" OR "Speech Disorders" OR "Speech Disorders in Children" OR "Speech Sound Disorder" OR "Speech Sound Disorders" OR dysarthria OR EXPAND[Concept] "developmental language disorder" OR DLD OR EXPAND[Concept] "language development disorder" OR EXPAND[Concept] "language impairment" OR receptive AND expressive AND delay OR (speech* OR language*) AND (disorder* OR delay* OR patholog*) OR EXPAND[Concept] "speech impairment"

Intervention box:
("Diagnostic Techniques and Procedures" OR "Language Tests" OR "Psychological Tests" OR instrument* OR inventory OR questionnaire* OR scale OR screening OR "Area Under Curve" OR "differential diagnosis" OR "Diagnostic Techniques and Procedures" OR "Likelihood Functions" OR "Predictive Value of Tests" OR accuracy OR "false positive" OR "false negative" OR "likelihood ratio" OR "predictive value" OR reproducib* OR ROC OR sensitivity OR specificity) NOT (pharmacotherap* OR Drug* OR medicin* OR surg* OR Placebo OR autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")

Together in Expert Search:
AREA[ConditionSearch] (("Developmental Language Disorder" OR "Developmental Language Disorders" OR "Developmental Language Disorder and Language Impairment" OR Dysarthria OR "Language Development Disorders" OR "Language Delay" OR "Language Development" OR "Language; Developmental Disorder, Expressive" OR "Language Disorder" OR "Language Disorders" OR "Language Impairment" OR "Specific Language Impairment" OR "Speech and Language Disorder" OR "Speech Articulation Disorder" OR "Speech Disorders" OR "Speech Disorders in Children" OR "Speech Sound Disorder" OR "Speech Sound Disorders") OR (dysarthria OR "developmental language disorder" OR DLD OR "language development disorder" OR "language impairment" OR (receptive AND expressive AND delay) OR ((speech* OR language*) AND (disorder* OR delay* OR patholog*)) OR "speech impairment")) AND AREA[InterventionSearch] ((EXPAND[Concept] "Diagnostic Techniques and Procedures" OR EXPAND[Concept] "Language Tests" OR EXPAND[Concept] "Psychological Tests" OR instrument* OR inventory OR questionnaire* OR scale OR screening OR EXPAND[Concept] "Area Under Curve" OR EXPAND[Concept] "differential diagnosis" OR EXPAND[Concept] "Diagnostic Techniques and Procedures" OR EXPAND[Concept] "Likelihood Functions" OR EXPAND[Concept] "Predictive Value of Tests" OR accuracy OR EXPAND[Concept] "false positive" OR EXPAND[Concept] "false negative" OR EXPAND[Concept] "likelihood ratio" OR

EXPAND[Concept] "predictive value" OR reproducib* OR ROC OR sensitivity OR specificity) AND NOT (pharmacotherap* OR Drug* OR medicin* OR surg* OR Placebo OR autism OR EXPAND[Concept] "down syndrome" OR EXPAND[Concept] "fragile syndrome" OR craniofacial OR EXPAND[Concept] "cleft palate")) AND AREA[StdAge] EXPAND[Term] COVER[FullMatch] "Child" AND AREA[LastUpdatePostDate] EXPAND[Term] RANGE[01/01/2014, 01/18/2023]

Limited to children and Last Update 1/1/2014 – 01/18/2023

Interventions: 134 results; 113 imported to EndNote

Condition box:
"Developmental Language Disorder" OR "Developmental Language Disorders" OR "Developmental Language Disorder and Language Impairment" OR Dysarthria OR "Language Development Disorders" OR "Language Delay" OR "Language Development" OR "Language; Developmental Disorder, Expressive" OR "Language Disorder" OR "Language Disorders" OR "Language Impairment" OR "Specific Language Impairment" OR "Speech and Language Disorder" OR "Speech Articulation Disorder" OR "Speech Disorders" OR "Speech Disorders in Children" OR "Speech Sound Disorder" OR "Speech Sound Disorders" OR dysarthria OR EXPAND[Concept] "developmental language disorder" OR DLD OR EXPAND[Concept] "language development disorder" OR EXPAND[Concept] "language impairment" OR receptive AND expressive AND delay OR (speech* OR language*) AND (disorder* OR delay* OR patholog*) OR EXPAND[Concept] "speech impairment"

Intervention box:
(Bilingualism OR "Communication Aids for Disabled" OR "Comparative Study" OR "Early Medical Intervention" OR "Evaluation Study" OR "Epidemiologic Study" OR Gestures OR "family workshop" OR "Intensive Language Action Therapy" OR intervention* OR "language facilitation" OR "Language Therapy" OR Multilingualism OR "Outcome and Process Assessment" OR "Parent-implemented intervention" OR "Rehabilitation of Speech and Language Disorders" OR "Speech and Language Therapy" OR "Speech Therapy" OR "Therapy, Computer-Assisted" OR therapeutics OR treatment*) NOT (pharmacotherap* OR Drug* OR medicin* OR surg* Placebo OR autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")

Limited to children and Last Update 1/1/2014 – 01/18/2023

Together in Expert Search:
AREA[ConditionSearch] ("Developmental Language Disorder" OR "Developmental Language Disorders" OR "Developmental Language Disorder and Language Impairment" OR Dysarthria OR "Language Development Disorders" OR "Language Delay" OR "Language Development" OR "Language; Developmental Disorder, Expressive" OR "Language Disorder" OR "Language Disorders" OR "Language Impairment" OR "Specific Language Impairment" OR "Speech and Language Disorder" OR "Speech Articulation Disorder" OR "Speech Disorders" OR "Speech Disorders in Children" OR "Speech Sound Disorder" OR "Speech Sound Disorders" OR dysarthria OR EXPAND[Concept] "developmental language disorder" OR DLD OR

EXPAND[Concept] "language development disorder" OR EXPAND[Concept] "language impairment" OR receptive AND expressive AND delay OR (speech* OR language*) AND (disorder* OR delay* OR patholog*) OR EXPAND[Concept] "speech impairment") AND AREA[InterventionSearch] ((Bilingualism OR "Communication Aids for Disabled" OR "Comparative Study" OR "Early Medical Intervention" OR "Evaluation Study" OR "Epidemiologic Study" OR Gestures OR “family workshop” OR “Intensive Language Action Therapy” OR intervention* OR "language facilitation" OR “Language Therapy” OR Multilingualism OR "Outcome and Process Assessment" OR “Parent-implemented intervention” OR “Rehabilitation of Speech and Language Disorders” OR “Speech and Language Therapy” OR “Speech Therapy” OR "Therapy, Computer-Assisted" OR therapeutics OR treatment*) NOT (pharmacotherap* OR Drug* OR medicin* OR surg* Placebo OR autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")) AND AREA[StdAge] EXPAND[Term] COVER[FullMatch] "Child" AND AREA[LastUpdatePostDate] EXPAND[Term] RANGE[01/01/2014, 01/18/2023]

WHO International Clinical Trials Registry Platform (WHO ICTRP), January 18, 2023

Screening and Diagnostic Accuracy Search: 7 results, 7 imported to EndNote

Condition box:
“Developmental Language Disorder” OR “Developmental Language Disorders” OR “Developmental Language Disorder and Language Impairment” OR Dysarthria OR “Language Development Disorders” OR “Language Delay” OR “Language Development” OR “Language; Developmental Disorder, Expressive” OR “Language Disorder” OR “Language Disorders” OR “Language Impairment” OR “Specific Language Impairment” OR “Speech and Language Disorder” OR “Speech Articulation Disorder” OR “Speech Disorders” OR “Speech Disorders in Children” OR “Speech Sound Disorder” OR “Speech Sound Disorders” OR dysarthria OR "developmental language disorder" OR DLD OR "language development disorder" OR "language impairment" OR receptive AND expressive AND delay OR (speech* OR language*) AND (disorder* OR delay* OR patholog*) OR "speech impairment"

Intervention box:
("Diagnostic Techniques and Procedures" OR "Language Tests" OR "Psychological Tests" OR instrument* OR inventory OR questionnaire* OR scale OR screening OR "Area Under Curve" OR "differential diagnosis" OR "Diagnostic Techniques and Procedures" OR "Likelihood Functions" OR "Predictive Value of Tests" OR accuracy OR "false positive" OR "false negative" OR "likelihood ratio" OR "predictive value" OR reproducib* OR ROC OR sensitivity OR specificity) NOT (pharmacotherap* OR Drug* OR medicin* OR surg* OR Placebo OR autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")

Selected Recruitment: ALL

Selected box to Search for clinical trials in children

Limited to dates: January 1, 2014 to January 18, 2023

Appendix B1. Original Search Strategies

Interventions Search: 63 results, 60 imported to EndNote

Condition box:
“Developmental Language Disorder” OR “Developmental Language Disorders” OR “Developmental Language Disorder and Language Impairment” OR Dysarthria OR “Language Development Disorders” OR “Language Delay” OR “Language Development” OR “Language; Developmental Disorder, Expressive” OR “Language Disorder” OR “Language Disorders” OR “Language Impairment” OR “Specific Language Impairment” OR “Speech and Language Disorder” OR “Speech Articulation Disorder” OR “Speech Disorders” OR “Speech Disorders in Children” OR “Speech Sound Disorder” OR “Speech Sound Disorders” OR dysarthria OR "developmental language disorder" OR DLD OR "language development disorder" OR "language impairment" OR receptive AND expressive AND delay OR (speech* OR language*) AND (disorder* OR delay* OR patholog*) OR "speech impairment"

Intervention box:
(Bilingualism OR "Communication Aids for Disabled" OR "Comparative Study" OR "Early Medical Intervention" OR "Evaluation Study" OR "Epidemiologic Study" OR Gestures OR “family workshop” OR “Intensive Language Action Therapy” OR intervention* OR "language facilitation" OR “Language Therapy” OR Multilingualism OR "Outcome and Process Assessment" OR “Parent implemented intervention” OR “Rehabilitation of Speech and Language Disorders” OR “Speech and Language Therapy” OR “Speech Therapy” OR "Therapy, Computer-Assisted" OR therapeutics OR treatment*) NOT (pharmacotherap* OR Drug* OR medicin* OR surg* Placebo OR autism OR "down syndrome" OR "fragile syndrome" OR craniofacial OR "cleft palate")

Selected Recruitment: ALL

Selected box to Search for clinical trials in children

Limited to dates: January 1, 2014 to January 18, 2023

Appendix B2. Eligibility Criteria

Category	Include	Exclude
Population	**KQs 1–3:** Unselected or explicitly asymptomatic children age 5 years or younger who communicate using any language **KQs 4–6:** Children who were diagnosed with a speech and language delay or disorder at age 6 years or younger* **All KQs:** A priori specific populations of interest include those defined by age, sex, cultural/linguistic background, and native language	Studies limited to children who were preterm infants (under 36 weeks of gestation) or with known conditions associated with speech and language delay or disorder, such as selective mutism, hearing impairment, developmental disorders (e.g., Down syndrome, fragile X syndrome, and autism), craniofacial anomalies, or neurological/neurogenetic disorders
Setting	**KQs 1–3:** Primary care settings and primary care–referable settings, childcare, schools, and other education settings **KQs 4–6:** Clinical, educational, early intervention, and home settings	All other settings
Screening	All validated tools and procedures applicable for use in primary care–relevant settings, designed to identify a speech and/or language delay or impairment, that meet the following criteria: 10 minutes or less to administer or to be interpreted in a primary care setting 10 minutes or more if completed by a parent or teacher and interpreted by the clinician Tools specifically for speech and/or language and general developmental instruments with a separate component for speech and/or language skills are eligible	Instruments not designed for use in children age 5 years or younger, tools that take more than 10 minutes to administer or that are not feasible to administer in primary care settings General developmental screening instruments that do not include a separate component for speech and language skills
Treatment/ Interventions	Any interventions designed to improve speech and/or language in children delivered at any age, as long as diagnosis occurs when child is age 6 years or younger; interventions may be delivered in various formats (e.g., individual or group settings, face-to-face, or via telehealth); therapists may be speech-language pathologists or other clinicians, parents, or teachers	Interventions delivered to children diagnosed after age 6 years
Comparisons	**KQs 1, 3:** Screened vs. unscreened populations **KQs 2, 3:** Screening tools vs. reference standard (diagnostic evaluation by qualified clinical professional) **KQs 4–6:** Intervention vs. no intervention (or usual care)	**KQs 1, 3:** No comparator **KQ 2:** Another screening tool **KQs 4–6:** No comparator, studies comparing two active interventions (i.e., comparative effectiveness)
Outcomes	**KQs 1, 4:** Speech and language outcomes, including speech domains (e.g., stuttering, fluency, articulation) and language domains (e.g., expressive language, receptive language, phonology, vocabulary, syntax, pragmatics) **KQs 1, 5:** Measures of academic skills or achievement (e.g., reading comprehension), behavior competence, socioemotional functioning, and quality of life **KQ 2:** Measures of screening test accuracy (e.g., sensitivity, specificity, positive and negative predictive value, likelihood ratios, area under the curve) **KQ 3:** Harms of screening, including labeling, stigma, parent anxiety, and other psychosocial harms **KQ 6:** Harms of interventions, including overdiagnosis, labeling, stigma, and others	All other outcomes

Appendix B2. Eligibility Criteria

Category	Include	Exclude
Study Designs	**KQs 1, 3, 6:** Controlled cohort studies; RCTs; nonrandomized, controlled trials **KQ 2:** Cross-sectional or cohort studies **KQs 4, 5:** RCTs	**All KQs:** Case-control studies, case reports, case series, or systematic reviews
Country	Studies conducted in countries categorized as "Very High" on the Human Development Index, as defined by the United Nations Development Programme	Studies conducted in countries not categorized as "Very High" on the Human Development Index
Quality Rating	Studies rated fair or good quality	Studies rated poor quality
Language of Published Study	English	Non-English

* Age criteria for studies of treatment include children up to age 6 years given that children who would be screened at age 5 years and referred for treatment may not receive services immediately.

Abbreviations: KQ=key question; RCT=randomized, controlled trial.

Randomized, Controlled Trials and Cohort Studies Criteria:

- Initial assembly of comparable groups
- Randomized, controlled trials (RCTs)—adequate randomization, including concealment and whether potential confounders were distributed equally among groups; cohort studies—consideration of potential confounders with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts
- Maintenance of comparable groups (includes attrition, crossovers, adherence, and contamination)
- Important differential loss to followup or overall high loss to followup
- Measurements that are equal, reliable, and valid (includes masking of outcome assessment)
- Clear definition of interventions
- Important outcomes considered
- Analysis: adjustment for potential confounders for cohort studies or intention-to-treat analysis for RCTs; for cluster RCTs, correction for correlation coefficient

Definition of Ratings Based on Above Criteria:

Good: Meets all criteria: Comparable groups are assembled initially and maintained throughout the study (followup ≥80%); reliable and valid measurement instruments are used and applied equally to the groups; interventions are spelled out clearly; important outcomes are considered; and appropriate attention is given to confounders in analysis. In addition, intention-to-treat analysis is used for RCTs.

Fair: Studies will be graded "fair" if any or all of the following problems occur without the important limitations noted in the "poor" category below: Generally comparable groups are assembled initially, but some question remains on whether some (although not major) differences occurred in followup; measurement instruments are acceptable (although not the best) and generally applied equally; some but not all important outcomes are considered; and some but not all potential confounders are accounted for. Intention-to-treat analysis is lacking for RCTs.

Poor: Studies will be graded "poor" if any of the following major limitations exist: Groups assembled initially are not close to being comparable or maintained throughout the study; unreliable or invalid measurement instruments are used or not applied equally among groups (including not masking outcome assessment); and key confounders are given little or no attention. Intention-to-treat analysis is lacking for RCTs.

Diagnostic Accuracy Studies Criteria:

- Screening test relevant, available for primary care, and adequately described
- Credible reference standard, performed regardless of test results
- Reference standard interpreted independently of screening test
- Indeterminate results handled in a reasonable manner
- Spectrum of patients included in study
- Sample size
- Reliable screening test

Definition of Ratings Based on Above Criteria:

Good: Evaluates relevant available screening test; uses a credible reference standard; interprets reference standard independently of screening test; assesses reliability of test; has few or handles indeterminate results in a reasonable manner; includes large number (greater than 100) of broad spectrum patients with and without disease.

Fair: Evaluates relevant available screening test; uses reasonable although not best standard; interprets reference standard independent of screening test; has moderate sample size (50 to 100 subjects) and a "medium" spectrum of patients.

Poor: Has a fatal flaw, such as uses inappropriate reference standard; improperly administers screening test; biased ascertainment of reference standard; has very small sample size or very narrow selected spectrum of patients.

Source: U.S. Preventive Services Task Force. U.S. Preventive Services Task Force, Procedure Manual, Appendix VI. Rockville, MD: U.S. Preventive Services Task Force; 2015[33, 82]

Appendix C. Excluded Articles

X1: Non-English Publication
X2: Ineligible Population
X3: Ineligible/No Screening
X4: Ineligible/No Treatment
X5: Ineligible/No Comparison
X6: Ineligible/No Outcome
X7: Ineligible Setting
X8: Ineligible Study Design
X9: Ineligible Country
X10: Abstract Only
X11: Poor Quality

1. Orellana CI, Wada R, Gillam RB. The use of dynamic assessment for the diagnosis of language disorders in bilingual children: a meta-analysis. *Am J Speech Lang Pathol*. 2019 Aug 9;28(3):1298-317. doi: 10.1044/2019_AJSLP-18-0202. PMID: 31194570. Exclusion Code: X8.

2. Pawlowska M. Evaluation of three proposed markers for language impairment in English: a meta-analysis of diagnostic accuracy studies. *J Speech Lang Hear Res*. 2014 Dec;57(6):2261-73. doi: 10.1044/2014_JSLHR-L-13-0189. PMID: 25198731. Exclusion Code: X8.

3. Mackay MT, Chua ZK, Lee M, et al. Stroke and nonstroke brain attacks in children. *Neurology*. 2014 Apr 22;82(16):1434-40. doi: 10.1212/WNL.0000000000000343. PMID: 24658929. Exclusion Code: X2.

4. Haghish EF, Vach W, Hojen A, et al. Estimating measurement error in child language assessments administered by daycare educators in large scale intervention studies. *PLoS One*. 2021;16(11):e0255414. doi: 10.1371/journal.pone.0255414. PMID: 34797825. Exclusion Code: X6.

5. Yeh LL, Liu CC. Comparing the informativeness of single-word samples and connected speech samples in assessing speech sound disorders. *J Speech Lang Hear Res*. 2021 Nov 8;64(11):4071-84. doi: 10.1044/2021_JSLHR-20-00172. PMID: 34618552. Exclusion Code: X3.

6. Sjostrand A, Kefalianos E, Hofslundsengen H, et al. Non-pharmacological interventions for stuttering in children six years and younger. *Cochrane Database Syst Rev*. 2021 Sep 9;9(9):CD013489. doi: 10.1002/14651858.CD013489.pub2. PMID: 34499348. Exclusion Code: X8.

7. Taha J, Stojanovik V, Pagnamenta E. Nonword repetition performance of Arabic-speaking children with and without developmental language disorder: a study on diagnostic accuracy. *J Speech Lang Hear Res*. 2021 Jul 16;64(7):2750-65. doi: 10.1044/2021_JSLHR-20-00556. PMID: 34232699. Exclusion Code: X2.

8. Parsons AA, Ollberding NJ, Copeland KA, et al. Factors associated with residential relocation and effects on early childhood development in a low-income home visitation population. *J Prim Prev*. 2021 Apr;42(2):125-41. doi: 10.1007/s10935-021-00625-4. PMID: 33651259. Exclusion Code: X4.

9. Euler HA, Merkel A, Hente K, et al. Speech restructuring group treatment for 6-to-9-year-old children who stutter: a therapeutic trial. *J Commun Disord*. 2021 Jan-Feb;89:106073. doi: 10.1016/j.jcomdis.2020.106073. PMID: 33444874. Exclusion Code: X2.

10. McGill N, McLeod S, Ivory N, et al. Randomised controlled trial evaluating active versus passive waiting for speech-language pathology. *Folia Phoniatr Logop*. 2021;73(4):335-54. doi: 10.1159/000508830. PMID: 32756053. Exclusion Code: X4.

11. Rakhlin NV, Li N, Aljughaiman A, et al. Narrative language markers of Arabic language development and impairment. *J Speech Lang Hear Res*. 2020 Oct 16;63(10):3472-87. doi: 10.1044/2020_JSLHR-20-00082. PMID: 32916078. Exclusion Code: X3.

12. Kan PF, Huang S, Winicour E, et al. Vocabulary growth: dual language learners at risk for language impairment. *Am J Speech Lang Pathol*. 2020 Aug 4;29(3):1178-95. doi: 10.1044/2020_AJSLP-19-00160. PMID: 32750277. Exclusion Code: X2.
13. Willadsen E, Persson C, Patrick K, et al. Assessment of prelinguistic vocalizations in real time: a comparison with phonetic transcription and assessment of inter-coder-reliability. *Clin Linguist Phon*. 2020 Jul 2;34(7):593-616. doi: 10.1080/02699206.2019.1681516. PMID: 31711312. Exclusion Code: X6.
14. Celik P, Ayranci Sucakli I, Yakut HI. Which Bayley-III cut-off values should be used in different developmental levels? *Turk J Med Sci*. 2020 Jun 23;50(4):764-70. doi: 10.3906/sag-1910-69. PMID: 31905494. Exclusion Code: X2.
15. Faldt A, Fabian H, Thunberg G, et al. The study design of ComAlong Toddler: a randomised controlled trial of an early communication intervention. *Scand J Public Health*. 2020 Jun;48(4):391-9. doi: 10.1177/1403494819834755. PMID: 31068096. Exclusion Code: X8.
16. Alt M, Mettler HM, Erikson JA, et al. Exploring input parameters in an expressive vocabulary treatment with late talkers. *J Speech Lang Hear Res*. 2020 Jan 22;63(1):216-33. doi: 10.1044/2019_JSLHR-19-00219. PMID: 31944869. Exclusion Code: X5.
17. Barker RM, Romski M, Sevcik RA, et al. Intervention focus moderates the association between initial receptive language and language outcomes for toddlers with developmental delay. *Augment Altern Commun*. 2019 Dec;35(4):263-73. doi: 10.1080/07434618.2019.1686770. PMID: 31868037. Exclusion Code: X5.
18. Li'el N, Williams C, Kane R. Identifying developmental language disorder in bilingual children from diverse linguistic backgrounds. *Int J Speech Lang Pathol*. 2019 Dec;21(6):613-22. doi: 10.1080/17549507.2018.1513073. PMID: 30253708. Exclusion Code: X3.
19. Koushik S, Hewat S, Onslow M, et al. Three Lidcombe program clinic visit options: a phase II trial. *J Commun Disord*. 2019 Nov-Dec;82:105919. doi: 10.1016/j.jcomdis.2019.105919. PMID: 31351345. Exclusion Code: X5.
20. Johnson S, Bountziouka V, Brocklehurst P, et al. Standardisation of the Parent Report of Children's Abilities-Revised (PARCA-R): a norm-referenced assessment of cognitive and language development at age 2 years. *Lancet Child Adolesc Health*. 2019 Oct;3(10):705-12. doi: 10.1016/S2352-4642(19)30189-0. PMID: 31402196. Exclusion Code: X5.
21. Kapa LL, Erikson JA. Variability of executive function performance in preschoolers with developmental language disorder. *Semin Speech Lang*. 2019 Aug;40(4):243-55. doi: 10.1055/s-0039-1692723. PMID: 31311051. Exclusion Code: X4.
22. Lavelli M, Barachetti C, Majorano M, et al. Impacts of a shared book-reading intervention for Italian-speaking children with developmental language disorder. *Int J Lang Commun Disord*. 2019 Jul;54(4):565-79. doi: 10.1111/1460-6984.12460. PMID: 30729644. Exclusion Code: X5.
23. Rudolph JM, Dollaghan CA, Crotteau S. The finite verb morphology composite: values from a community sample. *J Speech Lang Hear Res*. 2019 Jun 19;62(6):1813-22. doi: 10.1044/2019_JSLHR-L-18-0437. PMID: 31112435. Exclusion Code: X2.
24. Korat O, Graister T, Altman C. Contribution of reading an e-book with a dictionary to word learning: comparison between kindergarteners with and without SLI. *J Commun Disord*. 2019 May-Jun;79:90-102. doi: 10.1016/j.jcomdis.2019.03.004. PMID: 30974294. Exclusion Code: X5.
25. Kruythoff-Broekman A, Wiefferink C, Rieffe C, et al. Parent-implemented early language intervention programme for late talkers: parental communicative behaviour change and child language outcomes at 3 and 4 years of age. *Int J Lang Commun Disord*. 2019 May;54(3):451-64. doi: 10.1111/1460-6984.12451. PMID: 30680870. Exclusion Code: X8.

26. Landry SH, Assel MA, Carlo MS, et al. The effect of the Preparing Pequenos small-group cognitive instruction program on academic and concurrent social and behavioral outcomes in young Spanish-speaking dual-language learners. *J Sch Psychol*. 2019 Apr;73:1-20. doi: 10.1016/j.jsp.2019.01.001. PMID: 30961875. Exclusion Code: X2.

27. Goycoolea MV, Levy R, Bustamante MP, et al. Chances of reversibility in early sensory deprivation of the Homo vulnerabilis: a 5-year (and ongoing) prospective study. *Acta Otolaryngol*. 2019 Apr;139(4):357-60. doi: 10.1080/00016489.2018.1538566. PMID: 30734637. Exclusion Code: X2.

28. Faldt A, Nordlund H, Holmqvist U, et al. Nurses' experiences of screening for communication difficulties at 18 months of age. *Acta Paediatr*. 2019 Apr;108(4):662-9. doi: 10.1111/apa.14557. PMID: 30153364. Exclusion Code: X6.

29. Syadar SF, Zarifian T, Modarresi Y, et al. Kurdish Speech Test: a validation study for children aged 3-5years. *Int J Pediatr Otorhinolaryngol*. 2019 Feb;117:61-6. doi: 10.1016/j.ijporl.2018.10.009. PMID: 30579091. Exclusion Code: X3.

30. McLeod S, Masso S. Screening children's speech: the impact of imitated elicitation and word position. *Lang Speech Hear Serv Sch*. 2019 Jan 28;50(1):71-82. doi: 10.1044/2018_LSHSS-17-0141. PMID: 30383182. Exclusion Code: X2.

31. Wu SY, Huang RJ, Tsai IF. The applicability of D, MTLD, and MATTR in Mandarin-speaking children. *J Commun Disord*. 2019 Jan-Feb;77:71-9. doi: 10.1016/j.jcomdis.2018.10.002. PMID: 30686328. Exclusion Code: X3.

32. Oetting JB. Prologue: toward accurate identification of developmental language disorder within linguistically diverse schools. *Lang Speech Hear Serv Sch*. 2018 Apr 5;49(2):213-7. doi: 10.1044/2018_LSHSS-CLSLD-17-0156. PMID: 29621801. Exclusion Code: X8.

33. Fabiano-Smith L, Hoffman K. Diagnostic accuracy of traditional measures of phonological ability for bilingual preschoolers and kindergarteners. *Lang Speech Hear Serv Sch*. 2018 Jan 9;49(1):121-34. doi: 10.1044/2017_LSHSS-17-0043. PMID: 29121152. Exclusion Code: X2.

34. Imeson J, Lowe R, Onslow M, et al. The Lidcombe Program and child language development: long-term assessment. *Clin Linguist Phon*. 2018;32(9):860-75. doi: 10.1080/02699206.2018.1448897. PMID: 29543506. Exclusion Code: X5.

35. Auza BA, Harmon MT, Murata C. Retelling stories: grammatical and lexical measures for identifying monolingual Spanish speaking children with specific language impairment (SLI). *J Commun Disord*. 2018 Jan-Feb;71:52-60. doi: 10.1016/j.jcomdis.2017.12.001. PMID: 29274509. Exclusion Code: X6.

36. Norbury CF, Vamvakas G, Gooch D, et al. Language growth in children with heterogeneous language disorders: a population study. *J Child Psychol Psychiatry*. 2017 Oct;58(10):1092-105. doi: 10.1111/jcpp.12793. PMID: 28921543. Exclusion Code: X4.

37. Fricke S, Burgoyne K, Bowyer-Crane C, et al. The efficacy of early language intervention in mainstream school settings: a randomized controlled trial. *J Child Psychol Psychiatry*. 2017 Oct;58(10):1141-51. doi: 10.1111/jcpp.12737. PMID: 28524257. Exclusion Code: X2.

38. Willinger U, Schmoeger M, Deckert M, et al. Screening for specific language impairment in preschool children: evaluating a screening procedure including the Token Test. *J Psycholinguist Res*. 2017 Oct;46(5):1237-47. doi: 10.1007/s10936-017-9493-z. PMID: 28474204. Exclusion Code: X6.

39. le Clercq CMP, van der Schroeff MP, Rispens JE, et al. Shortened nonword repetition task (NWR-S): a simple, quick, and less expensive outcome to identify children with combined specific language and reading impairment. *J Speech Lang Hear Res*. 2017 Aug 16;60(8):2241-8. doi: 10.1044/2017_JSLHR-L-16-0060. PMID: 28702677. Exclusion Code: X3.

40. Pua EPK, Lee MLC, Rickard Liow SJ. Screening bilingual preschoolers for language difficulties: utility of teacher and parent reports. *J Speech Lang Hear Res*. 2017 Apr 14;60(4):950-68. doi: 10.1044/2016_JSLHR-L-16-0122. PMID: 28297001. Exclusion Code: X5.

41. Liu XL, de Villiers J, Ning C, et al. Research to establish the validity, reliability, and clinical utility of a comprehensive language assessment of Mandarin. *J Speech Lang Hear Res*. 2017 Mar 1;60(3):592-606. doi: 10.1044/2016_JSLHR-L-15-0334. PMID: 28253384. Exclusion Code: X3.

42. Kazemi Y, Saeednia S. The clinical examination of non-word repetition tasks in identifying Persian-speaking children with primary language impairment. *Int J Pediatr Otorhinolaryngol*. 2017 Feb;93:7-12. doi: 10.1016/j.ijporl.2016.11.028. PMID: 28109501. Exclusion Code: X3.

43. Fey ME, Leonard LB, Bredin-Oja SL, et al. A clinical evaluation of the competing sources of input hypothesis. *J Speech Lang Hear Res*. 2017 Jan 1;60(1):104-20. doi: 10.1044/2016_JSLHR-L-15-0448. PMID: 28114610. Exclusion Code: X5.

44. Storkel HL, Voelmle K, Fierro V, et al. Interactive book reading to accelerate word learning by kindergarten children with specific language impairment: identifying an adequate intensity and variation in treatment response. *Lang Speech Hear Serv Sch*. 2017 Jan 1;48(1):16-30. doi: 10.1044/2016_LSHSS-16-0014. PMID: 28036410. Exclusion Code: X5.

45. Haley A, Hulme C, Bowyer-Crane C, et al. Oral language skills intervention in pre-school-a cautionary tale. *Int J Lang Commun Disord*. 2017 Jan;52(1):71-9. doi: 10.1111/1460-6984.12257. PMID: 27296626. Exclusion Code: X2.

46. Murphy KA, Justice LM, O'Connell AA, et al. Understanding risk for reading difficulties in children with language impairment. *J Speech Lang Hear Res*. 2016 Dec 1;59(6):1436-47. doi: 10.1044/2016_JSLHR-L-15-0110. PMID: 27959975. Exclusion Code: X4.

47. Schutte U. Culturally sensitive adaptation of the concept of relational communication therapy as a support to language development: an exploratory study in collaboration with a Tanzanian orphanage. *S Afr J Commun Disord*. 2016 Nov 7;63(1):e1-e13. doi: 10.4102/sajcd.v63i1.166. PMID: 28155305. Exclusion Code: X2.

48. Bagner DM, Garcia D, Hill R. Direct and indirect effects of behavioral parent training on infant language production. *Behav Ther*. 2016 Mar;47(2):184-97. doi: 10.1016/j.beth.2015.11.001. PMID: 26956651. Exclusion Code: X2.

49. Oetting JB, McDonald JL, Seidel CM, et al. Sentence recall by children with SLI across two nonmainstream dialects of English. *J Speech Lang Hear Res*. 2016 Feb;59(1):183-94. doi: 10.1044/2015_JSLHR-L-15-0036. PMID: 26501934. Exclusion Code: X3.

50. Yilmaz D, Bayar-Muluk N, Bayoglu B, et al. Screening 5 and 6 year-old children starting primary school for development and language. *Turk J Pediatr*. 2016;58(2):136-44. doi: 10.24953/turkjped.2016.02.003. PMID: 27976553. Exclusion Code: X5.

51. Ciccia AH, Roizen N, Garvey M, et al. Identification of neurodevelopmental disabilities in underserved children using telehealth (INvesT): clinical trial study design. *Contemp Clin Trials*. 2015 Nov;45(Pt B):226-32. doi: 10.1016/j.cct.2015.10.004. PMID: 26475663. Exclusion Code: X6.

52. Rvachew S, Brosseau-Lapre F. A randomized trial of 12-week interventions for the treatment of developmental phonological disorder in Francophone children. *Am J Speech Lang Pathol*. 2015 Nov;24(4):637-58. doi: 10.1044/2015_AJSLP-14-0056. PMID: 26381229. Exclusion Code: X5.

53. Spencer TD, Petersen DB, Adams JL. Tier 2 language intervention for diverse preschoolers: an early-stage randomized control group study following an analysis of response to intervention. *Am J Speech Lang Pathol*. 2015 Nov;24(4):619-36. doi: 10.1044/2015_AJSLP-14-0101. PMID: 26125951. Exclusion Code: X2.

54. Pratt AS, Justice LM, Perez A, et al. Impacts of parent-implemented early-literacy intervention for Spanish-speaking children with language impairment. *Int J Lang Commun Disord*. 2015 Sep-Oct;50(5):569-79. doi: 10.1111/1460-6984.12140. PMID: 26176703. Exclusion Code: X4.

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Appendix C. Excluded Articles

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Appendix C. Excluded Articles

237. Charkaluk ML, Rousseau J, Calderon J, et al. Ages and Stages Questionnaire at 3 years for predicting IQ at 5-6 years. *Pediatrics*. 2017 Apr;139(4)doi: 10.1542/peds.2016-2798. PMID: 28360034. Exclusion Code: X5.

238. Cunningham BJ, Washington KN, Binns A, et al. Current methods of evaluating speech-language outcomes for preschoolers with communication disorders: a scoping review using the ICF-CY. *J Speech Lang Hear Res*. 2017 Feb 1;60(2):447-64. doi: 10.1044/2016_JSLHR-L-15-0329. PMID: 28219081. Exclusion Code: X8.

239. Anderson PJ, Burnett A. Assessing developmental delay in early childhood - concerns with the Bayley-III scales. *Clin Neuropsychol*. 2017 Feb;31(2):371-81. doi: 10.1080/13854046.2016.1216518. PMID: 27687612. Exclusion Code: X8.

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241. Hsiao C, Richter L, Makusha T, et al. Use of the ages and stages questionnaire adapted for South Africa and Zambia. *Child Care Health Dev*. 2017 Jan;43(1):59-66. doi: 10.1111/cch.12413. PMID: 27709653. Exclusion Code: X5.

242. Cleland J, Scobbie JM, Heyde C, et al. Covert contrast and covert errors in persistent velar fronting. *Clin Linguist Phon*. 2017;31(1):35-55. doi: 10.1080/02699206.2016.1209788. PMID: 27610938. Exclusion Code: X4.

243. Preston JL, Leece MC, Maas E. Motor-based treatment with and without ultrasound feedback for residual speech-sound errors. *Int J Lang Commun Disord*. 2017 Jan;52(1):80-94. doi: 10.1111/1460-6984.12259. PMID: 27296780. Exclusion Code: X2.

244. Sutherland R, Trembath D, Hodge A, et al. Telehealth language assessments using consumer grade equipment in rural and urban settings: feasible, reliable and well tolerated. *J Telemed Telecare*. 2017 Jan;23(1):106-15. doi: 10.1177/1357633X15623921. PMID: 26768598. Exclusion Code: X2.

245. Kim SW, Kim JY, Lee SY, et al. The comparison of M-B CDI-K Short Form and K-ASQ as screening test for language development. *Ann Rehabil Med*. 2016 Dec;40(6):1108-13. doi: 10.5535/arm.2016.40.6.1108. PMID: 28119842. Exclusion Code: X2.

246. Simpson S, D'Aprano A, Tayler C, et al. Validation of a culturally adapted developmental screening tool for Australian Aboriginal children: early findings and next steps. *Early Hum Dev*. 2016 Dec;103:91-5. doi: 10.1016/j.earlhumdev.2016.08.005. PMID: 27544061. Exclusion Code: X3.

247. Thomas DC, McCabe P, Ballard KJ, et al. Telehealth delivery of Rapid Syllable Transitions (ReST) treatment for childhood apraxia of speech. *Int J Lang Commun Disord*. 2016 Nov;51(6):654-71. doi: 10.1111/1460-6984.12238. PMID: 27161038. Exclusion Code: X2.

248. Armon-Lotem S, Meir N. Diagnostic accuracy of repetition tasks for the identification of specific language impairment (SLI) in bilingual children: evidence from Russian and Hebrew. *Int J Lang Commun Disord*. 2016 Nov;51(6):715-31. doi: 10.1111/1460-6984.12242. PMID: 26990037. Exclusion Code: X2.

249. Visser M, Nel M, Bronkhorst C, et al. Childhood disability population-based surveillance: assessment of the Ages and Stages Questionnaire Third Edition and Washington Group on Disability Statistics/UNICEF module on child functioning in a rural setting in South Africa. *Afr J Disabil*. 2016;5(1):265. doi: 10.4102/ajod.v5i1.265. PMID: 28730058. Exclusion Code: X5.

Appendix C. Excluded Articles

250. Salim SS, Mustafa MB, Asemi A, et al. A speech pronunciation practice system for speech-impaired children: a study to measure its success. *Res Dev Disabil*. 2016 Sep;56:41-59. doi: 10.1016/j.ridd.2016.05.013. PMID: 27262125. Exclusion Code: X5.

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252. Goldstein H, Kelley E, Greenwood C, et al. Embedded instruction improves vocabulary learning during automated storybook reading among high-risk preschoolers. *J Speech Lang Hear Res*. 2016 Jun 1;59(3):484-500. doi: 10.1044/2015_JSLHR-L-15-0227. PMID: 27123881. Exclusion Code: X2.

253. van der Linde J, Swanepoel W, Hanekom L, et al. Early detection of communication delays with the PEDS tools in at-risk South African infants. *Afr J Disabil*. 2016;5(1):223. doi: 10.4102/ajod.v5i1.223. PMID: 28730050. Exclusion Code: X9.

254. Kim JH, Ballard E, McCann CM. Parent-rated measures of bilingual children's speech accuracy: implications for a universal speech screen. *Int J Speech Lang Pathol*. 2016 Apr;18(2):202-11. doi: 10.3109/17549507.2015.1081284. PMID: 27172854. Exclusion Code: X6.

255. Guo LY, Schneider P. Differentiating school-aged children with and without language impairment using tense and grammaticality measures from a narrative task. *J Speech Lang Hear Res*. 2016 Apr 1;59(2):317-29. doi: 10.1044/2015_JSLHR-L-15-0066. PMID: 27088899. Exclusion Code: X2.

256. D'Aprano A, Silburn S, Johnston V, et al. Adaptation of the Ages and Stages Questionnaire for remote Aboriginal Australia. *Qual Health Res*. 2016 Apr;26(5):613-25. doi: 10.1177/1049732314562891. PMID: 25488936. Exclusion Code: X6.

257. Lousada M, Valente ARS, Mendes A. Validation of a pediatric speech and language screening (RALF). *Folia Phoniatr Logop*. 2016;68(6):247-51. doi: 10.1159/000479928. PMID: 29176312. Exclusion Code: X8.

258. Mirawdeli A, Howell P. Is it necessary to assess fluent symptoms, duration of dysfluent events, and physical concomitants when identifying children who have speech difficulties? *Clin Linguist Phon*. 2016;30(9):696-719. doi: 10.1080/02699206.2016.1179345. PMID: 27315282. Exclusion Code: X5.

259. Armijo I, Schonhaut L, Cordero M. Validation of the Chilean version of the Ages and Stages Questionnaire (ASQ-CL) in community health settings. *Early Hum Dev*. 2015 Dec;91(12):671-6. doi: 10.1016/j.earlhumdev.2015.10.001. PMID: 26513627. Exclusion Code: X5.

260. Siu AL, U.S. Preventive Services Task Force. Screening for speech and language delay and disorders in children aged 5 years or younger: U.S. Preventive Services Task Force recommendation statement. *Pediatrics*. 2015 Aug;136(2):e474-81. doi: 10.1542/peds.2015-1711. PMID: 26152670. Exclusion Code: X8.

261. El-Behadli AF, Neger EN, Perrin EC, et al. Translations of developmental screening instruments: an evidence map of available research. *J Dev Behav Pediatr*. 2015 Jul-Aug;36(6):471-83. doi: 10.1097/DBP.0000000000000193. PMID: 26154718. Exclusion Code: X8.

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263. Park J, Miller CA, Mainela-Arnold E. Processing speed measures as clinical markers for children with language impairment. *J Speech Lang Hear Res*. 2015 Jun;58(3):954-60. doi: 10.1044/2015_JSLHR-L-14-0092. PMID: 25682521. Exclusion Code: X5.

264. Freed J, McBean K, Adams C, et al. Performance of children with social communication disorder on the Happe Strange Stories: physical and mental state responses and relationship to language ability. *J Commun Disord*. 2015 May-Jun;55:1-14. doi: 10.1016/j.jcomdis.2015.03.002. PMID: 25935076. Exclusion Code: X2.

265. Kwun Y, Park HW, Kim MJ, et al. Validity of the Ages and Stages Questionnaires in Korean compared to Bayley Scales of Infant Development-II for screening preterm infants at corrected age of 18-24 months for neurodevelopmental delay. *J Korean Med Sci*. 2015 Apr;30(4):450-5. doi: 10.3346/jkms.2015.30.4.450. PMID: 25829813. Exclusion Code: X2.

266. Kazemi Y, Klee T, Stringer H. Diagnostic accuracy of language sample measures with Persian-speaking preschool children. *Clin Linguist Phon*. 2015 Apr;29(4):304-18. doi: 10.3109/02699206.2014.1003097. PMID: 25606693. Exclusion Code: X3.

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269. De-Andres-Beltran B, Rodriguez-Fernandez AL, Gueita-Rodriguez J, et al. Evaluation of the psychometric properties of the Spanish version of the Denver Developmental Screening Test II. *Eur J Pediatr*. 2015 Mar;174(3):325-9. doi: 10.1007/s00431-014-2410-7. PMID: 25164064. Exclusion Code: X3.

270. Preston JL, McCabe P, Rivera-Campos A, et al. Ultrasound visual feedback treatment and practice variability for residual speech sound errors. *J Speech Lang Hear Res*. 2014 Dec;57(6):2102-15. doi: 10.1044/2014_JSLHR-S-14-0031. PMID: 25087938. Exclusion Code: X2.

271. McKnight S. Implementing the Ages and Stages Questionnaire in health visiting practice. *Community Pract*. 2014 Nov;87(11):28-32. PMID: 25612412. Exclusion Code: X6.

272. Taylor OD, Armfield NR, Dodrill P, et al. A review of the efficacy and effectiveness of using telehealth for pediatric speech and language assessment. *J Telemed Telecare*. 2014 Oct;20(7):405-12. doi: 10.1177/1357633X14552388. PMID: 25400002. Exclusion Code: X8.

273. Damico JS, Nettleton SK, Damico HL, et al. Discriminant validity with a direct observational assessment system: research with previously identified groups. *Clin Linguist Phon*. 2014 Jul-Aug;28(7-8):617-26. doi: 10.3109/02699206.2014.926999. PMID: 25000382. Exclusion Code: X2.

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275. Srinithiwat B, Ularntinon S. Concurrent validity of the Ages & Stages Questionnaires, Third Edition, Thai-version (ASQ-3 Thai) with the Denver Developmental Screening Test II (DDST-II) in developmental screening of 18, 24, and 30 months old children at Queen Sirikit National Institute of Child Health. *J Med Assoc Thai*. 2014 Jun;97 Suppl 6:S6-13. PMID: 25391166. Exclusion Code: X5.

276. Kim SW, Jeon HR, Park EJ, et al. The usefulness of M-B CDI-K Short Form as screening test in children with language developmental delay. *Ann Rehabil Med*. 2014 Jun;38(3):376-80. doi: 10.5535/arm.2014.38.3.376. PMID: 25024962. Exclusion Code: X2.

277. Mononen R, Aunio P, Koponen T. A pilot study of the effects of RightStart instruction on early numeracy skills of children with specific language impairment. *Res Dev Disabil*. 2014 May;35(5):999-1014. doi: 10.1016/j.ridd.2014.02.004. PMID: 24629543. Exclusion Code: X2.

278. Crowe K, Cuervo S, Guiberson M, et al. A systematic review of interventions for multilingual preschoolers with speech and language difficulties. *J Speech Lang Hear Res*. 2021 Nov 8;64(11):4413-38. doi: 10.1044/2021_JSLHR-21-00073. PMID: 34554866. Exclusion Code: X8.

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280. Zhang Z, Xu Q, Joshi RM. A meta-analysis on the effectiveness of intervention in children with primary speech and language delays/disorders: focusing on China and the United States. *Clin Psychol Psychother*. 2021 May;28(3):585-605. doi: 10.1002/cpp.2522. PMID: 33068068. Exclusion Code: X8.

281. Dubois P, St-Pierre MC, Desmarais C, et al. Young adults with developmental language disorder: a systematic review of education, employment, and independent living outcomes. *J Speech Lang Hear Res*. 2020 Nov 13;63(11):3786-800. doi: 10.1044/2020_JSLHR-20-00127. PMID: 33022192. Exclusion Code: X2.

282. Stanford E, Durrleman S, Delage H. The effect of working memory training on a clinical marker of French-speaking children with developmental language disorder. *Am J Speech Lang Pathol*. 2019 Nov 19;28(4):1388-410. doi: 10.1044/2019_AJSLP-18-0238. PMID: 31419156. Exclusion Code: X2.

283. Biggs EE, Carter EW, Gilson CB. Systematic review of interventions involving aided AAC modeling for children with complex communication needs. *Am J Intellect Dev Disabil*. 2018 Sep;123(5):443-73. doi: 10.1352/1944-7558-123.5.443. PMID: 30198767. Exclusion Code: X8.

284. O'Neill T, Light J, Pope L. Effects of Interventions that include aided augmentative and alternative communication input on the communication of individuals with complex communication needs: a meta-analysis. *J Speech Lang Hear Res*. 2018 Jul 13;61(7):1743-65. doi: 10.1044/2018_JSLHR-L-17-0132. PMID: 29931287. Exclusion Code: X8.

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286. Wales D, Skinner L, Hayman M. The efficacy of telehealth-delivered speech and language intervention for primary school-age children: a systematic review. *Int J Telerehabil*. 2017 Spring;9(1):55-70. doi: 10.5195/ijt.2017.6219. PMID: 28814995. Exclusion Code: X8.

287. Tosh R, Arnott W, Scarinci N. Parent-implemented home therapy programmes for speech and language: a systematic review. *Int J Lang Commun Disord*. 2017 May;52(3):253-69. doi: 10.1111/1460-6984.12280. PMID: 27943521. Exclusion Code: X8.

288. Chorna O, Hamm E, Cummings C, et al. Speech and language interventions for infants aged 0 to 2 years at high risk for cerebral palsy: a systematic review. *Dev Med Child Neurol*. 2017 Apr;59(4):355-60. doi: 10.1111/dmcn.13342. PMID: 27897320. Exclusion Code: X2.

289. Duran LK, Hartzheim D, Lund EM, et al. Bilingual and home language interventions with young dual language learners: a research synthesis. *Lang Speech Hear Serv Sch*. 2016 Oct 1;47(4):347-71. doi: 10.1044/2016_LSHSS-15-0030. PMID: 27679851. Exclusion Code: X8.

290. Baxter S, Johnson M, Blank L, et al. Non-pharmacological treatments for stuttering in children and adults: a systematic review and evaluation of clinical effectiveness, and exploration of barriers to successful outcomes. *Health Technol Assess*. 2016 Jan;20(2):1-302, v-vi. doi: 10.3310/hta20020. PMID: 26767317. Exclusion Code: X8.

291. Cleave PL, Becker SD, Curran MK, et al. The efficacy of recasts in language intervention: a systematic review and meta-analysis. *Am J Speech Lang Pathol*. 2015 May;24(2):237-55. doi: 10.1044/2015_AJSLP-14-0105. PMID: 25654306. Exclusion Code: X8.

292. Biele G, Lekhal R, Overgaard KR, et al. The effect of special educational assistance in early childhood education and care on psycho-social difficulties in elementary school children. *Child Adolesc Psychiatry Ment Health*. 2022 Feb 24;16(1):14. doi: 10.1186/s13034-022-00442-5. PMID: 35209931. Exclusion Code: X8.

293. Keung AY, Ho VF, Shum KK. Early cognitive intervention using mediated learning for preschoolers with developmental delay: a randomized controlled trial. *Br J Educ Psychol*. 2022 Sep;92(3):1109-32. doi: 10.1111/bjep.12490. PMID: 35195914. Exclusion Code: X2.

294. Rezaeerezvan S, Kareshki H, Pakdaman M. The effect of cognitive-behavioral play therapy on improvements in expressive linguistic disorders of bilingual children. *Front Psychol*. 2021;12:626422. doi: 10.3389/fpsyg.2021.626422. PMID: 35069301. Exclusion Code: X9.

295. Petersen DB, Staskowski M, Spencer TD, et al. The effects of a multitiered system of language support on kindergarten oral and written language: a large-scale randomized controlled trial. *Lang Speech Hear Serv Sch*. 2022 Jan 5;53(1):44-68. doi: 10.1044/2021_LSHSS-20-00162. PMID: 34860575. Exclusion Code: X2.

296. West G, Snowling MJ, Lervag A, et al. Early language screening and intervention can be delivered successfully at scale: evidence from a cluster randomized controlled trial. *J Child Psychol Psychiatry*. 2021 Dec;62(12):1425-34. doi: 10.1111/jcpp.13415. PMID: 33783013. Exclusion Code: X2.

297. Brignell A, Krahe M, Downes M, et al. Interventions for children and adolescents who stutter: a systematic review, meta-analysis, and evidence map. *J Fluency Disord*. 2021 Dec;70:105843. doi: 10.1016/j.jfludis.2021.105843. PMID: 33743406. Exclusion Code: X8.

298. Kueser JB, Leonard LB, Deevy P, et al. Word-learning trajectories influence long-term recall in children with developmental language disorder and typical development. *J Commun Disord*. 2021 Nov-Dec;94:106160. doi: 10.1016/j.jcomdis.2021.106160. PMID: 34768092. Exclusion Code: X3.

299. Calder SD, Claessen M, Leitao S, et al. Evaluating two different dose frequencies and cumulative intervention intensities to improve past tense production for early school-aged children with developmental language disorder. *Int J Lang Commun Disord*. 2021 Nov;56(6):1278-95. doi: 10.1111/1460-6984.12667. PMID: 34431174. Exclusion Code: X8.

300. Frizelle P, Tolonen AK, Tulip J, et al. The impact of intervention dose form on oral language outcomes for children with developmental language disorder. *J Speech Lang Hear Res*. 2021 Aug 9;64(8):3253-88. doi: 10.1044/2021_JSLHR-20-00734. PMID: 34213951. Exclusion Code: X8.

301. Senent-Capuz N, Baixauli-Fortea I, Moret-Tatay C. Parent-implemented Hanen program It Takes Two to Talk((R)): an exploratory study in Spain. *Int J Environ Res Public Health*. 2021 Aug 3;18(15)doi: 10.3390/ijerph18158214. PMID: 34360506. Exclusion Code: X5.

302. Hodgins H, Harrison GL. Improving phonological awareness with Talking Tables in at-risk kindergarten readers. *Res Dev Disabil*. 2021 Aug;115:103996. doi: 10.1016/j.ridd.2021.103996. PMID: 34116299. Exclusion Code: X2.

303. de la Torre Carril A, Duran-Bouza M, Perez-Pereira M. Capacity of the CCC-2 to discriminate ASD from other neurodevelopmental disorders. *Children (Basel)*. 2021 Jul 27;8(8)doi: 10.3390/children8080640. PMID: 34438530. Exclusion Code: X2.

304. Walters C, Sevcik RA, Romski M. Spoken vocabulary outcomes of toddlers with developmental delay after parent-implemented augmented language intervention. *Am J Speech Lang Pathol*. 2021 May 18;30(3):1023-37. doi: 10.1044/2020_AJSLP-20-00093. PMID: 33789437. Exclusion Code: X2.

Appendix C. Excluded Articles

305. Rehfeld DM, Sulak TN. Service delivery schedule effects on speech sound production outcomes. *Lang Speech Hear Serv Sch*. 2021 Apr 20;52(2):728-37. doi: 10.1044/2021_LSHSS-20-00068. PMID: 33822654. Exclusion Code: X5.

306. Byers BA, Bellon-Harn ML, Allen M, et al. A comparison of intervention intensity and service delivery models with school-age children with speech sound disorders in a school setting. *Lang Speech Hear Serv Sch*. 2021 Apr 20;52(2):529-41. doi: 10.1044/2020_LSHSS-20-00057. PMID: 33497584. Exclusion Code: X2.

307. Frizelle P, Tolonen AK, Tulip J, et al. The influence of quantitative intervention dosage on oral language outcomes for children with developmental language disorder: a systematic review and narrative synthesis. *Lang Speech Hear Serv Sch*. 2021 Apr 20;52(2):738-54. doi: 10.1044/2020_LSHSS-20-00058. PMID: 33465314. Exclusion Code: X8.

308. Rinaldi S, Caselli MC, Cofelice V, et al. Efficacy of the treatment of developmental language disorder: a systematic review. *Brain Sci*. 2021 Mar 23;11(3)doi: 10.3390/brainsci11030407. PMID: 33806938. Exclusion Code: X8.

309. Rowe A, Titterington J, Holmes J, et al. A classroom intervention targeting working memory, attention and language skills: a cluster randomised feasibility trial. *Pilot Feasibility Stud*. 2021 Feb 6;7(1):45. doi: 10.1186/s40814-021-00771-w. PMID: 33549138. Exclusion Code: X6.

310. Calder SD, Claessen M, Ebbels S, et al. The efficacy of an explicit intervention approach to improve past tense marking for early school-age children with developmental language disorder. *J Speech Lang Hear Res*. 2021 Jan 14;64(1):91-104. doi: 10.1044/2020_JSLHR-20-00132. PMID: 33332157. Exclusion Code: X2.

311. Donaghy M, O'Brian S, Onslow M, et al. Verbal contingencies in the Lidcombe Program: a noninferiority trial. *J Speech Lang Hear Res*. 2020 Oct 16;63(10):3419-31. doi: 10.1044/2020_JSLHR-20-00155. PMID: 32956008. Exclusion Code: X5.

312. Forrest CL, Gibson JL, Halligan SL, et al. A cross-lagged analysis of emotion regulation, peer problems, and emotional problems in children with and without early language difficulties: evidence from the Millennium Cohort Study. *J Speech Lang Hear Res*. 2020 Apr 27;63(4):1227-39. doi: 10.1044/2020_JSLHR-19-00188. PMID: 32315250. Exclusion Code: X4.

313. Jesus LMT, Martinez J, Santos J, et al. Comparing traditional and tablet-based intervention for children with speech sound disorders: a randomized controlled trial. *J Speech Lang Hear Res*. 2019 Nov 22;62(11):4045-61. doi: 10.1044/2019_JSLHR-S-18-0301. PMID: 31644381. Exclusion Code: X5.

314. Lewis BA, Freebairn L, Tag J, et al. Differential long-term outcomes for individuals with histories of preschool speech sound disorders. *Am J Speech Lang Pathol*. 2019 Nov 19;28(4):1582-96. doi: 10.1044/2019_AJSLP-18-0247. PMID: 31604025. Exclusion Code: X2.

315. Rvachew S, Matthews T. An N-of-1 randomized controlled trial of interventions for children with inconsistent speech sound errors. *J Speech Lang Hear Res*. 2019 Sep 20;62(9):3183-203. doi: 10.1044/2019_JSLHR-S-18-0288. PMID: 31479383. Exclusion Code: X5.

316. Crowe K, Guiberson M. Evidence-based interventions for learners who are deaf and/or multilingual: a systematic quality review. *Am J Speech Lang Pathol*. 2019 Aug 9;28(3):964-83. doi: 10.1044/2019_AJSLP-IDLL-19-0003. PMID: 31398302. Exclusion Code: X2.

317. Plante E, Mettler HM, Tucci A, et al. Maximizing treatment efficiency in developmental language disorder: positive effects in half the time. *Am J Speech Lang Pathol*. 2019 Aug 9;28(3):1233-47. doi: 10.1044/2019_AJSLP-18-0285. PMID: 31343897. Exclusion Code: X5.

318. Majnemer A, O'Donnell M, Ogourtsova T, et al. BRIGHT Coaching: a randomized controlled trial on the effectiveness of a developmental coach system to empower families of children with emerging developmental delay. *Front Pediatr*. 2019;7:332. doi: 10.3389/fped.2019.00332. PMID: 31440489. Exclusion Code: X2.

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321. Silva D, Menezes PL, Almeida GF, et al. Influence of speech-language therapy on P300 outcome in patients with language disorders: a meta-analysis. *Braz J Otorhinolaryngol*. 2019 Jul-Aug;85(4):510-9. doi: 10.1016/j.bjorl.2019.01.012. PMID: 30902588. Exclusion Code: X6.

322. Hattar-Pollara M. Barriers to education of Syrian refugee girls in Jordan: gender-based threats and challenges. *J Nurs Scholarsh*. 2019 May;51(3):241-51. doi: 10.1111/jnu.12480. PMID: 30977586. Exclusion Code: X8.

323. Esmaili SK, Mehraban AH, Shafaroodi N, et al. Participation in peer-play activities among children with specific learning disability: a randomized controlled trial. *Am J Occup Ther*. 2019 Mar/Apr;73(2):7302205110p1-p9. doi: 10.5014/ajot.2018.028613. PMID: 30915972. Exclusion Code: X2.

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325. Curtis PR, Kaiser AP, Estabrook R, et al. The longitudinal effects of early language intervention on children's problem behaviors. *Child Dev*. 2019 Mar;90(2):576-92. doi: 10.1111/cdev.12942. PMID: 28872672. Exclusion Code: X11.

326. Szymaszek A, Dacewicz A, Urban P, et al. Training in temporal information processing ameliorates phonetic identification. *Front Hum Neurosci*. 2018;12:213. doi: 10.3389/fnhum.2018.00213. PMID: 29928195. Exclusion Code: X3.

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Appendix C. Excluded Articles

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Appendix C. Excluded Articles

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391. Rossi JC. The development and evaluation of a program of stimulation for preschool children with delayed motor or language development: ProQuest Information & Learning; 2022. Exclusion Code: X2.

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Appendix C. Excluded Articles

403. Yazejian N, Bryant DM, Hans S, et al. Child and parenting outcomes after 1 year of Educare. *Child Dev*. 2017 Sep;88(5):1671-88. doi: 10.1111/cdev.12688. PMID: 28176302. Exclusion Code: X2.

404. Rowley BA. Child behavioral rating scale kindergarten assessment: analysis of the Child Behavioral Rating Scale (CBRS): ProQuest Information & Learning; 2016. Exclusion Code: X3.

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406. Besner AC. Comparison of placement decisions based on picture naming 10 and picture naming 20: ProQuest Information & Learning; 2015. Exclusion Code: X3.

407. Greenwood CR, Buzhardt J, Walker D, et al. Criterion validity of the early communication indicator for infants and toddlers. *Assessment for Effective Intervention*. 2019;45(4):298-310. doi: 10.1177/1534508418824154. PMID: 2020-60289-006. Exclusion Code: X6.

408. Felimban HS. Developmental and risk status of toddlers from Arab American families: what we know about families today: ProQuest Information & Learning; 2020. Exclusion Code: X4.

409. San Antonio MC, Fenick AM, Shabanova V, et al. Developmental screening using the Ages and Stages Questionnaire. *Infants & Young Children*. 2014;27(2):111-9. doi: 10.1097/iyc.0000000000000005. PMID: 2014-10475-003. Exclusion Code: X6.

410. Staal, II, van Stel HF, Hermanns JM, et al. Early detection of parenting and developmental problems in young children: non-randomized comparison of visits to the well-baby clinic with or without a validated interview. *Int J Nurs Stud*. 2016 Oct;62:1-10. doi: 10.1016/j.ijnurstu.2016.07.001. PMID: 27423790. Exclusion Code: X6.

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415. Silver RB, Newland RP, Hartz K, et al. Integrating early childhood screening in pediatrics: a longitudinal qualitative study of barriers and facilitators. *Clinical Practice in Pediatric Psychology*. 2017;5(4):426-40. doi: 10.1037/cpp0000214

10.1037/cpp0000214.supp (Supplemental). PMID: 2017-55264-012. Exclusion Code: X8.

416. Paul MJ, Thordardottir ET. Investigation of the psychometric properties of the milestones en Français du Québec, a new language screener for French-speaking children between 12 and 71 months. *Canadian Journal of Speech-Language Pathology and Audiology*. 2019;43(2):133-52. PMID: 2019-65932-005. Exclusion Code: X6.

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Appendix C. Excluded Articles

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Appendix C. Excluded Articles

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Appendix D Table 1. Quality Ratings of Studies of Screening Questionnaires and Clinical Prediction Tools (KQ 2), Part 1

First Author, Year	Index Test	Reference Standard	Bias Due to Patient Selection	Comments	Bias Due to Index Test	Comments	Bias Due to Reference Standard	Comments
Faldt, 2021[83]	ITC (Swedish version)	Behavior Sample from CSBS	Low	None	Low	None	Unclear	Unclear if reference standard was scored without knowledge of screening test result.
Holzinger, 2021[40]	SPES-3 (Sprachentwicklungs creening)	Independent diagnoses by two experienced clinical linguists using SETK-3, AWST-R, and spontaneous language sample	Unclear	All screen-positive children from four practices were invited to participate and a random sample of other children who had not had a reference test already (regardless of screening result); the authors partially address potential for spectrum bias using modeling and imputation.	Low	None	Low	None
Kok, 2019[37]	ICS-TC	HKCAT	Low	None	Low	None	Low	None
Nayeb, 2019[39]	Nurse Screenng Nurse-administered comprehensive test (5 items) and ability to use 2-word or 3-word sentences	SLP-administered Reynell Development Language Scales III (Swedish version) and observation of communication	Low	None	Low	None	Low	None

Appendix D Table 1. Quality Ratings of Studies of Screening Questionnaires and Clinical Prediction Tools (KQ 2), Part 1

First Author, Year	Index Test	Reference Standard	Bias Due to Patient Selection	Comments	Bias Due to Index Test	Comments	Bias Due to Reference Standard	Comments
Nayeb, 2021[41]	Nurse Screening Swedish measure—5 comprehension questions, use of two-word utterances—combined screening in both Swedish and maternal langauge	SLP conducted a structured observation during a play session to assess child's ability to talk in multi-word utterances and receptive portion of RDLS	Low	None	Low	None	Low	Authors state that a blinded RA sent de-identified protocols to the SLP who scored screening tests. The same SLP conducted assessments for the reference standard. Since the SLP was not aware of child names on the screening tests, assume that results were not known at the time of the reference test examination.
Pace, 2022[58] (Study 2 only)	QUILS	Auditory Component Subtest of the PLS-5	Unclear	There is no description of how students were selected from participating sites (university speech and hearing clinic, a public school with inclusive preschool and kindergarten classrooms, and preschool programs and Head Start centers in four university sites), whether it was consistent across sites or if there were specific exclusion criteria at the point of recruitment.	Low	Threshold was determined based on optimal sensitivity/specificity values from ROC curves.	Low	None
Vehkavuori, 2018[84]	CDI-SF and CSBS (Finnish)	RDLS III	Unclear	No description of how sample was recruited from larger cohort study.	Unclear	Authors reported using a threshold for the screener, but it was unclear if this was prespecified or based on results of the current analysis.	Unclear	Unclear if results of reference test were interpreted independently of index tests; however, this is unlikely to be a concern given that the reference test is a standardized assessment.

Appendix D Table 1. Quality Ratings of Studies of Screening Questionnaires and Clinical Prediction Tools (KQ 2), Part 1

First Author, Year	Index Test	Reference Standard	Bias Due to Patient Selection	Comments	Bias Due to Index Test	Comments	Bias Due to Reference Standard	Comments
Visser-Bochane, 2021[85]	Dutch well-child language screening protocol (producing a 2-word sentence and pointing out 5 body parts on a doll)	Home visit by SPL, who administered three standardized diagnostic tests; diagnosis was made on a combination of test results	High	Risk of spectrum bias; all children who failed the screening were invited to participate, along with gender-matched children who passed the screening test.	Low	None	Low	None
Visser-Bochane, 2021[38]	ELS	Home visit by language specialist, who administered multiple standardized age-appropriate diagnostic tests*	Low	None	Low	Unclear how the threshold was chosen and whether it was prespecified or based on analyses that informed an optimal threshold.	Unclear	Unclear whether reference test was administered without knowledge of index test results; screening questionnaire was collected by the person conducting a home visit to conduct reference tests.
Wilson, 2022[59]	ASQ and SSLM	PLS-5	Low	None	Low	No single threshold was used for the index test-optimal cutoff scores determined from ROC curve analysis.	Low	None

* Lexilist Comp and Production, Schilchting Lang Comp, Word Prod, Sentence Prod, Language Standard, Communication Checklist.

Abbreviations: ASQ=Ages and Stages Questionnaire; AWST-r=Aktiver Wortschatztest für 3-bis 5-jährige Kinder; CDI-SF=Children's Depression Inventory-Short Form. CSBS=Communication and Symbolic Behavior Scales; ELS=Early Language Scale; HKCAT=Hong Kong Cantonese Articulation Test; ITC=Intelligibility in Context Scale; ICS-TC=Intelligibility in Context Scale–Traditional Chinese; PLS-5= Preschool Language Scale, Fifth Edition; QUILS= Quick Interactive Language Screener; RDLS=Reynell Developmental Language Scales; ROC=receiver operating characteristic; SETK-3=Sprachentwicklungstest für zweijahrige Kinder; SLP=speech-language pathologist; SPEC-3=Sprachentwicklungsscreening; SSLM=Sure Start Language Measure.

Appendix D Table 2. Quality Ratings of Studies of Screening Questionnaires and Clinical Prediction Tools (KQ 2), Part 2

First Author, Year	Bias Due to Flow and Timing	Comments	Overall Quality Rating	Comments	Are There Concerns That the Included Patients Do Not Match the Review Question?	Comments on Applicability
Faldt, 2021[83]	High	Overall, a small proportion of those who had the screening test were evaluted with the reference standard (26% of screen positives and 9% of screen negatives). Sampling from the larger pool who had the index test differed by group (random sampling of screen negatives and nonrandom referral of positives). Although the authors say the children referred were similar to those who were not referred, the reasons for referral are not clear and the children may differ in characteristics not reported or measured. Those not referred had screen-postiive results close to the reference standard and were not incuded in the analysis.	Poor	None	NA	NA
Holzinger, 2021[40]	Low	It is unclear how many children were excluded based on missing data or other factors.	Fair	There is a risk of spectrum bias based on sampling of all positive results and a selection of other children. This was partially addressed using modeling and imputation to estimate accuracy for a larger population.	Yes	Sample limited to German children.
Kok, 2019[37]	Unclear	It is unclear whether the 11% who were excluded for missing data were simiilar to the population analyzed in terms of risk factors for an SLD.	Fair	It is unclear whether the 11% who were excluded for missing data were simiilar to the population analyzed in terms of risk factors for an SLD.	Yes	Population is from those speaking Cantonese in Hong Kong; reference test is specific to this language only.

Appendix D Table 2. Quality Ratings of Studies of Screening Questionnaires and Clinical Prediction Tools (KQ 2), Part 2

First Author, Year	Bias Due to Flow and Timing	Comments	Overall Quality Rating	Comments	Are There Concerns That the Included Patients Do Not Match the Review Question?	Comments on Applicability
Nayeb, 2019[39]	Unclear	Reference standard was conducted within 2 months of the screening, which may be an interval that allows some children who had a positive test result to catch up; 25% were lost to attrition and were excluded from analysis.	Fair	The reference standard was conducted within 2 months of the screening, which may be an interval that allows some children who had a positive test result to catch up; 25% were lost to attrition and were excluded from analysis.	Yes	Sample limited to Swedish children.
Nayeb, 2021[41]	Unclear	Of those screened, 10% did not have the reference test and were excluded from the analysis. It is unclear if they were more or less likely to have an SLD compared with the completers.	Fair	There was a risk of bias related to flow and timing. Not all the participants were included in the analysis; 10% who were screened did not have the reference test and were excluded. It is unclear if they were more or less likely to have an SLD compared with the completers.	Yes	Screening was conducted in Swedish and various other lanaguages not commonly spoken in the United States. The screening occurred in the home setting and was conducted by trained nurses and preschool staff; may not be applicable to screening in U.S. primary care settings.
Pace, 2022[58] (Study 2 only)	Unclear	There is no information on missing data; authors note final sample represented those who "completed both the QUILS and the standardized assessment administered for validation."	Fair	There is no information on methods to select participats from sites or missing data; authors note final sample represented those who "completed both the QUILS and the standardized assessment administered for validation."	Yes	QUILS screener is intended for use in a classroom or community context; it takes approximately 15 minutes to complete.

Appendix D Table 2. Quality Ratings of Studies of Screening Questionnaires and Clinical Prediction Tools (KQ 2), Part 2

First Author, Year	Bias Due to Flow and Timing	Comments	Overall Quality Rating	Comments	Are There Concerns That the Included Patients Do Not Match the Review Question?	Comments on Applicability
Vehkavuori, 2018[84]	Unclear	There is no description of attrition, and it is unclear if the analyzed sample includes all those who completed the index test or a subset of those who completed the index and reference test.	Poor	There was unclear patient selection and no description of attrition or whether those analyzed included all who were recruited vs. only the sample that completed the screening and the index test. It is unclear whether the screening test cut point was prespecified.	NA	NA
Visser-Bochane, 2021[85]	Unclear	The reference standard was conducted within 4 months of the screening, which may be an interval that allows some children who had a positive test result to catch up.	Poor	There was a risk of spectrum bias given the recruitment of all children with screen-positive results and the age-matched sample of children with negative screening results. The reference standard was conducted within 4 months of screeing, which may be an interval that allows some children who had a positive test result to catch up.	Yes	Sample limited to Dutch children.
Visser-Bochane, 2021[38]	Low	None	Fair	It is unclear how the threshold was chosen for the screener and unclear whether the SLP knew the results of screener before administering the reference measure.	Yes	Sample limited to Dutch children.
Wilson, 2022[59]	Unclear	A large proportion of participants who completed the index test did not attend an appointment for the reference test (44%); however, characteristics of those who attended and those who did not were similar, and the reasons for not attending were primairly due to COVID-19 lockdown.	Fair	A large proportion of participants who completed index test did not attend appointment for reference test (44%); however, characteristics of those who attended and those who did not were similar, and reasons for not attending were primairly due to COVID-19 lockdown.	Yes	Children enrolled from the U.K.

Abbreviations: NA=not applicable; QUILS=Quick Interactive Language Screening; SLD=speech language disorder; SLP=speech-language pathologist.

Appendix D Table 3. Quality Ratings of Treatment Cluster Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Randomization Process	Comment on Randomization Process	Bias Due to Timing of Identification or Recruitment of Participants	Comment on Timing of Identification or Recruitment of Participants	Bias Due to Deviations From Intended Interventions	Comment on Deviations From Intended Interventions	Bias Due to Missing Outcome Data	Comment on Missing Outcome Data
McLeod, 2017[64]	Low	None	Low	None	Low	None	Low	None
Wilcox, 2020[69]	Some concerns	None	Low	None	Low	None	Low	Overall, 9% of teachers (clusters) and the children in their classrooms (9% of all children) were lost to attrition due to teachers not continuing in trial; the reasons for attrition varied (moving, teachers let go, and other personal reasons). Of the included children, another 10% had missing data at 1 or more time point.

Appendix D Table 4. Quality Ratings of Treatment Cluster Randomized Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Measurement of the Outcome	Comment on Measurement of the Outcome	Bias Due to Selection of the Reported Result	Comment on Selection of the Reported Result	Overall Bias	Comment for Overall Bias
McLeod, 2017[64]	Low	None	Some concerns	None	Some concerns	No information about selection of reported results or whether multiple eligible analyses of data were conducted. the authors report conducting analyses using multiple imputation but only report primary analyses that includes those with complete data.
Wilcox, 2020[69]	Some concerns	Pre- and post-testing completed by blinded research assistants, but curriculum-based measures in intervention group were completed by teachers (completed by research assistants in the control group)	Some concerns	Data were missing for 10.7% of these measurement points and we assumed that these data were missing at random for all analyses.	Some concerns	Allocation sequence described as a “lottery” with no other information provided. Unclear whether allocation was concealed until all clusters (teachers) were enrolled and assigned to invertenion groups. Only maternal education level and income were described; includes no other baseline characteristics of children or teachers. Intervention assessors were not blinded for curriculum-based outcomes. No information on whether data were analyzed based on a prespecified plan or if multile analyses of data were conducted and current analysis chosen based on results.

Appendix D Table 5. Quality Ratings of Treatment Randomized Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Randomization Process	Comment on Randomization Process	Bias Due to Deviations From Intended Interventions	Comment on Deviations From Intended Interventions	Bias Due to Missing Outcome Data	Comment on Missing Outcome Data
Thordardottir, 2015[65]	Low	None	Some concerns	None	Some concerns	None
McLeod, 2020[63]	Low	None	Some concerns	None	High	None
Roberts, 2015[86-88]	Low	None	Low	None	High	None
Roberts, 2014[89]	Some concerns	None	Low	None	High	None
Peredo, 2022[66]	Low	None	Low	None	Low	None
Acosta-Rodríguez, 2022[67]	Low	None	Some concerns	None	Low	None
Namasivayam, 2021[68]	Some concerns	None	Low	None	Some concerns	None
Delgado-Cruz, 2022[90]	Some concerns	Groups were statistically similar based on age and randomization was adjusted for sex. There are no remarks in the article about the similarity of baseline outcome measures.	Some concerns	No blinding; unclear if there were deviations from the intended intervention due to the trial context.	High	Authors note that 32 participants were excluded for not completing the tests due to repeated absences or lack of cooperation, but it is unclear whether the exclusions occurred before or after randomization. Those who could not cooperate could be at higher risk for speech/language problems.

Appendix D Table 5. Quality Ratings of Treatment Randomized Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Randomization Process	Comment on Randomization Process	Bias Due to Deviations From Intended Interventions	Comment on Deviations From Intended Interventions	Bias Due to Missing Outcome Data	Comment on Missing Outcome Data
Madsen, 2022[91]	High	Intervention was delivered at the level of the classroombut not all classrooms were randomized; some teachers in the treatment arm had been involved in a previous trial and their classrooms continued in the treatment group. Qualitatively meaningful baseline differences were present; treatment children were more likely to be non-Hispanic, Black/African American, speak English at home, live in households earning >$50,000 a year, and have parents with a bachelor's degree than control group children. There was also a small, nonsignificant difference in pre-intervention word scores.	Low	None	Low	None

Appendix D Table 5. Quality Ratings of Treatment Randomized Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Randomization Process	Comment on Randomization Process	Bias Due to Deviations From Intended Interventions	Comment on Deviations From Intended Interventions	Bias Due to Missing Outcome Data	Comment on Missing Outcome Data
Parra-López, 2022[92]	Some concerns	No detail reported about use of allocation concealment. No detail about distribution of age, sex, or other relevant baseline characteristics between groups.	Some concerns	Data were excluded for participants who were excluded post-randomization due to "abandoning" school mid-study or having articulation difficulties caused by organic difficulties. Overall attrition was minimal (5.5%), and therefore, exclusion of missing data would not have introduced problematic amount of bias.	Low	None
Chen, 2022[93]	Some concerns	No detail reported about allocation concealment. No rational provided for why sample size was nearly twice as high in the intervention vs. control arm (34 vs. 15), including whether this was purposeful or if there were post-randomization exclusions or differential attrition (and authors focused on completers only), or other reasons.	Some concerns	No detail about whether attrition occurred or whether ITT or a similar analytic approach was used; authors note that fidelity measures were implemented, but these were not described.	Some concerns	Unclear whether there was attrition/missing data, or if analysis focuses only on children who completed the study.

Abbreviations: ITT=intention to treat.

Appendix D Table 6. Quality Ratings of Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Measurement of the Outcome	Comment on Measurement of the Outcome	Bias Due to Selection of the Reported Result	Comment on Selection of the Reported Result	Overall Bias	Comment for Overall Bias
Thordardottir, 2015[65]	Low	None	Some concerns	None	Some concerns	Of those randomized, 15% (n=5) did not complete the study and were not included in the analysis. In addition, one participant initially randomized to the intervention was reassigned to the control group for logistical reasons. Analysis was modified ITT. Unclear if attrition depended on child's language ability or scores. Authors note factors that could influence child development as reasons for attrition: parental difficulty traveling to intervention site, parental lack of motivation, and other family situations that caused difficulty participating.
McLeod, 2020[63]	Low	None	Low	None	Some concerns	None
Roberts, 2015[86-88]	Some concerns	None	Some concerns	None	High	None
Roberts, 2014[89]	Some concerns	None	Some concerns	None	High	None
Peredo, 2022[66]	Low	None	Low	None	Low	20% overall attrition and 17% differential attrition in this small sample would suggest potential for attrition bias, but sensitivity analyses comparing ITT with complete case data suggest this risk is minimal and not enough to affect the results.
Acosta-Rodríguez, 2022[67]	Low	None	Some concerns	None	Some concerns	Unclear if allocation concealment was used during randomization. No reporting of treatment fidelity or how it might have been measured. No information reported about which analyses were prespecified or how closely applied analyses fit the analytic plan laid out by the protocol.

Appendix D Table 6. Quality Ratings of Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Measurement of the Outcome	Comment on Measurement of the Outcome	Bias Due to Selection of the Reported Result	Comment on Selection of the Reported Result	Overall Bias	Comment for Overall Bias
Namasivayam, 2021[68]	Low	None	Low	None	Some concerns	More patients in wait-list arm (82.6% vs. 65.0%) had a history of speech and language intervention prior to the study. Followup data were missing for 10% to 18% of participants depending on outcome. Unclear if missing data affected the results (or how) and whether the absence of data was related to severity of children's SLD.
Delgado-Cruz, 2022[90]	Some concerns	Unclear if outcome assessors evaluating narrative performance were aware of children's group assignments.	Some concerns	Unclear if analysis was done according to prespecified analysis plan.	High	Authors note that 32 participants were excluded for not completing the tests due to repeated absences or lack of cooperation, but it is unclear whether the exclusions occurred before or after randomization. Children who could not cooperate could be at higher risk for speech/language problems. Unclear whether groups were similar at baseline in terms of speech and language outcomes.
Madsen, 2022[91]	Low	None	Low	None	High	Intervention was delivered at the level of the classroom and was not completely randomized; some teachers in the treatment arm had been involved in a previous trial and their classrooms continued in the treatment group. Qualitatively meaningful baseline differences were present; treatment children were more likely to be non-Hispanic, Black/African American, speak English at home, live in households earning >$50,000 a year, and have parents with a bachelor's degree. There was also a small, nonsignificant difference in pre-intervention word scores.

Appendix D Table 6. Quality Ratings of Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year	Bias Due to Measurement of the Outcome	Comment on Measurement of the Outcome	Bias Due to Selection of the Reported Result	Comment on Selection of the Reported Result	Overall Bias	Comment for Overall Bias
Parra-López, 2022[92]	High	Primary outcome measure was administered in the speech therapy classroom, presumably by the teachers administering the intervention or control lesson plans. Unclear to what extent this introduced outcome assessment bias.	Low	None	High	Most concerning issue was the potential for outcome assessment bias because the primary outcome measure was administered in the speech therapy classroom, presumably by the teachers administering intervention or control lesson plans. No detail was reported about the use of allocation concealment. No statistical evaluation was reported for distribution of age, sex, or other relevant baseline characteristics between groups. Analysis did not include participants who were excluded post-randomization due to "abandoning" school mid-study or having articulation problems caused by organic difficulties. Overall attrition was minimal (5.5%), and therefore, exclusion of missing data would not have introduced a problematic amount of bias.
Chen, 2022[93]	Some concerns	Method for measuring speech discrimination task may not be appropriate—there are other potential reasons children may score low (e.g., poor attention, ADHD). Vocabulary definition production task is appropriate.	Low	None	High	No detail reported about allocation concealment, including rational for why sample size was nearly twice as large in the intervention vs. the control arm (34 vs. 15), Unclear whether there was attrition/missing data, or if the analysis focused only on children who completed the study. Method for measuring speech discrimination task may not be appropriate—there are other potential reasons children may score low (e.g., poor attention, ADHD).

Abbreviations: ADHD=attention deficit hyperactivity disorder; ITT=intention to treat; SLD=speech language disorder.

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Acosta-Rodríguez, 2022[67] RCT Fair	50	67.8	42 NR	School-based curriculum intervention	Children identified by school staff as showing signs of developmental language delay Spain (Canary Islands)	Teachers and speech and language therapists	20 hours of teacher training; 95 (60-minute) sessions delivered by teachers and therapists; weekly visits from research team for support	Curriculum aimed at improving oral language comprehension skills by retelling and story generation, embedded in normal preschool curriculum, delivered jointly by teachers and therapists. Content included a wide range of language skills and activities (e.g., review of low-frequency vocabulary, summary of story highlighting main concepts). Students also completed a series of activities supported by visual material, graphic resources, and multiple-choice questions.	No treatment
Almost, 1998[70] RCT Fair	26	42.0	19 NR	Speech sound disorders	Referrals to speech-language pathology clinic Canada	SLPs	Individual biweekly 30-minute sessions over 4 months	Individual treatment for children with phonological disorders (but normal receptive language function); focused on remediation (e.g., remediation of inclusion of final consonants). Each session focused on a specific phonological process.	No treatment
Gibbard, 1994[60] RCT Fair	36	29.5	31 NR	Language delay	Referrals to a speech-language therapy clinic United Kingdom	Parents	11 (60- to 75-minute) parent training sessions every 2 weeks over 6 months	Parental group training at a community health center to improve child linguistic complexity. Content of sessions included setting objectives and methods and games to achieve objectives. Emphasis was placed on transferring linguistic skills during games to daily life situations.	No treatment

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Girolametto, 1996; Girolametto, 1997[61, 71] RCT Fair	25	28.6	12 NR	Language delay	Waiting lists for 2 self-referred, parent-focused language programs (parents responding to advertisements) Canada	Parents with coaching and feedback from SLPs	8 (2.5-hour) parent training sessions over 11 weeks and 3 home visits from an SLP to provide support	An adapted version of the Hanen Program for Parents, administered by 2 SLPs and a parent associate. Sessions taught strategies via lectures, role-plays, and discussions. Adaptations included providing parents with target words to incorporate into daily routines, training parents to select additional lexical targets once target words were mastered, training parents to introduce new target words, and training parents to model 2-word combinations. SLPs provided 3 home visits for coaching and feedback.	Delayed treatment
Glogowska, 2000[72] RCT Good	159	34.0	25 NR	Community-based speech-language disorders	Referrals to speech-language clinics from primary care United Kingdom	Speech and language therapists	No set duration or frequency; mean hours of therapy received was 6.2 total	Individual speech and language therapy tailored to child's needs provided by therapists at 16 NHS community clinics for children with difficulties in 1 of 3 domains (general language, expressive language, and phonology). Study aimed to evaluate the benefit of routine therapy received by referred children rather than a prescribed regimen.	Watchful waiting
Jones, 2005[73] RCT Fair	54	54.4	22 NR	Fluency disorders	Preschool children presenting to speech clinics for treatment New Zealand	Parents and speech pathologists	Parent training, daily home practice sessions; and weekly clinic visits until fluency improved, followed by less frequent visits	Lidcombe Program of Early Stuttering Intervention delivered according to the program manual. Parents were trained to provide verbal contingencies related to stuttering via acknowledgments ("That was smooth"), praise ("That was good talking"), and request for self-evaluation ("Were there any bumpy words then?") daily, with children initially meeting with a therapist weekly. When stuttering frequency was less than 1.0% of syllables stuttered over 3 consecutive weeks, treatment decreased in frequency.	Wait-list

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Lewis, 2008[74] RCT Fair	22	52.4	36 NR	Fluency disorders	Parent recruited via press advertisements for a study on treatment for stuttering Australia	Parent and SLP via telehealth (telephone, videos, email, mail, audio recordings)	Parent training, daily practice; and weekly telephone visits with SLP until fluency improved, followed by less frequent contacts	Lidcombe Program of Early Stuttering Intervention implemented as similar as possible to the program manual but delivered via telehealth. Parents were trained to provide verbal contingencies related to stuttering in the form of acknowledgments ("That was smooth"), praise ("That was good talking"), and request for self-evaluation ("Were there any bumpy words then?") daily, supported by weekly calls with a therapist. When stuttering frequency was less than 1.0% of syllables stuttered over 3 consecutive weeks, frequency of treatment decreased. SLP observation and evaluation occurred via audio-recorded samples mailed to the therapist. Parent training was conducted using videos.	Regular telephone contacts every 8 weeks, "as a matter of courtesy, to maintain contact, and to facilitate compliance" per authors
McLeod, 2017[64] Cluster RCT Fair	123	56.1*	36* NR	Speech sound disorders	Children recruited via screening of parents and educators for concerns about how children "talked and made speech sounds" Australia	Preset computer-based program facilitated by untrained teachers	Individual 1-hour sessions 4 times per week over 9 weeks (18 hours total) facilitated by teachers†	Software-based intervention, Phoneme Factory Sound Sorte (PFSS), consisting of 7 interactive games customized based on child's needs. Children listened and responded to auditory and visual stimuli that target phoneme segmentation and identification, blending, minimal pair discrimination, and rhyme detection, based on preset modes ("teacher settings") targeting common phonological error patterns. Teachers participated using headphones, assisting when necessary (e.g., when children were not proficient at using the computer mouse to respond to prompts, teachers moved it to the location on the screen where children pointed).	Standard care (typical classroom practices)

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
McLeod, 2020[63] RCT Fair	101	53.10	43* Aboriginal or Torres Strait Islander: 15; Other groups NR	Community-based speech-language intervention	Referrals to 2 community health centers for speech and/or language problems Australia	SLPs	12 weekly 45-minute individual sessions delivered in 2 6-week blocks separated by a 2-week break	Individual therapy reflecting usual practice offered immediately (vs. being wait-listed). A session plan template was used to structure the content of each session. During the initial session, 3 main goals were identified in collaboration with caregivers based on the initial assessment. Common goals included phonological processes, vocabulary, and grammar (e.g., pronouns and verb tenses). Additional goals were targeted if the initial intervention goals were achieved. Home practice activities were provided at each session targeting participants' speech, language, and/or early literacy goals.	Advice Control—brief visit with SLP to review results and resources‡ Device Control—URL for family-friendly, evidence-based website§ aimed at stimulating speech and language skills

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Namasivayam, 2021[68] RCT Fair	45	48.4	39 NR	Speech sound disorders (children with speech motor delay)	Children presenting to 3 community-based centers for treatment of speech sound disorders Canada	SLP	45-minute individual sessions delivered twice weekly for 10 weeks	Intervention for children with speech motor delay, PROMPT, focused on improving the accuracy and stability of speech production. Individual goals were chosen to reflect the complex interrelationships among physical-sensory, cognitive-linguistic, and social-emotional domains based on the 7 hierarchal and interactive developmental stages in speech motor control.[ll] Techniques used to stimulate sensory input (i.e., tactile, kinesthetic, proprioceptive, auditory, and visual) to facilitate the formation of sensory and motor pathways required for the acquisition and accurate production of speech movement patterns.	Standard care provided to those on a wait-list, including a 4-page handout detailing speech, language, and literacy strategies to be carried out at home
Peredo, 2022[66] RCT Good	21	33.1	43 Latino: 100	Language delay	Participants recruited via agencies and community services working with Spanish-speaking families via advertisements and referrals United States	Caregiver taught by trained coaches during individual home-based sessions	Caregiver training delivered over 24 sessions, twice weekly for 3 months	Intervention teaching Spanish caregivers a culturally and linguistically adapted version of EMT strategies during individual home interactions with their children. Strategies included following child's interests, contingent responding to child's communicative intent, matching linguistic input to the child's zone of proximal development, and prompting language in highly motivating contexts. Contexts for intervention were play, book sharing, and naturally occurring home routines.	Wait-list

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Robertson, 1997[75] RCT Fair	20	49.7	35 NR	Language delay	Children identified with SLI enrolled in a language-based early childhood classroom United States	Researchers and peers	4 (15-minute) play sessions with peer models over 3 weeks in an environment designed for the study	Verbal scripts for playing house elicited from participating children during 4 sessions with 1–3 classmates (15–20 minutes each) before randomization; researchers told children they were trying to teach younger children how to play house and encouraged children to tell what they knew using prompts (e.g., "What do you do when you play house?"). After randomization, children in the intervention group were assigned to play with peers who had normal language abilities in a room with play prompts designed to support the verbal scripts for playing house.	No interaction with peer models[¶]
Robertson, 1999[76] RCT Fair	21	25.12	43 White: 100	Language delay	Families of children that responded to various advertisements[#] United States	SLPs	75-minute individual therapy sessions delivered twice weekly over 12 weeks	Interactive, individualized child-centered intervention that emphasized vocabulary development via individual therapy sessions. The intervention incorporated a "script" in conjunction with themes designed to help children organize information by providing a unifying concept to which all newly presented vocabulary could be linked.	Wait-list

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Thordardottir, 2015[65] RCT Fair	29	59.6	10 NR	Language delay	Recruitment of children identified with a language impairment by an SLP at various clinical treatment centers and public school settings Canada	SLP (monolingual intervention) or SLP with active parental participation using home language (bilingual intervention)	16 (50-minute) weekly individual sessions	Both treatments: Individual treatment plans were formulated based on needs and targets designed by SLPs; treatment goals included a vocabulary target and a syntactic target. Vocabulary training included 4 verbs and 6 nouns per session, including 5 words the child understood but did not produce and 5 that the child neither understood nor produced. A story retell probe using a wordless picture book was used to assess progress in subject-object-verb sentence formation. Monolingual treatment—delivered by SLPs in French only. Parents were present during sessions but were asked not to participate. Bilingual treatment—delivered by SLPs in collaboration with home language-speaking parents. Parents provided models of therapy targets in their respective languages and engaged in play responding to their child's home language utterances.	Wait-list (no treatment)

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Wake, 2011[62] Cluster RCT Good	301	18.1	49 NR	Language delay	Recruitment via parent survey at participating health centers** Australia	Parents completing training sessions led by interventionists (1 with speech pathology background and 2 with a psychology background)	Six weekly 2-hour group sessions at a local community center with childcare available	Parent-toddler community-based language promotion program designed for toddlers identified as "slow to talk" via routine screening. Adapted version of a manual-based program ("You Make the Difference"). The goal included promotion of child-centered interactions and language modeling responsive interaction strategies. Group sessions covered various content related to interacting with children to increase language skills and included parent-child practice during the end of the session that was videotaped. Subsequent sessions showed short video clips of positive parent-child interactions to reinforce specific strategies.	Usual care (followup for routine child health visits)
Wake, 2013[77] RCT Fair	200	49.5	34 NR	Language delay	Participants recruited from 2 previous population-based early childhood trials that promoted literacy and language development Australia	Trained language assistants (psychology and sociology university graduates) supervised by an SLP	18 (1-hour) home-based therapy sessions delivered in 3 blocks of 6 weekly sessions every 3 months	Intervention designed to promote narrative skills, vocabulary and grammar, and phonological awareness and preliteracy skills for children identified with language delay. The language assistant conducted a language screen on the initial session to identify areas that needed to be targeted during that block. Sessions covered phonological awareness/letter knowledge, specific language target activity, and shared book reading. Each session involved a brief review with parents, activities directed at the child, and activities for home practice.	No treatment; parents were informed about local speech pathology services (if desired) by mail

Appendix E Table 1. Characteristics of Included Treatment Randomized, Controlled Trials (KQs 4 and 5)

First Author, Year Study Design Quality	N	Mean Age (Months)	% F % Race/ Ethnicity	Intervention Type	Recruitment Setting Country	Delivery Personnel	Duration/ Frequency of Intervention	Description of Intervention Content	Control Group
Wilcox, 2020[69] RCT Fair	289	53.1	30 White: 54 Black: 2 Hispanic: 26 Multi-racial: 12 American Indian: 2 Asian: 3	School-based curriculum intervention	Children from participating preschool programs†† identified with developmental speech and/or language impairment United States	Preschool classroom teachers	34 weeks of instruction during 1 school year covering 14 thematic units that are each 2 weeks in duration with review weeks every 5th week	Whole-class curriculum that embeds incidental and explicit oral language and early literacy teaching practices within planned learning opportunities. Instruction is mapped to early learning standards, materials (pictures, books, and songs), and developmentally appropriate lesson plans that create language and early literacy learning opportunities. Learning opportunities are embedded within typical preschool activities (e.g., book reading, free play) and implemented with evidence-based teaching practices.‡‡	Usual preschool curriculum

* Values were calculated based on information provided by the study authors.

† Participating schools were offered financial reimbursement to partially compensate for the time spent by the educators on the intervention and to maintain appropriate student–teacher ratios.

‡ Caregivers received a 45-minute session with an SLP to review assessment results, goal setting, and resources. The authors report that this was a revised model of usual practice of wait-lists between diagnosis and beginning therapy, which were informed by literature on book sharing, language stimulation, and speech stimulability training.

§ Website titled "Waiting for Speech Pathology" that included 48 downloadable handouts covering speech, language, and early literacy, general information on speech-language pathology, and links to other websites, was provided to caregivers. The URL was sent via email during the intervention phase, with two reminder emails sent two and four months after the initial email.

‖ Seven hierarchal and interactive developmental stages in speech motor control include the following: stage I: tone, stage II: phonatory control, stage III: mandibular control, stage IV: labial–facial control, stage V: lingual control, stage VI: sequenced movements, and stage VII: prosody. These hierarchical speech motor goals are embedded into the cognitive-linguistic and social-emotional needs of the child.

¶ Children in the control group had access to a play area in their normal classroom with similar play prompts.

This included agencies associated with families of young children (e.g., preschools, pediatricians, day-care providers, and Head Start centers), local newspapers, and advertising via local radio and public TV stations.

** Consenting parents were mailed screening expressive vocabulary checklists to determine eligibility.

†† Programs covered by the Individuals with Disabilities Education Act.

‡‡ Teachers received ongoing professional development, including group training sessions and individualized, in-class coaching on a weekly basis in the fall and biweekly in the spring.

Abbreviations: EMT=Enhanced Milieu Teaching; F=female; N=number of participants; NHS=National Health Service; NR=not reported; PROMPT=Prompts for Restructuring Oral Muscular Phonetic Targets; RCT=randomized, controlled trial; SLI=specific language impairment; SLP=speech-language pathologist.

Appendix E Table 2. Results of Included Treatment Randomized, Controlled Trials of Language Delay Interventions (KQ 4)

First Author, Year	N	Mean Age, Months	Intervention(s)	Control	Analysis; Timing of Outcome Assessment	Expressive Language Outcomes	Receptive Language Outcomes
Gibbard, 1994[60]	36	29.5	Parental group training to improve child linguistic complexity; 11 bimonthly 60- to 75-minute training sessions over 6 months	No treatment	Difference in post-intervention means, adjusted for baseline scores; 26 weeks	Mean (SD), intervention vs. control* Mean length of utterances:† 2.3 (0.7) vs. 1.4 (0.4) Cohen's d=1.65 (p<0.001) RDLS, Expressive score: 38.7 (8.6) vs. 20.8 (6.2) Cohen's d=2.69 (p<0.001) DLS, Picture Test 17.7 (2.4) vs. 7.8 (6.5) Cohen's d=1.95 (p<0.001) DLS, Total Score: 92.3 (70.2) vs.11.3 (11.8) Cohen's d=1.88 (p<0.001)	Mean (SD), intervention vs. control RDLS, Comprehension score: 40.5 (9.4) vs. 29.3 (5.6) Cohen's d=1.95 (p<0.001) Renfrew Action Picture Test: Grammatical ability: 5.2 (4.6) vs. 0.3 (1.0) Cohen's d=1.50 (p<0.001) Information content: 15.7 (8.3) vs. 3.2 (4.9) Cohen's d=1.89 (p<0.001)
Peredo, 2022[66]	21	33.1	Culturally and linguistically adapted version of EMT strategies for Spanish-speaking caregivers delivered during home-based twice weekly sessions (24 total) over 3 months	Wait-list	Difference in post-intervention means, adjusted for baseline age, PLS-5 total language score, baseline value;15 weeks (~2 weeks post-intervention) and 26 weeks (~12 weeks post-intervention)	Mean scores, intervention vs. control* Expressive Vocabulary, EOWPVT-SBE scores: 15 weeks: 5.55 vs. 2.35, Cohen's d=0.50; p=0.181 26 weeks: 4.77 vs. 3.86, Cohen's d=0.17; p=0.721 Analysis of child-caregiver interactions:‡ Unprompted no. of different words used: 15 weeks: 12.27 vs. 11.59, Cohen's d=0.06; p=0.836 26 weeks:18.03 vs. 15.21, Cohen's d=0.21; p=0.667 Unprompted total no. of words used: 15 weeks: 33.71 vs. 24.64, Cohen's d =0.23; p=0.427 26 weeks: 53.88 vs. 28.39, Cohen's d =0.77; p=0.147	Mean scores, intervention vs. control Receptive Language, ROWPVT-SBE scores: 15 weeks: 12.23 vs. 7.61, Cohen's d=0.54; p=0.318 26 weeks: 11.29 vs. 6.53, Cohen's d=0.60, p=0.050

Appendix E Table 2. Results of Included Treatment Randomized, Controlled Trials of Language Delay Interventions (KQ 4)

First Author, Year	N	Mean Age, Months	Intervention(s)	Control	Analysis; Timing of Outcome Assessment	Expressive Language Outcomes	Receptive Language Outcomes
Robertson, 1999[76]	21	25.1	Individual sessions delivered by an SLP over twice weekly 76-minute sessions for 12 weeks, designed to be interactive and emphasizing vocabulary development	Wait-list	Difference between groups in post-treatment scores, adjusted for baseline scores;12 weeks	Mean (SD), intervention vs. control* Outcomes based on language samples:§ Mean length of utterances 1.32 (0.32) vs. 1.09 (0.11) Cohen's d=1.40 (p=0.003) Total no. of words: 33.3 (16.6) vs. 16.6 (12.5) Cohen's d=2.99 (p<0.001) No. of different words: 15.1 (5.2) vs. 8.5 (5.3) Cohen's d=2.80 (p<0.001) No. of different words, controlling for number of words: Mean NR: Cohen's d=2.14 (p<0.001) % of intelligible utterances: 88.1 (7.5) vs.71.5 (11.9) Cohen's d=2.16 (p<0.001) Vocabulary size (CDI Words and Sentences scores): 76.2 (37.5) vs. 51.4 (40.8) Cohen's d=2.99 (p<0.001)	NR

Appendix E Table 2. Results of Included Treatment Randomized, Controlled Trials of Language Delay Interventions (KQ 4)

First Author, Year	N	Mean Age, Months	Intervention(s)	Control	Analysis; Timing of Outcome Assessment	Expressive Language Outcomes	Receptive Language Outcomes
Thordardottir, 2015[65]	29	59.6	Individual treatment based on targets set by SLPs delivered over 16 weekly 50-minute sessions; 2 treatment arms: 1 monolingual: delivered by French SLPs with no parental participation 2 bilingual: SLP collaboration with home-speaking parents to provide models of targets in their respective languages	Wait-list	Difference between groups in change from baseline scores; 16 weeks	Expressive Vocabulary (EOWPVT score): Monolingual: 5.0 Bilingual: 3.4 No treatment: 0.9 No significant differences per the authors Improvement on intervention-specific expressive vocabulary probes:‖ Pre-post change in the monolingual and bilingual treatment groups was significantly larger compared with the control group (p=0.000 and p=0.001, respectively)	Receptive Language (EVIP score): Monolingual: 6.2 Bilingual: 4.1 No treatment: 6.0 Receptive Language (RDLS score): Monolingual: 16.3 Bilingual: 13.5 No treatment: 8.6 No significant differences per the authors¶ Improvement on intervention-specific receptive vocabulary probes:‖ Pre-post change in the monolingual and bilingual treatment groups was significantly larger compared with the control group (p=0.000 and p=0.003, respectively)
Wake, 2011[62]	301	18.1	Parent-toddler community-based language promotion program designed for toddlers identified as “slow to talk” via routine screening; 6 weekly 2-hour group sessions	Usual care (followup for routine child health visits)	Difference between groups at outcome assessment, adjusted for clustering, potential confounders (sex, exact age at outcome assessment, local government area, 3 indicators of SES, and baseline values	Difference in mean scores (95% CI) MCDI vocabulary raw score: 2 year: 2.1 (-3.0 to 7.2); p=0.42 3 year: 4.1 (-2.3 to 10.6); p=0.21 PLS expressive communication standard score: 2 year: 1.2 (-1.6 to 4.0); p=0.41 EVT expressive vocabulary standard score: 3 year: -0.5 (-4.4 to 3.4); p=0.80	Difference in mean scores (95% CI) PLS Auditory Comprehension standard score: 2 year: 1.4 (-2.2 to 5.0); p=0.44 3 year: -0.3 (-4.2 to 3.7); p=0.90

Appendix E Table 2. Results of Included Treatment Randomized, Controlled Trials of Language Delay Interventions (KQ 4)

First Author, Year	N	Mean Age, Months	Intervention(s)	Control	Analysis; Timing of Outcome Assessment	Expressive Language Outcomes	Receptive Language Outcomes
Wake, 2013[77]	200	49.5	Individual home-based therapy delivered by trained assistants to promote narrative skills, vocabulary, grammar, phonological awareness, and preliteracy skills; 18 (1-hour) sessions delivered in 3 blocks of 6 weekly sessions	No treatment	Difference in mean scores between groups at followup, adjusted for child's gender, mother's education level, recruitment setting, and baseline scores; 52 weeks	Expressive Language, CELF-P2 score: 2.0 (-0.5 to 4.4); p=0.12	CELF-P2, Receptive Language score: 0.6 (-2.5 to 3.8); p=0.69 Phonological Awareness, CTOPP score: 5.0 (2.2 to 7.8); p<0.001 Pragmatic language skills, CCC-2 total score: -1.0 (-3.7 to 1.6); p=0.4
Girolametto, 1996; Girolametto, 1997[61, 71]	25	28.6	An adapted version of the Hanen Program for Parents; parents attended 8 (2.5-hour) sessions over 11 weeks and received 3 home visits from an SLP	Delayed treatment	Difference in post-intervention means adjusted for baseline values;14 weeks	CDI, completed by parent: Expressive vocabulary size (No. of words):* 187.7 (181) vs. 65.4 (66) Cohen's d=0.88 (p<0.01) Structural complexity: 16.7 (13) vs. 5.2 (10) Cohen's d=0.68 (p<0.04) Videotapes of the parent-child play sessions: No. of different words used: 64.5 (46) vs. 25.2 (22) Cohen's d=1.13 (p<0.02) No. of different learned (target) words: 3.0 (2.1) vs. 1.0 (1.2) Cohen's d=1.67 (p<0.01) Talkativeness (no. of utterances or words/minute): Mean NR; Cohen's d=0.62 (p<0.06)	NR

Appendix E Table 2. Results of Included Treatment Randomized, Controlled Trials of Language Delay Interventions (KQ 4)

First Author, Year	N	Mean Age, Months	Intervention(s)	Control	Analysis; Timing of Outcome Assessment	Expressive Language Outcomes	Receptive Language Outcomes
Robertson, 1997[75]	20	49.7	4 (15-minute) play sessions with peer models who had normal language development over 3 weeks in an environment designed for the study, using play scripts created by researchers and participating children	No interaction with peer models	Difference from baseline to followup, adjusted for baseline values; 3 weeks	Based on transcripts from play script reports (response to prompts): (1) No. of words used: F=70.72 (p<0.0001) No. of different words used: F=73.79 (p<0.0001) No. of linguistic markers (terms used that indicated temporal sequence): F=73.51 (p<0.01)*	NR

* Cohen's d calculated by the authors of the previous evidence review on this topic.

† Number of words or utterances from recorded language samples.

ǂ Outcomes measured via videotapes of caregiver-child interactions; transcribed interactions were analyzed via the Systematic Analysis of Language Transcripts software.

§ Audiotaped transcripts of 15-minute spontaneous language samples gathered at pre- and post-test intervals were transcribed and analyzed using Systematic Analysis of Language Transcripts software.

ǁ Refers to vocabulary used during intervention training sessions, which included 47 age-appropriate vocabulary items based on the MacArthur-Bates Communicative Development Inventory.

¶ Means increased on the EVIP, EOWPVT, and RDLS for all the groups. However, only the RDLS approached significance (p=.057).

Abbreviations: CBCL=Child Behavior Checklist; CCC-2=Children's Communication Checklist, Second Edition; CDI=MacArthur Communicative Developmental Inventory; CELF-P2=Clinical Evaluation of Language Fundamentals-Preschool, Second Edition; CI=confidence interval; CTOPP=Comprehensive Test of Phonological Processing; DLS: Derbyshire Language Scheme; EMT=Enhanced Milieu Teaching; EOWPVT=Expressive One-Word Picture Vocabulary Test; EOWPVT-SBE=Expressive One-Word Picture Vocabulary Test, Spanish-Bilingual Edition; EVIP=Échelle de vocabulaire en images Peabody; EVT=Expressive Vocabulary Test; F=F-statistic; MCDI=MacArthur-Bates Communicative Development Inventory; N=sample size; no.=number; NR=not reported; PLS=Preschool Language Scale; PLS-5=Preschool Language Scale, Fifth Edition; RDLS=Reynell Developmental Language Scales; ROWPVT-SBE=Receptive One-Word Picture Vocabulary Test-4-Spanish-Bilingual Edition; SD: standard deviation: SES=socioeconomic status; SLP=speech-language pathologist.

Appendix E Table 3. Results of Included Treatment Randomized, Controlled Trials of School-Based Curriculum and Community-Based Speech-Language Disorder Interventions (KQ 4)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Speech and Sound Outcomes	Language Outcomes
Wilcox, 2020[69] School-based curriculum	289	53.1	Whole-class curriculum that embeds incidental and explicit oral language and early literacy teaching practices within planned learning opportunities; 34 weeks of instruction during 1 school year covering 14 thematic units, 2 weeks in duration each with review weeks every 5th week	Usual preschool curriculum	Differences between group at followup, adjusted for maternal education, baseline scores; p-values adjusted to address multiplicity of tests using the false-discovery rate control method; 34 weeks	NR	Mean post-test scores (SD), intervention vs. control: CELF-P2 Standard scores: Core language: 90.27 (0.91) vs. 89.52 (0.86); p=0.6182 Receptive language 94.40 (1.12) vs. 93.11 (1.06); p=0.5943 Expressive language 87.86 (0.85) vs. 84.98 (0.80); p-value=0.0630 Vocabulary Tests targeted by the curriculum:* Fall expressive vocabulary: 18.27 (0.56) vs.14.47 (0.54); p<0.0001 Fall receptive vocabulary: 35.73 (0.49) vs. 33.01 (0.52); p=0.0055 Spring expressive vocabulary: 23.15 (0.68) vs.18.44 (0.63); p<0.0001 Spring receptive vocabulary: 36.75 (0.45) vs. 33.49 (0.54); p<0.0001

Appendix E Table 3. Results of Included Treatment Randomized, Controlled Trials of School-Based Curriculum and Community-Based Speech-Language Disorder Interventions (KQ 4)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Speech and Sound Outcomes	Language Outcomes
Acosta-Rodríguez, 2022[67] School-based curriculum	50	67.8	Curriculum intervention with 95 (60-minute) sessions each delivered jointly by teachers and SLPs involving retelling and story generation	Usual classroom practices	Difference between groups in change from baseline to post-intervention, controlled for baseline scores; means and SD shown in figures only; numerical results reported as F-statistic from ANOVA models and generalized η2 (effect size) only;† ~52 weeks§	NR	Oral comprehension. subsets of the CELF-4, Spanish: Concepts and Following Directions: F(1;97)=40.3, η2=0.30; p ≤0.001 Word Classes-Receptive: F(1;97)=156.6, η2=0.62; p ≤0.001 Sentence Structure: F(1;97)=134.8; η2=0.59; p ≤0.001 Comprehension of paragraphs and narratives (correct responses to 2 tasks assessing comprehension):‡ F(1;97)=20.7, η2=0.18; p ≤0.001 Semantic Fluency, COWAT (no. of animals named in 60 seconds): F(1;97)=11.7, η2=0.11; p ≤0.001
Glogowska, 2000[72] Community-based speech-language disorders	159	34	Referrals to speech-language clinics from primary care; no set frequency/duration; mean hours of therapy received was 6.2 total‖	Watchful waiting	Difference between groups at 12-month followup, adjusted for baseline measure; 52 weeks	Mean phonology error rate: −4.4 (95% CI, −12.0 to 3.3); p=0.26 Improvement on criteria used for study entry:¶ OR=1.3 (95% CI, 0.67 to 2.4); p=0.46	Difference in age-adjusted PLS component scores: Expressive language: 1.4 (−2.1 to 4.8); p=0.44 Auditory comprehension: 4.1 (0.5 to 7.6), d=~0.3; p=0.025 BLADES: 0.1 (−0.4 to 0.6); p=0.73

Appendix E Table 3. Results of Included Treatment Randomized, Controlled Trials of School-Based Curriculum and Community-Based Speech-Language Disorder Interventions (KQ 4)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Speech and Sound Outcomes	Language Outcomes
McLeod, 2020[63] Community-based speech-language disorders	101	53.1	Individual therapy reflecting usual practice offered immediately (vs. being wait-listed) at 2 community-based treatment centers; 12 weekly 45-minute sessions delivered in 26-week blocks separated by 2-week breaks	Advice control: brief visit with SLP to review results and resources[**] Device control: link to evidence-based website with resources	Mean differences in outcomes at followup controlling for baseline measures; 26 weeks	% of consonants correct, mean (SE):[#] Therapy: 7.40 (2.45) Advice: -4.72 (2.69) Device: -3.57 (2.49) p=0.001 for comparison of Therapy vs. both Advice and Device groups Speech Intelligibility ICS, mean score (SE): Therapy: 4.01 (0.08) Advice: 3.89 (0.09) Device: 3.92 (0.08) Comparison across groups NS (p=0.500)	Expressive and receptive language skills CELF-P2 mean score (SE): Therapy: 49.56 (1.09) Advice: 50.18 (1.19) Device: 48.10 (1.10) Comparison across groups NS (p=0.502)

[*] Refers to receptive and expressive one-word picture vocabulary test that assessed higher-level receptive and expressive vocabulary targeted in the curriculum intervention and many other preschool curricula.

[†] Per the authors, an η2 around 0.01 is generally considered a small effect, an η2 around 0.06 indicates a medium effect, and an η2 >0.14 is a large effect.

[‡] Two tasks were completed, with correct responses scoring 1-point in both cases. The first task consisted of reading a short paragraph out loud and clearly to peers once, at a steady, leisurely pace, one word per second. The second task involved telling a story with the help of picture cards.

[§] Duration of intervention was approximately one school year. Baseline measures were obtained prior to the intervention at the end of the 2017–2018 school year. The intervention was e implemented during the 2018–2019 school year (from the first week of November to the first week of April), with post-intervention outcomes obtained in the second half of April.

[‖] All participants were children newly referred from primary care who were living in a monolingual home and who had no diagnosis of severe learning difficulties, autism, oromotor deficits, or primary diagnosis of stuttering or dysphonia.

[¶] This refers to a binary variable indicating whether the child had improved sufficiently on the single clinical measure on which he or she had entered the study to no longer satisfy that particular criterion by 12 months, which may have been a speech or language outcome.

[#] Children's speech production was assessed using the Phonology Assessment from the Diagnostic Evaluation of Articulation and Phonology software.

[**] Caregivers received a 45-minute session with an SLP to review assessment results, goal setting, and resources. The authors report that this was a revised model of usual practice of wait-lists between diagnosis and beginning therapy, informed by literature on book sharing, language stimulation, and speech stimulability training.

Abbreviations: ANOVA=analysis of variance; BLADES=Bristol Language Development Scales; CELF-4=Clinical Evaluation of Language Fundamentals- Fourth Edition, Spanish; CELF-P2=Clinical Evaluation of Language Fundamentals-Preschool, Second Edition (Australian Standardized Edition); CI=confidence interval; COWT=Controlled Oral Word Association Test; F=F-statistic from ANOVA models; ICS=Intelligibility in Context Scale; η2=Eta-squared effect size; N=sample size; no.=number; NR=not reported; NS=not significant; OR=odds ratio; PLS=Preschool Language Scale; SD=standard deviation; SE=standard error; SLP=speech-language pathologist.

Appendix E Table 4. Results of Included Treatment Randomized, Controlled Trials of Fluency and Speech-Sound Disorder Interventions (KQ 4)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Speech and Sound Outcomes
Jones, 2005[73] Fluency disorders	54	54.4	Lidcombe Program of Early Stuttering Intervention delivered according to manual; weekly face-to-face clinic visits with a therapist until improvement in stuttering occurred, then less frequently; parents were trained to provide verbal contingencies specific to stuttering	Wait-list	Difference between groups at followup, controlled for baseline stuttering frequency (measured via parent-recorded speech samples); 39 weeks	Mean % of syllables stuttered (SD), treatment vs. control: 1.5 (SD 1.4) vs. 3.9 (SD 3.5) Difference between groups in change from baseline % syllables stuttered: 2.3 (95% CI, 0.8 to 3.9); p=0.003
Lewis, 2008[74] Fluency disorder	22	52.4	Lidcombe Program of Early Stuttering Intervention delivered according to manual; weekly telehealth visits with a therapist until improvement occurred, then less frequently; parents were trained to provide verbal contingencies specific to stuttering	Regular telephone contacts every 8 weeks*	Difference between groups in change from baseline mean syllables stuttered;†39 weeks	Mean % of syllables stuttered treatment vs. control: Baseline: 6.7 vs. 4.5 39 weeks: 1.1 vs. 1.9 Difference between groups in change from baseline mean % syllables stuttered: 3.0 (95% CI, NR)
Almost, 1998[70] Speech sound disorder	26	42	Individual biweekly 30-minute sessions with an SLP for 4 months; treatment specific to children with a severe phonological disorder but normal receptive language function	No treatment	Difference in means at followup, adjusted for baseline scores and means across different timepoints; mean values NR, numerical results provided as F-statistic from ANOVA models and p-values;‡ 16 weeks	Phonological processes (APP-R score): F=8.64, Cohen's d=1.15; p=.007 Articulation (GFTA score): F=8.92, Cohen's d=1.17; p=0.007 % consonants correct: F=8.06, Cohen's d=1.11; p=0.009
McLeod, 2017[64] Speech sound disorder	123	56.1*	Interactive software-based intervention, PFSS, for children with speech sound disorders was delivered in schools with teacher assistance	Standard care (typical classroom practices)	Difference between groups in change from baseline mean over time (1 week and 6–8 weeks post-intervention); 10 and 15–17 weeks	Mean (SD), intervention vs. control Speech production, % of consonants correct (assessed via DEAP): Baseline: 69.25 (9.13) vs. 64.34 (11.74) Between-group difference in change from baseline: 6.15 vs. 5.43; p=0.874 Speech Intelligibility, ICS (parent reported): Baseline: 3.75 (0.36) vs. 3.90 (0.38) Between-group difference in change from baseline: 0.22 vs. 0.11; p=0.726

Appendix E Table 4. Results of Included Treatment Randomized, Controlled Trials of Fluency and Speech-Sound Disorder Interventions (KQ 4)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Speech and Sound Outcomes
Namasivayam, 2021[68] Speech sound disorder	45	48.4	Intervention for children with speech motor delay, PROMPT, focused on improving the accuracy and stability of speech production; 45-minute individual sessions twice weekly for 10 weeks	Standard care provided to those on a wait-list, including a 4-page handout detailing speech, language, and literacy strategies to be carried out at home	Difference between groups in change from baseline to followup scores, adjusted for baseline scores;10 weeks	Speech motor control outcomes: VMPAC-FOC score: 6.270 (1.223 to 11.318); p=0.016 VMPAC-SEQ score (95% CI): 4.769 (-3.050 to 12.587); p=0.225 Probe Words score: 28.790 (3.784 to 58.832); p=0.025 Speech articulation outcomes: Single-word articulation subtest of DEAP: 5.157 (2.061 to 8.252); p=0.002 Phonological process errors subtest of DEAP: 1.858 (-1.807 to 5.523); p=0.311 % of consonants correct: 10.855 (6.166 to 15.545); p<0.001 Speech intelligibility outcomes: Word level (CSIM score): 8.595 (3.283 to 13.907); p=0.002 Sentence level (BIT score): -1.632 (-11.059 to 7.796); p=0.728

* Per the authors, regular phone contact was made to the control group as a matter of courtesy to maintain contact and to facilitate compliance.

† Outcomes assessed via three different parent audiotape recordings of conversational speech in everyday, nontreatment situations, both before and after treatment; one made with the child's knowledge at home, one made with the child's knowledge away from home, and one made covertly at home. Each recording contained a minimum of 300 syllables, which required approximately 10 minutes of conversation between the child and an adult; mean percentage of syllables stuttered was averaged across the different recordings.

ǂ Cohen's d effect size values were calculated by the authors of the previous evidence review on this topic.

Abbreviations: ANOVA=analysis of variance; APP-R=Assessment of Phonological Processes- Revised; BIT=Beginner's Intelligibility Test; CI=confidence interval;; CSIM=Children's Speech Intelligibility Measure; DEAP=Diagnostic Evaluation of Articulation and Phonology Assessment; F=F-statistic from ANOVA models; GFTA=Goldman-Fristoe Test of Articulation; ICS=Intelligibility in Context Scale; N=sample size; NR=not reported; PFSS=Phoneme Factory Sound Sorter; PROMPT=Prompts for Restructuring Oral Muscular Phonetic Targets; SD=standard deviation; SLP=speech-language pathologist; VMPAC-FOC: Verbal Motor Production Assessment for Children-Focal Oromotor Control; VMPAC-SEQ=Verbal Motor Production Assessment for Children- Sequencing.

Appendix E Table 5. Results of Included Treatment Randomized, Controlled Trials Reporting on School Performance, Function, or Quality-of-Life (KQ 5)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Emerging Literacy Outcomes	QOL, Function, Socialization or Behavior Outcomes
Wilcox, 2020[69] School-based curriculum	289	53.1	Whole-class curriculum that embeds incidental and explicit oral language and early literacy teaching practices within planned learning opportunities; 34 weeks of instruction during 1 school year covering 14 thematic units, 2 weeks each in duration with review weeks every 5th week	Usual preschool curriculum	Differences between group at followup, adjusted for maternal education, baseline scores; p-values adjusted to address multiplicity of tests using the false-discovery rate control method; 34 weeks	TOPEL standard post-test scores (SD), intervention vs. control definitional vocabulary: 96.77 (1.18) vs. 96.16 (1.11); p=0.7067 Phonological awareness: 92.74 (1.41) vs. 91.16 (1.33); p=0.5943 PALS-PreK scores (no. correct): Uppercase letter recognition: 7.72 (0.33) vs. 7.25 (0.31); p=0.5943 Lowercase letter recognition: 22.60 (0.37) vs. 23.05 (0.37); p=0.5943 Letter names: 17.57 (0.74) vs. 18.34 (0.73); p=0.5943 Beginning sound awareness: 20.15 (0.62) vs. 17.67 (0.58); p=0.0630	NR
Glogowska, 2000[72] Community-based speech-language disorders	159	34	Referrals to speech-language clinics from primary care; no set frequency/duration; mean hours of therapy received was 6.2 total	Watchful waiting	Difference between groups at 12-month followup, adjusted for baseline measure; 52 weeks	NR	Vineland socialization skills: 0.6 (-3.1 to 4.2); p=0.76
McLeod, 2020[63] Community-based speech-language disorders	101	53.1	Individual therapy reflecting usual practice offered immediately (vs. being wait-listed) at 2 community-based treatment centers; 12 weekly 45-minute sessions delivered in 26-week blocks separated by 2-week breaks	Advice control—brief visit with SLP to review results and resources. Device control—link to evidence-based website with resources	Mean differences in outcomes at followup controlling for baseline measures; 26 weeks	PWPA mean score (SE): Therapy: 10.26 (0.51) Advice: 9.03 (0.56) Device: 8.71 (0.52) Comparison across groups: NS (p=0.087)	NR

Appendix E Table 5. Results of Included Treatment Randomized, Controlled Trials Reporting on School Performance, Function, or Quality-of-Life (KQ 5)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Emerging Literacy Outcomes	QOL, Function, Socialization or Behavior Outcomes
McLeod, 2017[64] Speech sound disorder	123	56.1	Interactive software-based intervention, PFSS, for children with speech sound disorders delivered in schools with teacher assistance	Standard care (typical classroom practices)	Difference between groups in change from baseline mean over time (1 week and 6–8-weeks post-intervention); 10 and 15–17 weeks	Mean (SD), intervention vs. control PWPA scores: Baseline: 6.29 (3.43) vs. 5.69 (3.09) 5–8 weeks post-intervention: 7.59 (2.75) vs. 7.29 (3.16) Between-group difference in change from baseline: 1.3 vs. 1.6; p=0.053 Letter Knowledge* Baseline: 8.02 (8.58) vs. 5.95 (7.96) 6–8 weeks post-intervention: 11.75 (9.40) vs. 9.02 (9.43) Between-group difference in change from baseline: 3.37 vs. 3.07; p=0.190	Functional communication (FOCUS score) Baseline 253.4 (49.25) vs. 256.5 (38.09) 6-8 weeks post-intervention: 261.1 (49.57) vs. 267.5 (49.69) p=0.668 KiddyCAT: Baseline: 3.68 (2.42) vs. 3.76 (2.48) 6-8 weeks post-intervention: 2.26 (2.39) vs. 3.15 (2.37); p=0.292 SPAA-C: Baseline: 6.95 (2.76) vs. 5.60 (3.04) 6–8 weeks post-intervention 5.90 (2.62) vs. 5.64 (2.71); p=0.151
Namasivayam, 2021[68] Speech sound disorder	45	48.4	Intervention for children with speech motor delay (PROMPT) focused on improving the accuracy and stability of speech production; 45-minute individual sessions twice weekly for 10 weeks	Standard care provided to those on a wait-list, including a 4-page handout detailing speech, language, and literacy strategies to be carried out at home	Difference between groups in change from baseline to followup scores, adjusted for baseline scores; 10 weeks	NR	Functional communication (FOCUS score): 2.042 (95% CI, -14.971 to 19.056); p=0.809

Appendix E Table 5. Results of Included Treatment Randomized, Controlled Trials Reporting on School Performance, Function, or Quality-of-Life (KQ 5)

First Author, Year Intervention Category	N	Mean Age, Months	Intervention Description, Dose, and Duration	Control	Analysis; Timing of Outcome Assessment	Emerging Literacy Outcomes	QOL, Function, Socialization or Behavior Outcomes
Robertson, 1999[76] Language delay	21	25	Individual sessions delivered by an SLP over twice weekly 76-minute sessions for 12 weeks, designed to be interactive and emphasizing vocabulary development	Wait-list	Difference between groups in post-treatment scores, adjusted for baseline scores;† 12 weeks	NR	Socialization (VABS socialization domain score): 50.5 (6.1) vs. 46.2 (5.3) Cohen's d=1.52; p=0.003) Parental stress (PSI Child Domain score): 103.6 (15.1) vs. 110.2 (17.3) Cohen's d=3.19; p<0.001)
Wake, 2011[62] Language delay	301	18.1	Parent-toddler community-based language promotion program designed for toddlers identified as "slow to talk" via routine screening; 6 weekly 2-hour group sessions	Usual care (followup for routine child health visits)	Difference between groups at outcome assessment, adjusted for clustering, potential confounders (sex, exact age at outcome assessment, local government area, three indicators of SES), and baseline values; 24weeks	NR	Child Behavior CBCL, externalizing behavior raw score (95% CI) 2 year: -0.3 (-1.6 to 1.1); p=0.71 3 year: -0.1 (-1.6 to 1.4); p=0.86 CBCL internalizing behavior raw score: (95% CI) 2 year: 0.1 (-0.9 to 1.1); p=0.78 3 year: -0.1 (-1.3 to 1.2); p=0.92
Wake, 2013[77] Language delay	200	49.550	Individual home-based therapy delivered by trained assistants to promote narrative skills, vocabulary, grammar, phonological awareness, and preliteracy skills; 18 (1-hour) sessions delivered in 3 blocks of 6 weekly sessions	No treatment	Difference in mean scores between groups at followup, adjusted for child gender, mother's education level, recruitment setting, and baseline scores; 52 weeks	Difference in mean scores at followup: Letter knowledge:‡ 2.4 (0.3 to 4.5); p=0.03	Behavioral problems. SDQ score: -0.5 (-1.7 to 0.7); p=0.43 Health-related quality of life: Peds QL total score: -0.8 (-5.2 to 3.5); p=0.71 HUI3 overall score: 0.03 (-0.02 to 0.09); p=0.22

Appendix E Table 5. Results of Included Treatment Randomized, Controlled Trials Reporting on School Performance, Function, or Quality-of-Life (KQ 5)

* Letter knowledge was determined by showing children pairs of each capital and lowercase letter of the alphabet in a random sequence. Children were asked to identify letters that they knew (e.g., Mm, Tt) and tell the SLP the name of the letter (e.g., em, tee) and the sound it made (e.g., /m/, /t/).

† Cohen's d effect size values were calculated by the authors of the previous evidence review on this topic.

ǂ Based on Letter Knowledge Task, 26 alphabet letters summed, with possible range from 0 to 26.

Abbreviations: CI=confidence interval; CBCL=Child Behavior Checklist; FOCUS=Focus on the Outcomes of Children Under Six; HUI3=Health Utilities Index Mark 3; KiddyCAT=Communication Attitude Test for Preschool and Kindergarten Children Who Stutter; N=sample size; NR=not reported; no.=number; NS=not significant; PALS-PreK=Phonological Awareness and Literacy Screening PreK; Peds QL=Pediatric Quality of Life Inventory (parent-proxy); PFSS=Phoneme Factory Sound Sorter; PROMPT=Prompts for Restructuring Oral Muscular Phonetic Targets; PSI=Parenting Stress Index; PSI-CD=Parenting Stress Index child domain score; PWPA=Preschool Word and Print Awareness; QOL=quality of life; SES=socioeconomic status; TOPEL=Test of Preschool Early Literacy; SD=standard deviation; SDQ=Strengths and Difficulties Questionnaire; SE=standard error; SLP=speech-language pathologist; SPAA-C=Speech Participation and Activity Assessment of Children; VABS=Vineland Adaptive Behavior Scale.