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Review Article

A Systematic Review of Interventions for Multilingual Preschoolers With Speech and Language Difficulties

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Purpose: There is a shortage of information on evidence-based interventions for supporting young multilingual children. The purpose of this review was to identify interventions that have been evaluated with preschool-age multilingual children with a speech and/or language disorder or who are at risk of poor speech, language, literacy, and/or educational outcomes.
Method: This review considered speech, language, and early literacy interventions evaluated with preschool-age multilingual children with a speech and/or language disorder or who have been identified as being at risk of language difficulties (PROSPERO ID: 165892). The following electronic databases were searched: EBSCO (CINAHL Plus, ERIC, PsycINFO, Medline, Education) and Linguistics, Language, and Behavior Abstracts. Data were extracted describing article, participant, methodological, and intervention variables, and effect sizes. The Council for Exceptional Children's (CEC) standards for evidence-based practice were used to examine the quality of studies.
Results: Fifty-six relevant studies were identified in 52 articles and these studies described 4,551 participants who had speech sound disorder (six articles), developmental language disorder (11 articles), or were considered to be at risk (36 articles). The interventions targeted speech production (seven studies), language (45 studies), and early literacy (11 studies) skills. Most studies reported positive effects. Only 15 studies met all quality indicators specified by the CEC (2014) and these described 18 interventions targeting language and literacy skills. The only intervention with sufficient evidence to be considered an evidence-based practice was Nuestros Niños [Our Children] for children's early literacy and phonological awareness skills.
Conclusions: A number of high-quality studies exist that describe speech, language and/or literacy interventions for preschool-age multilingual children with a speech and/or language disorder, or who have been identified as being at risk of language difficulties. However, there remains limited evidence for specific interventions as to their ability to inform evidence-based practices.
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Multilingual interventions for children with a speech sound disorder (SSD) and/or developmental language disorder (DLD) are of international interest among speech-language pathologists (SLPs; Thordardottir & Rioux, 2019; Verdon et al., 2015b). Half of the world's population speaks more than one language (Eberhard et al., 2021) and SSD and DLD are among the most common difficulties addressed by SLPs in pediatric populations (American Speech-Language-Hearing Association [ASHA], 2020; Broomfield & Dodd, 2004). These factors have given rise to an increasing demand for SLPs to provide intervention to children from culturally and linguistically diverse backgrounds (Eberhard et al., 2021; McLeod et al., 2013). In response to this need, this systematic review evaluated research describing speech, language, and early literacy interventions for multilingual children diagnosed with SSD and/or DLD or identified as being *at risk* of poor speech, language, and/or educational outcomes to establish the evidence base for practice with these children.

Multilingual Children

The terms *multilingual* and *bilingual* are at times used interchangeably when describing an individual who communicates using more than one language (Surrain & Luk, 2019). This review uses the term *multilingual* in the context

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of the definition of the International Expert Panel on Multilingual Children's Speech (2012): multilingual children are those who are "acquiring more than one language, are able to comprehend and/or produce two or more languages in oral, manual, or written form with at least a basic level of functional proficiency or use, regardless of the age at which the languages were learned" (p. 1). Past research describing typically developing multilingual children has found positive, neutral, and negative effects of multilingualism on cognitive and language development and skills. Multilingualism has been associated with academic, social, and cognitive advantages, including improved metalinguistic awareness, executive control, word learning, linguistic creativity, and cognitive processing (Bialystok, 2018). Additionally, multilingualism supports cultural identity and may support acculturation for individuals living in a foreign country (Espinosa, 2007; Laketa et al., 2021). Other studies have reported negative effects of multilingualism including reduced vocabulary size in each language, reduced speed of picture identification tasks, slower rate of development of morphosyntactic skills, reduced performance on verbal fluency tasks, slower performance on lexical retrieval tasks, and increased interference in lexical decisions (Byers-Heinlein, 2013; Hoff, 2018; Quinteros Baumgart & Billick, 2018). It should be noted that such advantages and disadvantages are not reported consistently in the literature and have been disputed (Bialystok, 2017; Paap et al., 2016). Studies have also reported null effects of multilingualism on children's performance in areas such as detecting grammatical errors and memory tasks (Bialystok, 2009).

While these are general trends in the literature, there is great variability in the direction and strength of findings in past research. Previous research has attributed this variability to many factors that relate to the child (e.g., age, cognitive skills), their language skills and environment (e.g., timing, age, and sequence of language exposure and learning, levels of proficiency), their social environment (e.g., level of parental education, socioeconomic status), as well as methodological differences between studies (e.g., outcome measures, assessment tools; Goldfeld et al., 2013; O'Connor et al., 2018). Factors such as earlier acquisition of the additional language, higher levels of parental education, higher socioeconomic status, and amount and quality of language exposure are particularly known to be associated with better language outcomes in multilingual children (Hoff, 2013; Simon-Cereijido et al., 2013).

Despite the variability of the outcomes of multilingual children described in the literature, an achievement gap between typically developing multilingual and monolingual children has been found consistently (Grimm et al., 2018; O'Connor et al., 2018). Multilingualism itself is not a risk factor contributing to the origin of this gap. However, many children who will become multilingual are born into families where the parents do not speak the majority language of the country. Such families are also often affected by a range of factors known to adversely impact on language outcomes for monolingual children, such as living in poverty, lower levels of parental education, increased levels of parental stress, poorer educational resourcing, and reduced access to services (Bialystok, 2018; Leung et al., 2020; Rowe et al., 2016; Vernon-Feagans et al., 2012). While the factors related to an achievement gap are many, varied, and at times controversial, SLPs play an important role in providing equity for multilingual children by improving their potential for strong speech, language, and literacy skills. In spite of the role that SLPs can play in multilingual populations, this is an acknowledged area of difficulty in SLPs' practice. The reasons for this are many, including a lack of culturally and linguistically appropriate assessment materials (Washington et al., 2019), insufficient clinical training (Caesar & Kohler, 2007), language mismatch between clients and clinicians (Pham et al., 2011), confusion over which language intervention should be conducted in and which language(s) should be targeted (Bialystok, 2018), and a lack of effective, evidence-based interventions suitable for multilingual populations (e.g., Crowe & Guiberson, 2019).

Speech and Language Challenges in Multilingual Children

Multilingual children with speech and language difficulties need evidence-based therapeutic interventions targeting their specific needs. However, given the unique profile of multilingual children, further understanding on the differences between children who come from culturally and linguistically backgrounds provides context for the current review. Children can be described as at risk of poor speech, language, and/or educational outcomes for many reasons; however, poverty is a common and prevalent reason. Children living in poverty are known to be at risk for poor outcomes in cognitive skills, and in language, early literacy, and academic achievement (Bornstein et al., 2010; Dickinson & Porche, 2011; Gilkerson et al., 2018; Liu et al., 2018, 2020; Schady et al., 2015). In the United States, such children are often growing up in immigrant multilingual environments (U.S. Department of Health and Human Services, 2013). Similarly, SSD and/or DLD during early childhood are associated with speech and/or language difficulties, reduced academic performance, and long-term emotional, behavioral, and social difficulties in the school-aged years (ASHA, 1993; Clegg et al., 2005; Law et al., 2009; Verdon et al., 2015a; Wake et al., 2013), but not multilingualism (C. Hambly & Fombonne, 2014; H. Hambly et al., 2013; Uljarević et al., 2016). Common to multilingual children who are at risk or diagnosed with speech and/or language difficulties is that early intervention is crucial for reducing the impact of difficulties, the broader consequences of these difficulties, and providing a strong foundation for future success.

Given the variability of language profiles in multilingual children, and the methodological differences when studying this population, little is known about the prevalence of speech, language, and reading difficulties among multilingual preschoolers. An available estimate refers to the prevalence of reading impairment among school-age children. This has been reported to be 20% for multilingual

children (Paradis et al., 2011), which is much higher than the 7% that has been reported for monolingual children (Hulme & Snowling, 2016). One reason for this apparent absence of information about the prevalence of communication difficulties in young multilingual children relates to difficulties with assessment. Inappropriate assessment of multilingual children's communication is common, leading to speech, language, and literacy difficulties among multilingual children being frequently both under and overdiagnosed as a disorder (Fabiano-Smith & Hoffman, 2018; Washington et al., 2019). SLPs must understand the differences and challenges of children from culturally and linguistically diverse backgrounds to provide evidence-based therapeutic interventions targeting their specific needs.

Previous Intervention Research

Systematic and Scoping Reviews

Five reviews were identified that have examined the published research evidence on intervention strategies for multilingual learners. One of these, conducted by Durán et al. (2016), reviewed bilingual and home language interventions/strategies for dual language learners aged 2 to 6 years who were identified with, or at risk for, language delays/impairments. Twenty-six relevant studies were identified in Durán et al.'s review, with the interventions identified grouped into three approaches: (a) English-only and English–Spanish preschool programs, (b) supplemental intervention programs focused on language and literacy stimulation, and (c) home-based interventions implemented by parents. Expanding on the work of Durán et al. (2016), Larson et al. (2020) conducted another systematic review that considered literature on language interventions for young, culturally and linguistically diverse children (birth to 5 years) including typically developing children and children diagnosed with a speech and/or language impairment. The review identified 41 studies with a variety of methodologies and included 16 studies included in Durán et al. (2016). Interventions targeted language skills (i.e., receptive, expressive, narrative discourse, mean length of utterance) in English and/or a language other than English, literacy outcomes (i.e., phonological awareness, print knowledge, letter-word identification, literacy strategy use, and writing), cognition, social, and emotional skills.

A scoping review of early language interventions for young dual language learners aged 9–47 months (Guiberson & Ferris, 2019) reported on 27 sources describing seventy different language strategies or procedures used with this population. The interventions were categorized into five major types: (a) general approaches, (b) caregiver-based recommendations, (c) interaction-based recommendations, (d) language strategies, and (e) early literacy strategies. Twenty of the 70 different strategies had *compelling evidence;* nine of which had compelling evidence in more than one study. These strategies included supporting first language/bilingual development, parent education programs; expanding on child's comments, cross-linguistic referencing; enhanced vocabulary instruction, shared book reading experiences; having children retell stories; asking open-ended questions; and creating experience books of personal narratives. Guiberson and Crowe (2018) conducted a scoping review of the literature addressing interventions for multilingual preschool to school-age children. Twenty-one sources describing 58 interventions were identified and described based on targeted domain (i.e., speech, auditory, language, literacy) and population (i.e., children with hearing loss, multilingual children with additional needs, and multilingual children with hearing loss). An important finding of this review was the significant lack of evidence documenting intervention strategies with multilingual children with hearing loss. A follow-up systematic review described and examined evidence-based interventions for d/Deaf and hard-of-hearing learners who used one or more spoken languages and hearing multilingual learners (birth to 21 years old; Crowe & Guiberson, 2019). A total of 146 interventions targeting speech, language, and/or literacy outcomes were identified.

These reviews have provided clinicians with a concise distillation of knowledge for the specific questions that they addressed. However, there is a need to expand the scope of a review to meet the clinical needs of SLPs around the globe who are working with multilingual children with speech and/or language difficulties. Durán et al. (2016) and Larson et al. (2020) focused on interventions measuring language outcomes alone within the context of the United States. Providing evidence-based intervention for multilingual preschool-age children is being addressed by researchers around the globe. Thus, a wider view of the available research evidence is required, including articles written in languages other than English that address speech, language, and literacy outcomes. While Crowe and Guiberson (2019) took a broad international scope, they did not consider children who were diagnosed with SSD and/or DLD or identified as being at risk, which are key groups for SLPs. Following the global approach used by Crowe and Guiberson (2019), this review expands the scope of a review and will provide clinicians with essential knowledge about available, high-quality interventions targeting speech, language, and/or literacy outcomes for multilingual children with a range of difficulties.

International Studies of Multilingual Preschool-Age Children

Children who are at risk. There are a number of international studies that have examined at-risk preschool-age multilingual children using a wide range of methods. For example, Jungmann et al. (2011) conducted an experimental clinical trial of a family-based early intervention program for children and families (multilingual and monolingual) from low-socioeconomic backgrounds in Germany. The intervention "pro-kind" started with a prenatal parent education phase. It provided intervention and monitoring for 755 children until the age of 2 years. In a different approach, Bekman et al. (2011) investigated the effectiveness of an intervention for 4- to 6-year-old Kurdish-speaking at-risk children in Turkey who had not previously attended a preschool program. Intervention resulted in significant improvements in

early literacy, morphosyntax, and narrative skills. Examining the impact of intervention on children already in a preschool program, Landry et al. (2019) explored the effectiveness of a language and literacy intervention for English–Spanish bilingual children at risk for language delays. They reported significant gains in Spanish oral language, print knowledge, phonological awareness, and phonics.

Children with SSDs. Published intervention studies targeting SSD in multilingual children are particularly limited. Rossouw and Pascoe (2018) identified seven articles evaluating multilingual interventions for children with SSD, all varying in approaches and languages. Their own study targeted speech production of a multilingual (isiXhosa, English, Southern Sotho) 4-year-old girl with SSD and generalization from isiXhosa to English was observed (Rossouw & Pascoe, 2018). Gildersleeve-Neumann and Goldstein (2015) measured the effect of bilingual (English, Spanish) intervention for two 5-year-old boys with SSD. Improved speech intelligibility and accuracy in both languages were observed. Similarly, Ramos and Mead (2014) conducted a case study with a 6-year-old English/Portuguese bilingual girl with SSD. Monolingual and bilingual approaches were compared, and greater improvements were reported in phonology when using a bilingual approach.

Children with developmental language delays. Interventions for multilingual children with DLD have also been investigated for children with a variety of language backgrounds, but again with few published studies in existence. In Canada, Thordardottir and Rioux (2019) conducted intervention in French for multilingual preschool-age children with DLD (home languages other than French included Arabic, Berber, Spanish, and Romanian). Following 12 therapy sessions over a 6- or 12-week therapy block, improvements were reported in children's French language (receptive/expressive) and syntax skills. In the United States, Pham et al. (2011) compared English-only intervention to bilingual intervention for receptive vocabulary development. Across four case studies, Pham et al. (2011) systematically manipulated the intervention variable to examine the effect of language of intervention to the growth in skills demonstrated by a 4-year-old English–Vietnamese speaking child. Based on the outcomes observed, bilingual intervention facilitated greater gains.

Evidence-Based Practice With Multilingual Children

Evidence-based practice (EBP) suggests grounding clinical decisions on integration of the best research evidence, clinical experience, client preferences, and local context (Dollaghan, 2007). When there is a lack of research on speech, language, or literacy interventions for multilingual preschool-age children, intervention studies conducted in related fields (e.g., education, psychology, linguistics) must be considered when gathering the best available evidence (Roulstone, 2011). Additionally, clinicians must identify evidence that is representative of the child they are working with, in terms of the general characteristics, nature of the child's difficulties, and the goals of the intervention. When appropriate research evidence is found, clinicians are required to determine the quality of the evidence, that is, what constitutes the *best available quality evidence*. However, this represents a significant challenge for clinicians who may neither have the time nor the expertise to examine the methodologies of intervention studies in detail. The systematic review conducted by Crowe and Guiberson (2019) examined the quality of their results (i.e., 146 interventions targeting speech, language, and literacy outcomes) using the Council for Exceptional Children's (CEC, 2014) standards for EBP in special education. Only six interventions evaluated with hearing multilingual children were contained within studies that met the CEC guidelines for quality and none of these interventions had sufficient evidence to be considered as contributing to EBP.

Objectives of This Systematic Review

The current review addressed the issue of the best available research evidence by conducting a thorough systematic search of the literature to identify studies that describe interventions for preschool-age, multilingual children who have been diagnosed with a speech and/or language disorder or who had been identified as being at risk of poor speech, language, and/or educational outcomes. This review critically examined the quality of evidence that studies provide using the standards for the EBP in special education published by the CEC (2014). Finally, following the CEC guidelines interventions were examined across studies to determine if, collectively, evidence exists for an intervention to be classified as informing the evidence base for practice. The purpose of this review was to inform the practice of those working with preschool-age multilingual children with speech and language difficulties, to identify strengths and limitations in the existing literature, and to identify promising interventions that require further investigations. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA; Moher et al., 2009, 2015; Shamseer et al., 2015).

In this study, we sought to answer the following questions: (a) which studies have investigated intervention strategies targeting speech, language, and/or early literacy skills in multilingual preschool-age children with speech and/or language disorders and/or who are at risk of poor speech, language, literacy, and/or educational outcomes?; (b) which interventions reported on in high quality studies have positive outcomes and positive effect sizes related to speech, language, and/or literacy outcomes in multilingual preschool-age children with speech and/or language disorders and/or who are at risk of poor speech, language, literacy, and/or educational outcomes?; and (c) which interventions have been examined and reported with sufficient rigor to be considered evidence-based interventions (EBI) for speech, language, and/or literacy outcomes in these populations of learners? The goal of this review is not to parse out individual details on the language used at home, in the community, in intervention, and/or outcome variables

but to identify interventions that have evidence for use with multilingual learners.

Method

Search Protocol

This review followed the PRISMA statement and checklist, which provides review authors with guidelines for improving the reporting quality of systematic reviews and meta-analyses (Moher et al., 2009, 2015; Shamseer et al., 2015). Adherence to the PRISMA guidelines in this review is documented in Supplemental Material S1 (PRISMA Table). Table 1 provides operational definitions of key terms and Table 2 presents Population, Interventions, Comparisons, and Outcomes (PICO) information relevant to this review. This review was registered with the International Prospective Register of Systematic Reviews (PROSPERO), ID 165892.

Systematic Literature Search

In April 2021,[1] a literature search was conducted of the following databases: EBSCO (CINAHL Plus, ERIC, PsycINFO, Medline, Education) and Linguistics, Language, and Behavior Abstracts. Terms were searched for in article abstracts in all databases. Where databases allowed for searches to be limited to peer-reviewed journals, this option was selected and the date of publication was restricted to after 1990. The search terms used were developed by the authors, three of whom have extensive experience with academic literature concerning multilingual learners and speech and language development and disorders in children. All combinations of terms describing population (bilingual, language learn*, multilingual), disorder/risk (at risk, disability, disorder, handicap, impairment, pathology), linguistic domain (functional communication, language, literacy, phonology, pragmatics, read*, social skills, speech, syntax, vocabulary), and therapy (approach, intervention*, strategy*, therapy) were searched in each database. Combinations of search terms within groups (i.e., bilingual language learn* OR multilingual) were not used. Instead, each search string consisted of one term from each term group joined by "AND," for example, "bilingual" AND "at risk" AND "functional communication" AND "approach." The complete search strategy and number of citations for each search term combination is presented as Supplemental Material S2 (Search Strategy). All search results were imported into Covidence systematic review software (Veritas Health Innovation, 2019). Duplicates were identified by the Covidence software initially and remaining duplicates were excluded when identified during abstract and full-text screening stages of the review.

[1]An initial search was conducted in October 2019 and a forward search for the period October 2019–April 2021 was conducted during the revision of this manuscript.

Supplementary Handsearching

Supplementary handsearching was undertaken to increase the number of potentially relevant articles for this review. The authors compiled a list of journals that may publish research concerning multilingual children with speech and language difficulties and the table of contents of all issues of the following journals between 1990 and 2021 were handsearched (American Journal of Speech-Language Pathology; Perspectives of the ASHA Special Interest Groups, Child Language Teaching and Therapy; Clinical Linguistics and Phonetics; Communication Disorders Quarterly; International Journal of Bilingual Education and Bilingualism; International Journal of Language and Communication Disorders; International Journal of Speech-Language Pathology; Journal of Communication Disorders; Journal of Speech, Language, and Hearing Research; Language, Speech, and Hearing Services in Schools; Seminars in Speech and Language; Speech, Language and Hearing; Topics in Language Disorders). A second stage of handsearching was conducted through pearling, which involved examining the reference lists of articles included in this systematic review, and review articles identified in the search for additional references, which may meet the inclusion criteria for this systematic review.

Article Screening

Inclusion and Exclusion Criteria

Research questions for this review are related to interventions for speech, language, and/or early literacy in preschool-age children with speech and/or language disorders or who are at risk of poor speech, language, or educational outcomes. Articles were excluded if (a) they were published before 1990. Understanding of multilingual language development and pedagogy and intervention practices for multilingual children has rapidly advanced in the past decades. Therefore, only articles published within the past 30 years were considered. Articles were excluded if (b) participants were not preschool-age children. Preschool-age children were defined as being 0–6 years who are not enrolled in formal/mandatory education. Where children's status in terms of educational enrollment was not clear, the cutoff age of 6;0 [years;months] was used. Where children both older and younger than 6;0 were included in a study, studies were included if more than 50% of participants had not yet entered formal education or were 6;0 or younger. Articles were excluded if (c) participants were not multilingual and did not have a speech and/or language disorder or were not identified as being at risk. Multilingualism was defined as functional knowledge and/or use of two or more spoken languages in oral and/or written form. Where multilingual and monolingual children were considered within the one study, studies were excluded unless one of the following criteria was met: more than 50% of children participating were multilingual, results were presented separately for monolingual and multilingual children, or multilingual status was considered as a variable in analyses within the study. Speech and/or language disorder was defined as a diagnosed SSD, DLD, or another disorder of speech and/or

Table 1. Definitions of terminology and abbreviations used within this systematic review.

Area	Term	Operational definition
Participants	Multilingual	Functional knowledge and/or use of two or more spoken languages in oral, manual, and/or written form.
	Preschool-age children	Participants aged 0–6 years who are not enrolled in formal/mandatory education.
	Diagnosed speech and/or language disorder	Children have a diagnosis of speech sound disorder, developmental language disorder, or another disorder of speech and/or language with no associated disabilities.
	At risk of poor speech, language, or educational outcomes	Children who do not have a diagnosed speech or language disorder but have been identified as being at risk for difficulties in speech, language, or educational development or outcomes.
Outcome domains	Speech	Production of the consonants, vowels, tones, and suprasegmental features of a language, phonological accuracy, and the production of intelligible speech.
	Language	Understanding and/or production of spoken language of spoken language morphology, vocabulary, syntax, and narratives where the specific subdomains are not assessed or reported on separately.
	Vocabulary	Understanding and/or production of spoken language vocabulary, assessed and reported separately from other components of language.
	Morphosyntax	Understanding and/or production of spoken language morphology and/or syntax, assessed and reported separately from other components of language.
	Narrative	Understanding and/or production of narratives in spoken language, assessed and reported separately from other components of language.
	Early Literacy	Understanding and/or use of skills related to written language, such as phonological awareness, phoneme–grapheme correspondence, emergent literacy skills, reading, writing, and spelling, etc., where the specific subdomains are not assessed/reported separately.
	Phonological awareness	Reflecting on and/or manipulating phonological language structures, for example, syllabification, rhyming, segmentation, and blending.
	Writing	Encoding language into text, including parts of words (e.g., morphemes), single words, writing fluency, grammar, text structure, and corresponding emerging prewriting skills.
Intervention	Intervention	An intentional change in a child's environment, experiences, or input intended to bring about a change in the child's speech, language, communication, or early literacy skills.
	Intervention data	Measurement of child's speech, language, communication, or early literacy skills that occurs prior to and after the child receiving the intervention. This may be in the form of direct measurement of the child's skills or reporting on children's skills by a parent and/or teacher.
Intervention setting	Clinic	Intervention that occurs in a speech-language pathology clinic, early intervention center, or that is provided by a SLP outside of a home or education setting.
	Education	Intervention that occurs in an early education center, preschool, day care center, or equivalent.
	Home	Intervention that occurs in a child's home.
Intervention agent	Educators	Staff in the education setting, including qualified educators/teachers, teaching assistants/aids, education paraprofessionals, and general staff.
	Family	Any member of the child's family (e.g., parent, sibling, grandparent, aunt/uncle) or a person associated with the family (i.e., babysitter).
	SLP	Practicing SLP and speech-language pathology student.
	Technology	Use of technology to deliver the intervention, that is, an app, computer program, audio/video recordings, or other technological device.
Language	Community language	The language(s) used in the child's education environment and/or in the wider community. This is the language through which the child will receive their formal education.
	Home language	The language(s) used in the child's home environment.
Study designs	Correlational	A study in which participants all receive the same single intervention and the dependent variable (i.e., the outcome measure) is compared pre- and post intervention.
	Crossover	A study in which participants all receive two interventions and the dependent variable (i.e., the outcome measure) is compared for each intervention. Crossover trials were defined as a type of EGC in this review.
	Experimental group comparison	A study with two or more groups of participants where the independent variable (i.e., the intervention) differs across the groups, and the dependent variable (i.e., the outcome measure) is compared between groups.
	Single-case experimental design	A study in which participant(s) act as their own control and repeated measures of the dependent variable (i.e., the outcome measure) occurs across different phases/conditions of the study.

Note. SLP = speech-language pathologist; EGC = experimental group comparison.

Table 2. Study question, Population, Interventions, Comparisons, Outcomes, and designs.

Study component	Current study
Overall questions	1. Which studies have investigated interventions strategies targeting speech, language, and/or early literacy skills in multilingual preschool-age children with speech and/or language disorders and/or who are at risk of poor speech, language, literacy, and/or educational outcomes? 2. Which interventions reported on in high-quality studies have positive outcomes and positive effect sizes related to speech, language, and/or literacy outcomes in multilingual preschool-age children with speech and/or language disorders and/or who are at risk of poor speech, language, literacy, and/or educational outcomes? 3. Which interventions have been examined and reported with sufficient rigor to be considered evidence-based interventions for speech, language, and/or literacy outcomes in these populations of learners?
Population	Multilingual children prior to starting formal schooling (preschool-age) with diagnosed speech and/or language disorders or identified as being at risk of speech, language, or educational outcomes.
Interventions	The interventions examined were not limited in this study. Any intervention targeting speech production, language skills, communication skills, and/or early literacy skills that was implemented in a clinical, educational, home, or other settings were considered.
Comparisons	The comparison of interventions were not limited in this study. Studies could compare the effect of one intervention to no intervention, an alternate intervention, or to the same intervention with a participant group with different characteristics. Self-control comparisons were also considered, as in single-case research designs and crossover designs.
Outcomes	Direct and indirect measurements of child speech, language, communication, and early literacy skills were considered. Intervention studies that measure outcomes in terms of parent or teacher behavior, and not child behavior, were not considered outcomes in this review.
Time	The duration of intervention and data collection were not specified in this review. However, studies must include pre- and postintervention data for the target outcomes.
Type of study	All types of intervention studies that include pre- and postintervention data for the target outcomes were considered for the qualitative synthesis of findings. However, only studies utilizing group experimental comparison design or single-case experimental design with pre- and postintervention data were included in the analysis of the evidence base for practice, in line with the Council for Exceptional Children (2014) standards for evidence-based practices in special education guidelines.
Setting	The setting where the intervention was conducted was not limited in this study. Interventions delivered in clinical, educational, home, or other settings were included.

language with no associated disabilities. Children at risk were defined as children who have been identified at risk for difficulties in speech, language, or educational development or outcomes by the authors of the study or by enrollment in an education program that required proof of at-risk status (e.g., enrolled in a Head Start program). Articles were excluded if (d) participants had been diagnosed with difficulties or disabilities (excluding a primary speech and/or language disorder), for example, autism spectrum disorder, specific learning disability, and/or other developmental delays. Articles were excluded if they did not provide (e) pre- and postdata from an intervention for targeting speech, language, and/or early literacy skills. The pre- and postdata were required to measure children's speech, language, and/or early literacy skills either through direct assessment or adult report, for example, parent or teacher report of children's skills. Interventions that considered parent or teacher behavior in the absence of data describing children's skills were excluded as were articles that compared educational methodologies, for example, comparing monolingual and bilingual preschool programs. Articles were excluded if (f) only qualitative pre- and postdata from an intervention were provided or (g) they were not research articles published in a peer-reviewed journal. The latter criterion was used to increase the quality of articles considered in the review, as evaluation of study quality was an key component of this review. Finally, articles were excluded if (h) the full text of an article could not be obtained. Articles were only excluded using these criteria following extensive searching, interlibrary loan requests through five different university libraries, and contacting authors. The language in which the article was published was not an exclusion criterion.

Application of Criteria

An initial screening of article titles and abstracts for eligibility was conducted in Covidence. The first two authors independently screened all articles for whether they met the aforementioned inclusion/exclusion criteria and were blind to each other's decisions. After each author had screened all articles through the Covidence software, which flagged conflicts between author decisions, articles with conflicting status were discussed between the two authors until consensus was reached. Where the status of an article was not agreed upon by both authors, it moved to the next stage of screening. Similarly, articles that were not in English and where insufficient information was available to determine eligibility, articles proceeded to the next stage of screening.

The second stage of evaluating inclusion/exclusion was screening of the full text of the articles that had not yet been excluded. Again, the first two authors independently examined each article against the inclusion/exclusion criteria and determined if the article should be included or excluded, and, if excluded, the reason for which it should be excluded. Exclusion criteria were applied hierarchically by the authors (i.e., from criterion "a" first). After all articles had been screened, the Covidence software identified

conflicts in include/exclude decisions and reasons for exclusion. Again, the two authors discussed conflicts until consensus was reached. If consensus was not reached, a third author was called upon to make this decision. At this stage, a modification on the procedure was implemented for papers that were written in languages other than English. The first author, who has experience extracting data from papers in languages other than English, screened the full text using her own knowledge of the languages and was assisted by Google translate where necessary. This procedure is outlined in McLeod and Crowe (2018). Articles and the extracted information relevant to article inclusion/exclusion status were then reviewed by a professional fluent in the language of the article to determine. Articles written in French (n = 1), German (n = 9), and Portuguese (n = 1) were examined.

Data Extraction

Data were extracted from included articles independently by the first two authors and entered into a spreadsheet. Differences were reviewed by the two authors and discussed until consensus was reached, with input obtained from other authors to resolve disagreements when necessary. The only variation to this was for articles in languages other than English, where the first author extracted as much of the data from the article as possible. The article and preliminary extracted data were sent to a professional fluent in the language, who was experienced in speech and language acquisition research, multilingualism, and linguistics, for verification of extracted data and extraction of additional data.

Extracted data included participant, methodological, and intervention variables from articles. Article variables were reference citation, year of publication, language of publication, and article source (e.g., systematic search, handsearch). Participant variables were country where data were collected, number of participants, participants' ages, participants' sex, target group (i.e., SSD, DLD, at risk), and languages (i.e., home language, dominant community language, language of education). Methodological variables were study design (i.e., correlational [COR], crossover [CRO], experimental group comparison [EGC], single-case experimental design [SCED]), randomization method, treatment allocation method, measurement of fidelity, and blinding. Intervention variables were the name and description of the intervention, intervention setting (i.e., clinical, educational, home), intervention agent(s) (e.g., teacher, SLP), domains targeted by the intervention (e.g., vocabulary, social communication), language(s) the intervention was delivered in, language(s) the intervention targeted, and language(s) used by intervention agents.

Outcome variables were the domains and subdomains examined, the tools/procedures used to measure outcomes at pre- and postintervals, intervention effect (e.g., statistical significance, effect size), and a qualitative description of the outcome. Where the effect sizes necessary for comparison of outcomes across studies were not present in the published study, effect sizes were calculated using methods relevant for data available in the study. This most often involved calculation of a pretest–posttest–control (d_{pcc}) effect size calculated using pre- and posttest means, standard deviations, and sample sizes for the experimental and control groups, following procedures outlined by Morris (2008). A description of all methods used to calculate effect sizes is included in the note below the table of study information included as Supplemental Material S3 (Study Information).

Study Quality Indicators

For all included articles, the quality of the study and reporting of key information about the study in the published article were examined using the standards for EBP in special education guidelines from the CEC (2014). The level of evidence that studies provided was examined using (ASHA, 2004) EBP in communication disorders technical report. Three reviewers with advanced knowledge of research methodology and the literature in the field completed the quality assessment (authors K. C., K. W., and M. G.). The three reviewers independently extracted data in accordance with the CEC's (2014) guidelines for assessing study quality. Disagreements were discussed between the authors involved until consensus was reached.

Quality Indicators and Risk of Bias

Risk of bias within studies was evaluated as part of the CEC (2014) quality analysis as these guidelines overlapped with other frameworks that examine bias such as Grading of Recommendations Assessment, Development, and Evaluation (Guyatt et al., 2011). Reviewers determined whether each of the following aspects were sufficiently addressed in an article (yes/no): context or setting, participants (demographics, classification), intervention agent (role and background, relevant training), practice (procedure, materials), implementation fidelity (adherence, dose, monitoring), internal validity (controls, comparison, contamination, group assignment, sufficient data points, attrition), outcome measures/dependent variables (social importance, dependent variables defined, outcome measurement, reliability, validity), and data analysis (appropriateness, effect sizes reported). An aspect was described with *yes* if it was described sufficiently to know that "it does not represent a meaningful threat to the validity of study findings" (CEC, 2014, p. 207).

Evidence-Base for Practice

Identifying interventions and effects. Variation and complexity in how interventions were conducted, and in what conditions they were conducted, made comparison of findings across studies difficult. The following steps were taken to systematically address this. First, if a study compared two different interventions or two different methods of implementing the intervention (e.g., English-only delivery vs. English–Spanish delivery), then these were considered to

be separate interventions. Second, if the outcomes of participants were described in more than one language then outcomes for each language were considered separately, for example, effect sizes for phonological awareness are presented separately for English and Spanish. Finally, in some studies, children were assessed in only one language but this language differed across children, that is, children were assessed in English or Spanish depending on their strengths/preference, and the study reported the scores of participants combined across languages. In such cases, the same effect size for an outcome is reported for both the community and the home language.

ASHA level of evidence. Level of evidence within the ASHA (2004) guidelines is based on study methodology. Each study was classified using the following hierarchy ordered from highest to lowest level of evidence: (Ia) well-designed meta-analysis of randomized controlled trial studies, (Ib) well-designed randomized controlled studies, (IIa) well-designed controlled studies without randomization, (IIb) well-designed quasi-experimental studies, (III) well-designed nonexperimental studies, (IV) expert recommendations.

CEC classification of intervention effect. The effect of intervention in each study was described using the CEC (2014) guidelines and classified as positive, mixed/neutral, or negative. Intervention effects in EGC studies were based on the effect sizes for outcomes in the domains/subdomains of interest, which was either presented in the article or calculated based on data presented in the article. When two or more measures were reported for a single domain or subdomain (e.g., two measures of receptive vocabulary), the effect size was averaged, as per CEC (2014) recommendations. Effect sizes were described as positive ($d \geq 0.25$), negative ($d \leq -0.25$), or neutral ($-0.25 < d < 0.25$; CEC, 2014; What Works Clearinghouse, 2017). Where effect sizes other than Cohen's d were used, then these effect sizes were fitted to categories based on equivalent values (Lenhard & Lenhard, 2016; University of Cambridge, 2020). Intervention effects in SCED studies with three or more participants were based on the direction of the relationship between the dependent and independent variables and the number and proportion of participants for whom a relationship was established (CEC, 2014). Studies with only one or two participants were excluded, as per CEC (2014) recommendations. Effects in SCED studies were defined as: positive (meaningful changes for ≥ 75% of participants, no harmful effects), negative (nontherapeutic change in ≥ 75% of participants), and neutral (criteria for positive and negative not met; CEC, 2014).

CEC classification of evidence-base for practice. The cumulative effect of interventions was examined to see if each intervention could be considered as informing the evidence-base for practice based on CEC (2014) guidelines and outlined in Crowe and Guiberson (2019). Interventions informed EBP if these criteria were met: (a) two EGC studies with random assignment, positive effects, and at least 60 participants; or four EGC studies with nonrandom assignment, positive effects, and at least 120 participants; or five SCED studies with positive effects and at least 20 participants; or (b) meet at least 50% of the criteria for two or more study designs described in (a); and (c) include no studies with negative effects and no more than at least a 3:1 ratio of studies with positive to neutral effects. Interventions potentially informed EBP if these criteria were met: (a) one EGC studies with random assignment and positive effects, or two or three EGC studies with non-random assignment and positive effects, or two to four SCED studies with positive effects; or (b) meet at least 50% of the criteria for two or more study designs described in (a); and (c) include no studies with negative effects and no more than at least a 2:1 ratio of studies with positive to neutral effects. Intervention that had mixed evidence met the following criteria: meet (a) or (b) for informing or potentially informing EBP and include no studies with negative effects and no more than at least a 2:1 ratio of studies with positive to neutral effects, or include studies with negative effects as long as those do not outnumber the studies with positive effects. Interventions that had negative effects were those in which the number of studies with negative effects outnumbered the number of studies with positive effects. Interventions were deemed to have insufficient evidence if they did not meet the criteria for any other category.

Reliability

Reliability was not considered for article screening or data extraction as these processes were completed independently by two authors and discussion of all differences occurred until consensus was reached. Reliability for quality analysis occurred for 34 of the 56 studies (60.7%), which included 12 randomly selected studies (21%) and all 25 (44.6%) studies that were within 2 points of a perfect score on the CEC quality guidelines. Point-by-point interrater reliability was 92.3% (61 differences across 788 data points).

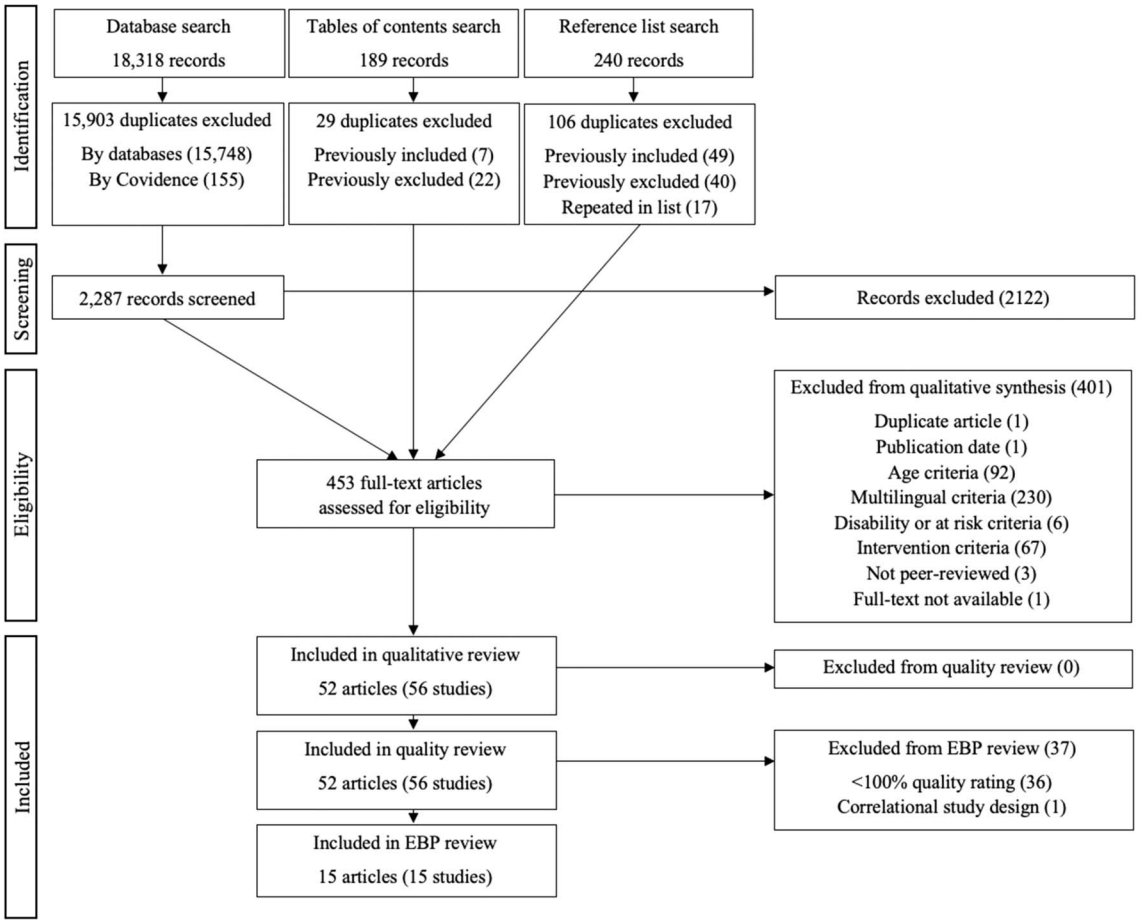
Results

The PRISMA flowchart detailing the search process and inclusion and exclusion of articles is presented in Figure 1. The final number of articles included was 52 articles describing 56 studies. Two articles included multiple studies within the same article. Two studies by Holm et al. (1997) were included, and four studies by Pham et al. (2011) were included. In both cases, all studies within an article reported on the same child. In the sections that follow, percentage calculations use a denominator describing either articles (n = 52) or studies (n = 56).

Publication Variables

The year of publication of articles ranged from 1990 to 2021 (M = 2012, SD = 6.5) with a negatively skewed distribution (−1.37, SE = 0.33), meaning that more articles were published in the later part of this range. The majority

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram describing the search and inclusion/exclusion process. EBP = evidence-based practice.



of articles were published in English (n = 50, 96.1%) and two (3.8%) were published in German.

Participant Characteristics

The 52 articles described 4,551 participants (M = 87.5, SD = 146.4). Participant characteristics for individual studies are summarized in Supplemental Material S3 (Study Information). The age of participants in articles was reported in a number of different ways, which made comparison difficult. Method of reporting age included age range of participants at the beginning of the study, mean age of all participants, mean age of each subgroup of participants, or a general range of participants was given (e.g., 4- to 5-year-olds). Where data on minimum and maximum participant age were available (n = 31, 59.6%), participants ranged in aged between 22 and 82 months. For the articles where the mean age of participants was reported or could be calculated from the information presented in the article (n = 43, 82.7%), the range of mean ages of participants was 27.8–67 months. In the five (9.6%) articles where specific ages were not presented, the age of participants was described as 4 years, 4–5 years, or pre-K/Kindergarten students. Data on participant sex were reported in 41 (78.8%) articles for 2,291 children, describing 1,082 (47.2%) females and 1,209 (52.7%) males.

The characteristics of participants that made them eligible for these articles, and for this review, were having an SSD (n = 6, 11.5%), DLD (n = 11, 21.2%; also described as specific language impairment or language disorder in these studies), or being at risk for poor language and education outcomes (n = 36, 69.2%). One study included children who were classified as being at risk, with a subgroup of these children diagnosed with DLD (Simon-Cereijido & Gutiérrez-Clellen, 2014). Reasons for participants being at risk in these 36 studies were described in articles as socioeconomic disadvantage (n = 32, 88.8%) and/or an identified delay in language or learning without the diagnosis of disorder (n = 12, 33.3%). In nine (25.5%) articles, participants were described as being at risk due to both socioeconomic disadvantaged and having an identified delay.

Articles reported on participating children living in 10 different countries. The majority of articles came from the United States (n = 40, 76.9%), followed by Canada

(n = 3, 5.8%), and the United Kingdom (n = 2, 3.8%). One (1.9%) each came from Australia, Germany, Luxembourg, South Africa, the Netherlands, and Turkey. One article did not specify where the participant was located (Mamdouh, 2008). Some information about the languages used by participants in a range of contexts was described in these articles. Forty-nine (94.2%) articles reported the language(s) used in participants' home environments. Most often reported was Spanish (n = 37, 71.2%) followed by English (n = 21, 40.4%), Arabic (n = 5, 7.7%), Turkish (n = 3, 5.8%), and two (3.8%) each for Bengali, Dutch, French, Mixteco, Punjabi, and Russian. Twenty-six other home languages were reported in one study each (see Supplemental Material S3: Study Information). Thirty-one (59.6%) articles reported the language(s) used in children's education environments. Most often reported was English-only (n = 19, 36.5%), followed by English and Spanish (n = 10, 19.2%), and one each for English and isiXhosa, Luxemburgish, and Turkish. One article included a cohort of children in an English-only setting and another in an English–Spanish bilingual setting. The language of the formal educational systems in which children were being prepared to enroll was either stated in the article or inferred by the authors (based on participant location, preschool language, language of the country/region). The target languages were Dutch (n = 1, 1.9%), English (n = 44, 84.6%), French (n = 2, 3.8%), German (n = 1, 1.9%), isiXhosa (n = 1, 1.9%), Luxembourgish (n = 1, 1.9%), Turkish (n = 1, 1.9%), and unable to be determined for Mamdouh (2008).

Study Design Characteristics

The research methodology used in the 56 included studies were: EGC (n = 34, 60.7%), SCED (n = 21, 37.5%), and COR (n = 1, 1.8%), with EGC including three studies which utilized a crossover design. Study designs definitions are presented in Table 1. Nine studies (16.1%) compared two interventions and 25 (44.6%) compared an intervention group with another group, often considered "business as usual" or control conditions. Monolingual and bilingual intervention conditions were compared in 17 studies (30.4%). The outcomes of monolingual and bilingual children receiving the same intervention were compared in three studies (5.4%).

Intervention Characteristics and Outcomes

Interventions were intended to develop participants' skills in a range of domains relevant to this review. Intervention goals addressed three broad domains: speech, language, and/or early literacy. Seven (12.5%) of the 56 studies targeted more than one domain, with the combination always being language and early literacy. General aspects of interventions will be discussed and then interventions will be discussed by domain.

Intervention Settings and Agents

Interventions were delivered in a variety of settings and by a range of agents across studies (n = 56). Five (8.9%) described intervention occurring in more than one setting, all of which were educational and home. Intervention settings were educational (n = 41, 73.2%), clinical (n = 6, 10.7%), and home (n = 14, 25.0%). Intervention was delivered by a variety of people. Sixteen (28.6%) studies involved more than one type of agent in delivering the intervention, with the most common combinations of agent being SLP and family (n = 5, 8.9%). This information was not provided in one study (1.8%). Interventions in studies were most often delivered by professionals who were SLPs (n = 23, 41.1%), including practicing SLPs and graduate student clinicians, or education setting staff, including teachers, teaching assistant, teacher aids, paraprofessionals, and general staff from the education setting (n = 20, 35.7%). Family members (n = 15, 26.8%), including mothers, parents, grandparents, and babysitters also delivered interventions. In the remaining studies, intervention was delivered by researchers whose background was not described (n = 3, 5.4%) or an agent using technology (n = 5, 8.9%) to support delivery of the intervention. Several studies utilized students as the intervention agents where the background was non-SLP or not specified (n = 6, 10.7%).

Intervention Language

Languages were considered as the language targeted by the intervention, the language used to deliver the intervention, and the agent(s) used to deliver intervention in each language. Here, a distinction is drawn between *home language* (i.e., the language used in the child's home environment) and *community language* (i.e., the nonhome language used in the child's education environment and/or in the wider community). The language targeted by intervention was the home language only in 10 (7.9%) of the 56 studies, the community language only in 26 (46.4%) studies, and 13 (23.2%) studies targeted both the home and community languages. The remaining seven (12.5%) studies included a condition where the community language was targeted in one condition and both languages were targeted in another. The languages targeted by intervention were English (n = 40, 71.4%), Spanish (n = 25, 44.6%), Vietnamese (n = 3, 5.4%), French (n = 2, 3.6%), and one (1.8%) each of Arabic, Dutch, German, isiXhosa, Luxembourgish, Moroccan Arabic, Tarafit Berber, and Turkish. The impact of the language targeted by intervention exceeds the scope of this systematic review, but is discussed in detail in Crowe et al. (2021).

The language used to deliver the intervention was the home language only in 11 (19.6%) studies and the community language only in 16 (28.6%) studies. Sixteen (28.6%) studies delivered intervention through both the home and community languages. The remaining 12 (21.4%) studies included a condition where the community language was used to deliver intervention in Condition 1, and both languages were used to deliver intervention in Condition 2. The languages used to deliver intervention were English (n = 39, 69.6%), Spanish (n = 31, 55.4%), Vietnamese (n = 4, 7.1%), French (n = 2, 3.6%), and one (1.8%) each for Arabic, Dutch, German, Hmong, Icelandic, isiXhosa, Luxembourgish, Moroccan Arabic, Tarafit Berber, and

Turkish. The language used to deliver intervention was not specified in one study (Castro et al., 2017) and the home language(s) used to deliver intervention to participants was not specified in one study (Thordardottir et al., 2015). The impact of the language intervention was delivered in and is discussed in detail in Crowe et al. (2021).

Intervention Outcomes

All studies reported pre- and postintervention data on outcomes relevant to speech, language, and/or early literacy. Nearly all studies reported positive findings (n = 55, 98.2%), which was considered to be a statistically significant improvement (EGC, CRO) or positive functional relationship (SCED) on at least one outcome measure. However, a nonsignificant change or nonpositive functional relationship was reported for at least one outcome measure by 27 (48.2%) of these studies, with 29 (51.8%) reporting positive changes in one or more outcome measure(s) and no change in one or more outcome measure(s). One (1.8%) study did not report positive findings for any outcome measure. No studies reported a negative impact on participants' outcomes. Interventions will now be discussed relevant to the domains that they relate to.

Interventions targeting speech. Interventions in seven studies targeted speech production, all reporting on participants with SSD without mention of comorbid DLD or having an at-risk status. The characteristics of these studies are shown in Table 3 and each study is summarized in Supplemental Material S3 (Study Information). The speech production outcomes (subdomains) examined were intelligibility (n = 3), accuracy of production (n = 7), and speech sound inventory (n = 2). The interventions used in these studies differed greatly, describing a bilingual therapy of SSD (Gildersleeve-Neumann & Goldstein, 2015), a core vocabulary approach (Holm & Dodd, 1999), minimal contrast approaches (Ray, 2002; Rossouw & Pascoe, 2018), articulation therapy (Holm et al., 1997), and phonological therapy (Holm et al., 1997; Mamdouh, 2008). In most studies, the intervention targeted skills in the community language and was delivered in the community language. All seven studies reported that intervention improved children's speech production skills for example, in phoneme accuracy, phonetic complexity, phonological processes and error patterns, consistency, and/or intelligibility. It should be noted that all studies also used SCED designs and described a sample of only eight participants across the seven studies.

Interventions targeting language. Forty-five (80.4%) of the 56 studies examined interventions that targeted children's language skills. The characteristics of these studies are shown in Table 3 and each study is summarized in Supplemental Material S3 (Study Information). The language outcomes (subdomains) examined were receptive vocabulary (n = 24), expressive vocabulary (n = 26), general vocabulary skills (n = 1), receptive language (n = 2), expressive language (n = 8), general language skills (n = 6), receptive narratives (n = 4), expressive narratives (n = 4), and morphosyntax (n = 5). Fourteen (31.1%) of the 45 studies examined participants with DLD, 31 (68.9%) targeted participants who were classified as being at risk, and one (2.2%) investigated participants with an identified language delay. One of these studies included children in an at-risk group and a group of children with DLD (Simon-Cereijido & Gutiérrez-Clellen, 2014).

The interventions used in these studies differed greatly in terms of their goals, their methods of delivery, and the measures used to examine outcomes. The most common approach, although the actual interventions differed, was use of shared-book reading that was a component of the intervention in nine studies (Brannon & Dauksas, 2012, 2014; Correa et al., 2015; Farver et al., 2009; Huennekens & Xu, 2010; Neuman & Kaefer, 2018; Restrepo et al., 2010, 2013; Tsybina & Eriks-Brophy, 2010). Shared-book reading included a variety of interactive book and language stimulation and teaching techniques, and in some studies, shared-book reading was combined with other language stimulation strategies. There were relatively few investigations of the exact same intervention packages across studies. Two exceptions to this are the "evidence-informed shared reading vocabulary approach" (Méndez et al., 2015, 2018) and "Nuestros Niños" [Our Children] (Buysse et al., 2010; Castro et al., 2017). Information about the interventions reported in each study are presented in Supplemental Material S3 (Study Information). The scope of interventions was diverse and ranged from multiyear programs that encompassed all aspects of children's time at preschool (e.g., Castro et al., 2017) to interventions conducted with one child over a 2-week period (Pham et al., 2011). Between these two extremes, there were also summer preschool programs (e.g., Bekman et al., 2011; Leacox & Jackson, 2014), preschool programs with focused activities (e.g., Zucker et al., 2021), within preschool group activities (e.g., Dockrell et al., 2010; Wahn, 2016), joint collaboration between preschools and home (e.g., Brannon & Dauksas, 2012; Landry et al., 2017), home-based intervention (e.g., Cooke et al., 2009; Peredo et al., 2018), and therapy blocks (Thordardottir et al., 2015; Thordardottir & Rioux, 2019).

A wide range of tools were used to measure changes in children's skills. Most often used were formal assessment measures and custom-designed tools. Formal assessments were used in many studies and it was common for the same assessment to be given in two languages where equivalent forms existed. For example, the Peabody Picture Vocabulary Test was used to measure skills in English, French, Spanish, and Turkish (e.g., Bekman et al., 2011; Méndez et al., 2015; Thordardottir & Rioux, 2019) and the Evoked Language Diagnosis of Grammatical Skills was administered in French, Luxembourgish, and Portuguese (Motsch & Schmidt, 2010). All other formal assessment tools only described children's skills in English and Spanish. Custom-designed tools were usually described as probes in studies and sought to specifically test content and skills targeted by the intervention, for example, testing children's knowledge of the vocabulary taught in the intervention (e.g., Lugo-Neris et al., 2010; Méndez et al., 2015). Other methods of assessment included the use of tasks such as sentence

Table 3. Summary of study characteristics.

Stage	Area	Subarea	Speech	Language	Early literacy	Total
Qualitative synthesis	Studies (*n*)		7	45	11	56
	Participants (*n*)		8	4,429	2,212	4,551
	Study design	COR	0 (0.0%)	0 (0.0%)	1 (9.1%)	1 (1.8%)
		EGC	0 (0.0%)	33 (73.3%)	8 (72.2%)	34 (60.7%)
		SCED	7 (100.0%)	12 (26.7%)	2 (18.2%)	21 (37.5%)
	Setting[a]	Clinic	3 (42.9%)	3 (6.7%)	0 (0.0%)	6 (10.7%)
		Education	4 (57.1%)	33 (73.3%)	11 (100%)	41 (73.2%)
		Home	1 (14.2%)	13 (28.9%)	2 (18.2%)	14 (25.0%)
	Language of intervention: Target[a]	Community only	5 (71.4%)	20 (44.4%)	4 (36.4%)	26 (46.4%)
		Home only	1 (14.2%)	8 (17.8%)	3 (27.3%)	10 (17.9%)
		Community OR both	0 (0.0%)	7 (15.6%)	1 (9.1%)	7 (12.5%)
		Both	1 (14.2%)	10 (22.2%)	3 (27.3%)	13 (23.2%)
	Language of intervention: Delivery[a]	Community only	5 (71.4%)	10 (22.2%)	3 (27.2%)	16 (28.6%)
		Home only	1 (14.2%)	8 (17.8%)	4 (36.4%)	11 (19.6%)
		Community OR both	0 (0.0%)	12 (26.7%)	1 (9.1%)	12 (21.4%)
		Both	1 (14.2%)	14 (31.1%)	2 (18.2%)	16 (28.6%)
		Not specified	0 (0.0%)	1 (2.2%)	1 (9.1%)	1 (1.8%)
	Intervention agent[a]	Education staff	0 (0.0%)	18 (40.0%)	6 (54.5%)	20 (35.7%)
		Family	0 (0.0%)	15 (33.3%)	2 (18.2%)	15 (26.8%)
		Researcher	0 (0.0%)	2 (4.4%)	1 (9.1%)	3 (5.4%)
		SLP	6 (85.7%)	16 (35.6%)	3 (27.3%)	23 (41.1%)
		Technology	0 (0.0%)	5 (11.1%)	0 (0.0%)	5 (8.9%)
		Other	0 (0.0%)	4 (8.9%)	3 (27.3%)	6 (10.7%)
		Not specified	1 (14.2%)	0 (0.0%)	0 (0.0%)	1 (1.8%)
	Subdomains[a]	Intelligibility	3 (42.9%)	—	—	—
		Production accuracy	7 (100.0%)	—	—	—
		Sound inventory	2 (28.6%)	—	—	—
		Receptive vocabulary	—	24 (53.3%)	—	—
		Expressive vocabulary	—	26 (57.8%)	—	—
		Vocabulary (not specified)	—	1 (2.2%)	—	—
		Receptive language	—	2 (4.4%)	—	—
		Expressive language	—	8 (17.8%)	—	—
		Language (not specified)	—	6 (13.3%)	—	—
		Receptive narrative	—	4 (8.9%)	—	—
		Expressive narrative	—	4 (8.9%)	—	—
		Morphosyntax	—	5 (11.1%)	—	—
		Early literacy	—	—	9 (81.8%)	—
		Phonological awareness	—	—	9 (81.8%)	—
		Writing	—	—	2 (18.2%)	—
	Study quality	EGC range	—	29.2%–100.0%	58.3%–100.0%	29.2%–100.0%
		M (*SD*)	—	87.5 (16.5)	91.1 (14.5)	86.6 (17.0)
		SCED range	50.0%–86.4%	50.0%–100.0%	86.4%–100.0%	50.0%–100.0%
		M (*SD*)	69.5 (15.7)	83.3 (13.3)	93.1 (9.6)	79.7 (15.5)

Note. Em dashes indicate data not relevant. SLP = speech-language pathologist; COR = correlational; SCED = single-case experimental design.

[a]A study may be classified under more than one category so percentage totals will be greater than 100%.

repetition (Bekman et al., 2011), narrative tasks (Correa et al., 2015; Spencer et al., 2019), and analysis of language samples for measures such as mean length of utterance, total number of words, and total number of different words (e.g., Huennekens & Xu, 2010).

Nearly all studies of the 45 studies (n = 44, 97.8%) reported positive findings on at least one outcome measure, with one study reporting null findings on all outcome measures (van Tuijl et al., 2001). Twenty-five (55.6%) of the 45 studies reported a null finding for at least one outcome measure. Children's outcomes were assessed in their home language only (n = 2, 4.4%), the community language only (n = 16, 35.6%), both languages (n = 23, 51.1%), or the language the child preferred (n = 1, 2.2%). Specific information about the language used in outcome measures was not specified in three studies. As the focus of the current review was not on the effect of intervention on different languages, this shall not be considered further in this article. The differential impact of intervention on community and home languages is discussed in detail in Crowe et al. (2021). A summary of the intervention findings of each study is presented in Supplemental Material S3 (Study Information).

Interventions targeting early literacy. Early literacy skills were examined as an outcome in 11 (21.2%) of the 56 studies. This encompassed: early literacy (pre-/emergent literacy/reading; n = 9, 81.8%), phonological awareness (n = 9, 81.8%), and writing (n = 2, 18.2%). The populations targeted by all 11 studies were children who were at risk without a diagnosis of SSD or DLD. Eleven different interventions were used in these studies, with the only intervention used twice being "Nuestros Niños" (Buysse et al., 2010; Castro et al., 2017). The interventions were whole preschool programs (Bekman et al., 2011), within preschool group activities (Gonzales & Tejero Hughes, 2018; Landry et al., 2019; Soto et al., 2020), Response to Intervention programs (Koutsoftas et al., 2009), and preschool–home collaborations (Caesar & Nelson, 2014; Landry et al., 2017). Three studies delivered intervention only in the home languages, three used only the community language, three used both the home and community languages, and one study included a condition where one group received intervention through the community language only and the other group received the intervention through instruction in both languages. This information was not available for one study (Castro et al., 2017).

A wide range of tools were used to measure changes in children's skills. Most often used were formal assessment measures and published assessments or tasks. A number of studies used equivalent measures across languages such as the English and Spanish versions of the Phonological Awareness Tasks (e.g., Buysse et al., 2010), Preschool Comprehensive Test of Phonological and Print Processing (e.g., Landry et al., 2019), Early Literacy Skills Assessment (e.g., Caesar & Nelson, 2014), Get Ready to Read (e.g., Gonzales & Tejero Hughes, 2018), or study specific probes (e.g., Soto et al., 2020). Nine studies reported positive findings on at least one outcome measure related to early literacy, with the exception being Castro et al. (2017). Four studies reported a null finding on at least one outcome measure. In these 11 studies, children's outcomes were assessed in the community language only (n = 2, 18.2%), both languages (n = 8, 72.7%), or the language the child preferred (n = 1, 9.1%). For the eight studies in which both languages used by the child were assessed, positive findings were reported on at least one outcome measure for either both languages (n = 7) or neither language (n = 1). Crowe et al. (2021) discusses the impact of intervention language in detail and a summary of the intervention findings of each study is presented in Supplemental Material S3 (Study Information).

Study Quality

The CEC (2014) guidelines state studies are appropriate for consideration as a source of evidence for EBP if they meet all of the relevant quality indicators for EGC (24 indicators) or SCED (22 indicators) studies. The one study that utilized a correlational design was excluded from this analysis (Gonzales & Tejero Hughes, 2018), meaning that 55 studies were considered in the study quality analysis. Fifteen (27.3%) of the 55 studies met all quality indicators, representing 35.3% (n = 12) of the 34 EGC studies and 14.3% (n = 3) of the 21 SCED studies. When looking across studies, quality scores ranged from 29.2% to 100.0% (M = 84.0%, SD = 16.7) with EGC studies having higher quality ratings, on average, than SCED studies (see Table 3). Where indicators applied to both study design types the indicator most often met was "The researcher controls and systematically manipulates the independent variable" (n = 55 of 55 studies, 100.0%; Indicator 6.1, p. 208). The indicator least often met was "The design controls for common threats to internal validity … so plausible, alternative explanations for findings can be reasonably ruled out" (n = 9 of 21 SCED studies, 42.9%; Indicator 6.7, p. 209). The number of studies that met each quality indicator is presented in Supplemental Material S4 (CEC Table).

Intervention Evidence Synthesis

The 15 studies (15 articles) that were of high quality (CEC, 2014) were examined for the ability of the interventions that they described to inform EBP. Information about these studies can be found in Table 4, including the effect size provided/calculated for each domain analyzed in the study.

The CEC (2014) guidelines for classifying the effect of studies as positive, neutral, or negative were followed to describe the impact of intervention in the 15 studies (see Table 5). Due to the number of different domains and subdomains addressed in each study, interventions were considered for their ability to inform EBP for each subdomain separately. All 15 studies described only one intervention, with one intervention (Nuestros Niños) described in two separate studies within these 15 studies (Buysse et al., 2010; Castro et al., 2017). Studies describing Focused Stimulation

Table 4. Description of studies included in the evidence synthesis.

Participants				Intervention	Delivery	Study	Outcomes investigated	Intervention effect	
Reference	*N*	Age (years;months)	Group	Name	Setting (agent)	Design	Domain (subdomain)	Language assessed	Domain and effect size[4]
Boyce et al. (2010)	75	1;10–5;0	At risk	Storytelling for the Home Enrichment of Language and Literacy Skills (SHELLS)	H (Fm)	EGC	LA (VE)	English Spanish	LA: d^a = 0.60
Buysse et al. (2010)	193	3;2–5;10	At risk	Nuestros Niños [Our Children]	E (Ed)	EGC	LA (VR, NR, L) LI (Pr, Ph)	English Spanish	LA: d^b = **–0.01** LI: d^b = 0.26 LA: d^b = **0.06** LI: d^b = 0.46
Castro et al. (2017)	340	4 yrs	At risk	Nuestros Niños [Our Children]	E (Ed)	EGC	LA (VR, VE) LI (Pr, Ph, Wr)	English Spanish	LA: d^b = **0.19** LI: d^b = **0.15** LA: d^b = **0.20** LI: d^b = 0.37
Farver et al. (2009)	94	3;9–5;2	At risk	Literacy Express Preschool Curriculum	E (Or)	EGC	LA (VR, VE) LI (Pr, Ph)	English Spanish	English Tx vs. Controls LA: d^b = 0.36 LI: d^b = 0.45 Bilingual Tx vs. Controls LA: d^b = 0.65 LI: d^b = 0.60 English Tx vs. Controls LA: d^b = **0.04** LI: d^b = **0.08** Bilingual Tx vs. Controls LA: d^b = 0.46 LI: d^b = 0.56
Greenwood et al. (2016)	9	4;5–5;2	At risk	Technology-Assisted Storybook Intervention	E (Re, Te)	SCED	LA (VR, NR)	English	LA: NAP[d] = 68%
Koutsoftas et al. (2009)	34	3–4 yrs	At risk	Intervention for Phonemic Awareness	E (Ed, SP)	SCED	LI (Ph)	English	LI: d_2^c = 1.34
Landry et al. (2019)	829	*M* = 4;7	At risk	Preparing Pequeños [Little Ones]	E (Ed)	EGC	LA (VE, L) LI (Pr, Ph)	English Spanish	LA: d^b = **–0.03** LI: d^b = **0.08** LA: d^b = **0.07** LI: d^b = 0.34
Lugo-Neris et al. (2010)	22	4;1–6;10	At risk	Shared Storybook Reading	E (SP)	CRO	LA (VR, VE)	English	Overall Changes (both Txs) LA: η^{2b} = 0.67 English Tx vs. Spanish Tx LA: η^{2b} = 0.13
Pollard-Durodola et al. (2018)	252	*M* = 4;8	At risk	Words of Oral Reading and Language Development (WORLD)	E (Ed)	EGC	LA (VR, VE)	English	LA: d^b = 0.56

(*table continues*)

Table 4. *(Continued).*

Reference	Participants			Intervention	Delivery	Study	Outcomes investigated	Intervention effect	
	N	Age (years;months)	Group	Name	Setting (agent)	Design	Domain (subdomain)	Language assessed	Domain and effect size[4]
Restrepo et al. (2010)	45	*M* = 4;8	At risk	Supplemental Instruction Program	E (SP)	EGC	LA (L)	Spanish	LA: d^a = 0.63
Simon-Cereijido & Gutiérrez-Clellen (2014)	107	*M* = 4;5	At risk DLD	Vocabulary, Oral Language and Academic Readiness (VOLAR)	E (Ed)	EGC	LA (LE)	English (All) Spanish (All) English (DLD) Spanish (DLD)	LA: d^a = **–0.11** LA: d^a = **0.22** LA: d^a = **–0.09** LA: d^a = **–0.15**
Spencer et al. (2019)	8	3;3–5;0	At risk	Dual language narrative intervention with embedded vocabulary instruction	E (Ed, Or)	SCED	LA (VR, NE)	English Spanish	LA (VR): d^b = 0.98 LA (NE): Positive LA (VR): d^b = 0.34 LA (NE): **Neutral**
Thordardottir et al. (2015)	29	3;9–5;8	DLD	Focused Stimulation	C (Fm, SP)	EGC	LA (VR, VE, LR, LE, MS,)	French and home language	LA: NC
van Tuijl et al. (2001)	319	4;0–5;2	At risk	Opstap Opnieuw [Step Up Again]	H (Fm)	EGC	LA (VR, VE)	Dutch Moroccan Arabic, Tarafit Berber, or Turkish	LA: d^b = **–0.04** LA: d^b = **0.02**
Zucker et al. (2021)	167	*M* = 4.8	At risk	Hablemos Juntos [Let's Talk Together]	E (Ed)	EGC	LA (VR, VE)	English Spanish	LA: g^b = **–0.03** LA: g^b = 0.49

Note. *Age.* yrs = years. *Group.* DLD = developmental language disorder. *Setting.* H = home; E = education; C = clinic. *Agent*. Fm = family; Ed = educator; Or = other; Re = researcher; Te = technology; SP = speech-language pathologist. *Design.* EGC = experimental group comparison; SCED = single-case experimental design; CRO = crossover. *Domain*. LA = language (VE = expressive vocabulary; VR = receptive vocabulary; NE = narrative expressive; NR = narrative receptive; ; L = language (not further specified); LE = expressive language; LR = receptive language; MS = morphosyntax); LI = literacy (Pr = pre-/emergent literacy/reading; Ph = phonological awareness; Wr = writing). *Domain and effect size*. [4]Where the same domain was examined in more than one language, the average effect size is presented, underlined data are positive effects ($d \geq 0.25$; $\eta^2 \geq 0.01$; $g \geq 0.5$), bolded data are neutral effects ($-0.25 < d < 0.25$); Tx = therapy/intervention; NC = not able to be calculated; [a]d_{pcc} calculated by the authors using pre and posttest means, standard deviations, and sample sizes for each group reported by study authors, following Morris (2008); [b]Value reported by study authors; [c]Individual effect size following Busk and Serlin (1992) as reported by the study authors; [d]Nonoverlap of All Pairs (NAP) effect-size index for single-case designs as described by Parker and Vannest (2009).

Table 5. Description of evidence from studies included in the evidence synthesis.

CEC group	Domain	Intervention name	Evidence level	Group	Mean effect sizes[†]
EBP	Early literacy	Nuestros Niños[2, 3]	Ib	At risk	d^b = 0.32
	Phonological awareness	Nuestros Niños[2, 3]	Ib	At risk	d^b = 0.40
Potentially EBP	Receptive vocabulary	Literacy Express Preschool Curriculum: Bilingual[4]	Ib	At risk	d^b = 0.55
		Shared Storybook Reading[8]	Ib	At risk	η^2 = 0.85
		Words of Oral Reading and Language Development[9]	Ib	At risk	d^b = 0.71
	Expressive vocabulary	Focused Stimulation Approach: Monolingual[13]	Ib	DLD	d^a = 0.78
		Focused Stimulation Approach: Bilingual[13]	Ib	DLD	d^a = 0.49
		Literacy Express Preschool Curriculum: Bilingual[4]	Ib	At risk	d^b = 0.58
		Shared Storybook Reading[8]	Ib	At risk	η^2 = 0.58
		Storytelling for the Home Enrichment of Language and Literacy Skills[1]	Ib	At risk	d^a = 0.60
		Words of Oral Reading and Language Development[9]	Ib	At risk	d^b = 0.42
	Receptive language	Focused Stimulation Approach: Monolingual[13#]	Ib	DLD	d^a = 0.59
		Focused Stimulation Approach: Bilingual[13#]	Ib	DLD	d^a = 0.38
	Expressive language	Supplemental Instruction Program[10]	IIa	At risk	d^a = 0.63
	Language	Nuestros Niños[2]	Ib	At risk	d^b = 0.26
	Early literacy	Literacy Express Preschool Curriculum: Bilingual[4]	Ib	At risk	d^b = 0.73
	Phonological awareness	Intervention for Phonemic Awareness[6]	IIa	At risk	d_2^c = 1.34
		Literacy Express Preschool Curriculum: Monolingual[4]	Ib	At risk	d^b = 0.28
		Literacy Express Preschool Curriculum: Bilingual[4]	Ib	At risk	d^b = 0.50
		Preparing Pequeños[7]	Ib	At risk	d^b = 0.32
	Writing	Nuestros Niños[3]	Ib	At risk	d^b = 0.42
Insufficient Evidence	Receptive vocabulary	Dual language narrative intervention with embedded vocabulary instruction[12]	IIa	At risk	d^b = 0.66
		Focused Stimulation Approach: Monolingual[13#]	Ib	DLD	d^a = 0.02
		Focused Stimulation Approach: Bilingual[13#]	Ib	DLD	d^a = –0.24
		Hablemos Juntos[15]	Ib	At risk	g^b = 0.24
		Literacy Express Preschool Curriculum: Monolingual[4]	Ib	At risk	d^b = 0.20
		Nuestros Niños[2, 3]	Ib	At risk	d^b = 0.07
		Opstap Opnieuw[14]	IIa	At risk	d^b = 0.00
		Technology-Assisted Storybook Intervention[5]	IIa	At risk	NAP[d] = 73%
	Expressive vocabulary	Hablemos Juntos[15]	Ib	At risk	g^b = –0.01
		Literacy Express Preschool Curriculum: Monolingual[4]	Ib	At risk	d^b = 0.20
		Nuestros Niños[3]	Ib	At risk	d^b = 0.17
		Opstap Opnieuw[14]	IIa	At risk	d^b = 0.02
		Preparing Pequeños[7]	Ib	At risk	d^b = 0.05
	Expressive language	Focused Stimulation Approach: Monolingual[13]	Ib	DLD	NC
		Focused Stimulation Approach: Bilingual[13]	Ib	DLD	NC
		Vocabulary, Oral Language and Academic Readiness[11]	IIa	At risk	d^a = 0.05
		Vocabulary, Oral Language and Academic Readiness[11]	IIa	DLD	d^a = –0.12
	Language	Preparing Pequeños[7]	Ib	At risk	d^b = 0.01
	Receptive narrative	Nuestros Niños[2]	Ib	At risk	d^b = –0.11
		Technology-Assisted Storybook Intervention[5]	IIa	At risk	NAP[d] = 65%
	Expressive narrative	Dual language narrative intervention with embedded vocabulary instruction[12]	IIa	At risk	Positive
	Morpho-syntax	Focused Stimulation Approach: Monolingual[13]	Ib	DLD	NC
		Focused Stimulation Approach: Bilingual[13]	Ib	DLD	NC
	Early literacy	Literacy Express Preschool Curriculum: Monolingual[4]	Ib	At risk	d^b = 0.24
		Preparing Pequeños[7]	Ib	At risk	d^b = 0.11
	Phonological awareness	Nuestros Niños[2, 3]	Ib	At risk	d^b = –0.03

Note. [†] = Where the same domain was examined in more than one language, the average effect size is presented. [#] = Effect size calculations based on standardized test results only (data were not available for vocabulary probes). *Abbreviations*. CEC = Council for Exceptional Children; EBP = evidence-based practice; DLD = developmental language disorder; Ib = well-designed randomized controlled study; IIa = well-designed controlled study without randomization; NC = not able to be calculated. *Effect sizes.* [a]d_{pcc} calculated by the authors from means, standard deviations, and sample sizes reported by study authors, following Morris (2008); [b]Value reported by study authors; [c]Individual effect size following Busk and Serlin (1992) as reported by the study authors; [d]Nonoverlap of All Pairs (NAP) effect-size index for single-case designs as described by Parker and Vannest (2009). *Citations*. [1]Boyce et al. (2010); [2]Buysse et al. (2010); [3]Castro et al. (2017); [4]Farver et al. (2009); [5]Greenwood et al. (2016); [6]Koutsoftas et al. (2009); [7]Landry et al. (2019); [8]Lugo-Neris et al. (2010); [9]Pollard-Durodola et al. (2018); [10]Restrepo et al. (2010); [11]Simon-Cereijido & Gutiérrez-Clellen (2014); [12]Spencer et al. (2019); [13]Thordardottir et al. (2015); [14]van Tuijl et al. (2001); [15]Zucker et al. (2021).

Approach (Thordardottir et al., 2015) and Literacy Express Preschool Curriculum (Farver et al., 2009) considered a monolingual and a bilingual intervention condition separately, and these conditions were considered as separate interventions in this analysis. The Vocabulary, Oral Language and Academic Readiness intervention (Simon-Cereijido & Gutiérrez-Clellen, 2014) examined the intervention with two populations, children who were at risk and children with DLD, and these conditions were considered as separate interventions in this analysis. Therefore, a total of 18 different interventions were considered in this analysis. For studies that evaluated children's skills in more than one language in the same subdomain, the effect sizes used in the classification of evidence were averaged across languages. These are the effect size values presented in Table 5. The component effect sizes in each language are included as Supplemental Material S5 (EBP Table).

One intervention met the guidelines for providing positive evidence and this evidence was for two domains: Nuestros Niños (Buysse et al., 2010; Castro et al., 2017) for early literacy and phonological awareness. A number of interventions were classified as potentially informing EBP in the subdomains of receptive vocabulary (n = 3), expressive vocabulary (n = 6), receptive language (n = 2), expressive language (n = 1), language (n = 1), early literacy (n = 1), phonological awareness (n = 4), and writing (n = 1; see Table 5). Insufficient evidence to draw a conclusion about an intervention's ability to inform EBP was the determination for all remaining intervention–subdomain combinations receptive vocabulary (n = 8), expressive vocabulary (n = 5), expressive language (n = 4), language (n = 1), receptive narrative (n = 2), receptive narrative (n = 1), morphosyntax (n = 2), early literacy (n = 2), and phonological awareness (n = 1; see Table 5). No interventions met the CEC (2014) evidence-based classification definitions for interventions with mixed evidence or interventions with negative effects. Few interventions were classified only as potentially informing EBP or having insufficient evidence. Three interventions only investigated one subdomain and were classified only as potentially informing EBP: Intervention for phonemic awareness (Koutsoftas et al., 2009), Storytelling for the Home Enrichment of Language and Literacy Skills (Boyce et al., 2010), and supplemental instruction program (Restrepo et al., 2010). A further three interventions investigated multiple subdomains and were always classified as potentially informing EBP: Shared Storybook Reading (Lugo-Neris et al., 2010), Technology-Assisted Storybook Intervention (Greenwood et al., 2016), and Words of Oral Reading and Language Development (Pollard-Durodola et al., 2018). Dual language narrative instruction with embedded vocabulary instruction (Spencer et al., 2019), Hablemos Juntos (Zucker et al., 2021), Opstap Opnieuw (van Tuijl et al., 2001), and Vocabulary, Oral Language and Academic Readiness (Simon-Cereijido & Gutiérrez-Clellen, 2014) were only classified as having insufficient evidence, that is, not having effect sizes classified as positive in any subdomain investigated.

The 15 studies that the 18 interventions were described in were classified according to ASHA recommendations (ASHA, 2004, 2005) and this is shown in Table 5. Studies were classified as well-designed randomized controlled studies (n = 9; level Ib) and well-designed controlled study without randomization (n = 6; level IIa).

Discussion

This systematic review addressed the issue of identifying high-quality evidence necessary to inform the practice of professionals working with preschool-age multilingual children with speech and language difficulties (i.e., those with a disorder or those at risk). This need was addressed through three steps. First, studies that had investigated interventions targeting the speech, language, and/or early literacy skills of preschool-age multilingual children with speech and/or language disorders and/or who are at risk of poor speech, language, literacy, and/or educational outcomes were identified and described. Second, the quality of these studies was examined in order to identify high-quality studies in which the intervention had a positive effect on these children's outcomes. Third, the interventions described in the high-quality studies were categories by outcome as to the extent to which they were able to be included in the evidence base for practice with these children.

Fifty-two studies were identified that met the criteria for this review, with these studies focusing on children with SSD, DLD, or being at risk, with interventions targeting speech production (seven studies), receptive and expressive language (42 studies), and/or early literacy (nine studies) skills. Most of the studies reported positive effects and the interventions were mostly delivered in the community language, though delivery in both languages was also common, particularly for studies where children were bilingual speakers of English and Spanish. Of the 52 studies, only 13 used designs from which causation could be implied and met all CEC (2014) quality indicators to be considered high-quality articles. The CEC (2014) guidelines were applied separately to each subdomain that studies describing these 13 interventions reported outcome data for to determine which interventions informed EBP for each subdomain. Only one intervention met the criteria for informing the evidence base for practice, the Nuestros Niños School Readiness Program (Buysse et al., 2010; Castro et al., 2017), and only for outcomes related to early literacy and phonological awareness. All the effects of interventions on all other subdomains were classified as either potentially informing EBP or as currently having insufficient evidence to be considered as informing EBP. This review concludes that there is need for rigorous planning, implementation, and reporting in future studies of interventions for speech, language, and early literacy skills in multilingual preschool-age children with a speech or language disorder or at risk for poor educational outcomes in these areas.

Strengths of the Literature

A strength of the literature included in the current review is that for preschool-age multilingual children, there is a body of research that empirically investigates the effect of interventions for children with SSD, DLD, or those identified as being at risk of poor outcomes. Across this literature, it is the heterogeneity of the individual studies and the interventions that they investigated that is a major strength of the literature. Geographic and linguistic diversity within studies was a strength of the literature as a whole. Regarding geographical locale, articles described interventions conducted across five continents: Africa (n = 1), Asia (n = 2), Australia and Oceania (n = 1), Europe (n = 5), and North America (n = 39). Studies varied in the language(s) used to assess intervention outcomes, which may reflect changes in thinking toward the value of understudied languages and children's home languages, as well as the expanding range of tools and methods to assess skills in a range of languages. While most studies evaluated children's outcomes in a single language (e.g., Turkish; Bekman et al., 2011), some evaluated two languages (e.g., English and Vietnamese; Pham et al., 2011), or more than two languages (e.g., English, Hindi, and Gujarati; Ray, 2002). Assessment tools and methods were similarly diverse, indicating strength in the literature through the examination of children's speech, language, and early literacy skills from multiple perspectives. For example, some studies used the same or equivalent assessments to examine children's skills in multiple languages (e.g., Ijalba, 2015; Motsch & Schmidt, 2010). Custom-designed tools that were comparable across languages were also a common strategy, such as vocabulary probes (e.g., Méndez et al., 2015; Thordardottir et al., 2015). While the literature from the English-speaking Global North dominated the review, the presence of literature from non-English-speaking contexts and the Global South signals a change in the field toward a more inclusive perspective.

In terms of the interventions themselves, diversity similarly created strength within the literature as a whole. Interventions were delivered in a range of settings and by a range of people, demonstrating the way in which responsibility of supporting multilingual children with communication challenges transcends individual settings or professionals. Interventions were delivered in education, home, and/or clinical settings. Interventions were implemented by a variety of agents, most often SLPs, families, and/or educators. Interventions existed in multiple delivery formats, including delivery to large groups, small groups, and individual children. Interventions were also formatted as pre-prepared curriculums (e.g., Landry et al., 2019), as responses to specific settings (e.g., Roberts, 2008) or tailored to individual children's needs (e.g., Pham et al., 2011). Where multilingual interventions were the goal but a setting only had monolingual professionals to deliver the intervention, innovative solutions were found, such as utilizing technology available in the preschool (e.g., Rivera Pérez et al., 2019) or enlisting parents as intervention collaborators with the assistance of technology (e.g., Cooke et al., 2009). Together, this demonstrates that it is possible for children to access effective support for speech, language, and early literacy within and across multiple settings, reducing barriers to children and families accessing support. Considering these intervention studies together shows the strength and possibilities of the literature that transcends what it is possible to understand from any study alone. Furthermore, the strength of the literature is that, as a whole, it provides evidence of ecological validity for interventions supporting children with SSD, DLD, or who are at risk of adverse speech, language, and/or education outcomes. The inclusion of people (e.g., families, SLP), setting formats (e.g., group, individual), and resources (e.g., technology in intervention) that are naturally available in children's lives (i.e., the child's ecosystem) supported the successful implementation of interventions. For example, a small number of studies (n = 5) reported using technology to support the delivery of intervention (e.g., Rivera Pérez et al., 2019; enhancing monolingual English-speaking SLPs' cultural competence) or to automate the learning experience for receptive vocabulary and narrative comprehension skills (e.g., Greenwood et al., 2016).

Limitations of the Literature

While the apparent diversity of the literature has just been considered a strength, it is also true that the actual lack of diversity in the literature is a limitation. While articles described interventions implemented across five continents, the vast majority of the interventions were conducted in the United States (n = 36, 69%), and these primarily considered multilingual learners of English and Spanish. While the large numbers of English and Spanish speakers in the United States may warrant this focus within research conducted in the United States, globally, there are more than 8,000 living languages and the majority of children are multilingual (Eberhard et al., 2021; Grosjean, 2013). Therefore, reducing the literature to being predominantly an examination of English–Spanish multilinguals constrains the applicability of evidence-based interventions for multilingual preschoolers whose language pairings fall outside this well-studied language paradigm. In response to this, more research is needed about (a) the effectiveness of existing EBIs for multilingual preschoolers who use different language pairings and (b) the effectiveness of interventions specifically developed for use with multilingual preschoolers who use different language pairings. Adaptation of EBIs to reflect culturally competent and responsive practices may also be possible, with the impact of these adaptations on each interventions' effectiveness also needing to be examined. In summary, future research must evaluate known EBIs with multilingual preschoolers from varied cultural and linguistic profiles as well as rigorously consider interventions developed in diverse settings for their effectiveness in supporting these vulnerable multilingual preschoolers, especially for understudied language pairings such as Catalan and Spanish (e.g., Bosch & Ramon-Casas, 2011), Jamaican Creole and English (e.g., Washington et al., 2021; Wright

Karem & Washington, 2021), or Hindi, Gujarati, and English (Ray, 2002).

Another ever-present limitation of the literature is that of bias. While not able to be systematically addressed within the scope of this review, it is almost certain that publication bias exists in the literature, presenting a significant limitation. A publication bias may arise when studies reporting null or negative findings are less likely to be published compared to those reporting positive findings (Guyatt et al., 2011). Considering this in light of the current review, all but one of the articles identified through the systematic search reported a positive outcome on at least one of the measures used to measure children's outcomes. As suggestions arise, progress is being made in some disciplines to reduce the impact of publication bias in research through measures such as the preregistration of clinical trials (e.g., ClinicanTrials.gov), preregistration of research hypotheses, and planned analyses in nonclinical trials (e.g., Open Science Framework), mandatory publication, having specific negative result articles/journals, two-stage review (method and then results), published rejection lists, and making unpublished data sets publicly available (Bernard et al., 2020; Carroll et al., 2017). However, many methods of reducing publication bias are still considered to be unfeasible (Carroll et al., 2017) and have not been implemented in the field of special education (Cook & Therrien, 2017) or speech-language pathology. In addition to this, there are also biases that differentially impact the possibility of publication of literature that are geographically based. Research from privileged settings, whether this is defined as the Global North, developed countries, or high-income countries, tends to be reviewed more positively (Skopec et al., 2020; Yousefi-Nooraie et al., 2006). This bias relates to many factors, which may include publication of less robust or null findings in non-English language journals (Egger et al., 1997), different standards being applied related to research quality depending on the research's country of origin (Yousefi-Nooraie et al., 2006), and differences in scientific rigor and research quality (Egger et al., 1997). This may explain why there were fewer articles identified from less privileged settings and why none were found to be of sufficient quality to be considered in the analysis of EBIs.

Following on from this, within the published and available literature, there was a dearth of high-quality articles, with only 13 of the 51 studies identified in this review meeting all the quality indicators for the CEC standards for EBPs in special education (CEC, 2014). This is a significant limitation of the current literature in this field. The lack of replication of intervention studies meant that only one intervention, Nuestros Niños (Buysse et al., 2010; Castro et al., 2017), could be considered within the category of *informing the evidence base for practice* within the CEC guidelines. A lack of replication studies has been a reported area of concern in the fields of special education and multilingual education (Crowe & Guiberson, 2019; Makel et al., 2016). Replication of the evidence is needed to help build the resource base of available high-level evidence for the effect of interventions in many fields, including special education (Cook et al., 2016; Makel et al., 2016).

Recommendations for Practitioners

Decisions about the interpretation, quality, and applicability of research evidence for use in the home, classroom, or clinic is often the prerogative of educators and clinicians at a local level, and in some instances, their supervisors or program administrators. EBP requires decisions to be grounded in an integration of the best research evidence, clinical experience, client preferences, and local context (Dollaghan, 2007). In considering what is the best available research evidence, practitioners can look to systematic reviews that have objectively examined the quality or study implementation and reporting, such as the present review, or evaluate articles themselves using tools such as the Standards for EBPs in Special Education (CEC, 2014). Practitioners' own expertise is invaluable in determining whether an intervention that has high-quality evidence will be appropriate for a given situation. For example, while Nuestros Niños was found to inform the evidence base for literacy-based interventions with Spanish-speaking children, this evidence may not hold when children are speakers of other languages and/or diagnosed with SSD or DLD.

Ongoing professional development can heighten professionals' expertise by keeping their knowledge current regarding promising multilingual speech, language, and literacy development interventions. Client preferences means considering the needs and preferences of those involved in the intervention, bearing in mind that this may include children, parents, and staff. These preferences may be closely linked with the demands of the local context and establishing if an intervention works in that context. For example, a context where there is a large transient population (e.g., programs that serve migrant populations and seasonal workers) or a context with finite resources in terms of staffing and staff language skills. Taking into account the local context will also assist in establishing if interventions are culturally appropriate and responsive for a given group of individuals. Therefore, through the lens of EBP, practitioners can combine the best-quality available evidence, their own expertise, their knowledge of the cultural background and preferences of others, and understanding of local context in order to implement interventions that have the best possibility of improving the speech, language, and/or early literacy outcomes of the children that they serve. From this perspective, practitioners can collect their own evidence by documenting the intervention(s) they use in the homes, classrooms, and clinics they serve and objectively monitor the impact of those interventions on children's skills.

Recommendations for Researchers

For researchers investigating interventions for preschool-age multilingual children, there is need for attention to planning, conducting, and reporting studies with a high level of rigor and transparency. In the present systematic

review, few studies met the CEC (2014) quality guidelines, with only two studies examining interventions for multilingual children with DLD and no studies examining interventions for multilingual children with SSD. The majority of studies examining interventions for multilingual children who were at risk of adverse outcomes likewise did not meet these guidelines. Crucial to improving the developmental outcomes of young multilingual learners are high-quality, evidence-based interventions, which is currently limited. In response to this, researchers should adhere to published quality guidelines and quality indicators for their intended study design from the inception of an intervention research project. This engineering of intervention research will ensure that key processes are planned, undertaken, and eventually reported, so that the research yields results that can actually inform clinical or educational practices. The Enhancing the QUAlity and Transparency Of health Research, or EQUATOR, network (www.equator-network.org) brings together reporting guidelines for a broad range of quantitative study designs and review types, as well as qualitative research. Using such guidelines to inform study design and reporting means that every reader has information key to appraising the quality of the research. Where publication page limits prevent all key information being included in a manuscript, providing online supplemental materials that clearly describe the researcher teams' response to each element of the reporting guidelines is beneficial (e.g., Supplemental Material S1: PRISMA Table).

Part of this focus toward high-quality research should be on high-quality replication studies, examining the same intervention contexts that are diverse, for example, in terms of the cultural and linguistic environments in which they are delivered. This type of planned replication of research with adjacent populations would act to provide a greater understanding of each intervention's external validity and allow for refinements to understand the key ingredients of an intervention in different contexts, and also with different cultural and linguistic communities. Finally, researchers, and more importantly, editors and journals, are strongly encouraged to report research that has null or negative findings, which is critical to transparency in reporting of high-quality research. While this will require a paradigm shift in the publishing culture, it is foundational to moving the field forward (cf. McLeod et al., 2017, which received the 2018 ASHA Editor's award). In the meantime, researchers should be alert to initiatives such as preprint services, Open Science Framework (https://osf.io), and File Drawer Data Liberation Effort (FIDDLE; https://s-quest.bihealth.org/fiddle/) as contexts for making hard-to-publish data and manuscripts publicly available.

Limitations of this Review

There are a number of limitations to this systematic review. First, the strict inclusion/exclusion criteria meant that only studies that exactly met the research question posed in this review were included. This led to a limitation in which articles which could have been informative to the topic in general were excluded because they did not meet the specific criteria of this review. For example, a number of studies had to be excluded because they did not include pretest measures, even though pretest measures could not be conducted for valid reasons, such as studies describing interventions that began when children were too young to assess, conducted with the parents of very young children (e.g., High et al., 2000), and in some cases, the intervention began during prenatal care (Jungmann et al., 2011). Second, the strict guidelines of the CEC (2014), which determine that only studies that meet all quality indicators could be considered to contribute to EBP, meant that studies that met the majority of indicators but failed to address one or two key details in the published article were excluded from consideration in EBP. The fact that a study did not meet all quality indicators does not necessarily mean that a study is of poor quality. The researchers may have met all requirements in conducting their study, but not, for example, have included descriptions of fidelity procedures in the article that was published. With no way of knowing whether fidelity had been examined or not, the indicator had to be considered as not being met. While this may have excluded some high-quality research from the final stage of analysis, the flip side is that the consistent and strict adherence to the CEC (2014) guidelines strengthened this systematic review by considering only interventions with the best-quality evidence.

Third, in the discipline of communication sciences and disorders, it is recommended that published and unpublished literature should be identified in reviews in order to reduce the impact of publication bias on review findings (Chow, 2018). However, the authors restricted the scope of this review to published, peer-reviewed literature for two reasons: (a) to provide clear, replicable search strategies and (b) to limit number of retrieved records in the search to those most likely to be of high quality, and thus, useful for informing the research questions of this review. This strategy may have resulted in potentially informative intervention studies presented in sources such as books, book chapters, dissertations, research reports, and working papers being excluded. Finally, while the authors aimed to be inclusive of literature published in languages other than English, the low number of records retrieved for non-English articles may indicate that the search terms and search strategy (including handsearching) was biased toward publications in English. Along with considering gray literature, future research should utilize more linguistically inclusive search methods to discover more diverse literature that may contribute to our knowledge of EBIs.

Conclusions

The aim of this systematic review was to identify and critically evaluate research describing interventions for the speech, language, and/or early literacy skills of preschool age, multilingual children who have been diagnosed with a speech and/or language disorder or who had been identified as being at risk of poor speech, language, and/or educational outcomes. While 52 studies were identified that

met the criteria of the review, only 15 met the criteria for being of high quality and only one intervention program, Nuestros Niños (Buysse et al., 2010; Castro et al., 2017), met the criteria for *informing* EBP and only in the areas of early literacy and phonological awareness. Attention to increasing the quality of research and research reporting and to conducting replication studies of promising interventions is needed in order to grow the evidence-base for practice with a more diverse base of multilingual children who have been diagnosed with a speech and/or language disorder or who had been identified as being at risk of speech, language, and/or educational outcomes.

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