

Language intervention in bilingual children with developmental language disorder: A systematic review

Author

Nair, Vishnu KK, Clark, Grace T, Siyambalapitiya, Samantha, Reuterskiöld, Christina

Published

2022

Journal Title

International Journal of Language & Communication Disorders

Version

Version of Record (VoR)

DOI

[10.1111/1460-6984.12803](https://doi.org/10.1111/1460-6984.12803)

Rights statement

© 2022 The Authors. International Journal of Language & Communication Disorders published by John Wiley & Sons Ltd on behalf of Royal College of Speech and Language Therapists. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

Downloaded from

<http://hdl.handle.net/10072/420022>

Griffith Research Online

<https://research-repository.griffith.edu.au>

REVIEW

Language intervention in bilingual children with developmental language disorder: A systematic review

Vishnu KK Nair¹ | Grace T. Clark² | Samantha Siyambalapitiya³ |
Christina Reuterskiöld⁴

¹School of Psychology and Clinical Language Sciences, University of Reading, Reading, UK

²Department of Communicative Sciences and Disorders, New York University, New York, NY, USA

³Speech Pathology, School of Allied Health Sciences Griffith University, Samantha, QLD, Australia

⁴Department of Biomedical and Clinical Sciences, Linköping University, Linköping, Östergötland, Sweden

Correspondence

Vishnu KK Nair, School of Psychology and Clinical Language Sciences University of Reading, Reading RG6 6AL, UK.
Email: v.nair@reading.ac.uk

Funding information

Vishnu K. K. Nair was supported by a postdoctoral fellowship from NYU Steinhardt School of Culture and Human Development.

Abstract

Background: Although there is a growing body of literature on cognitive and language processing in bilingual children with developmental language disorder (DLD), there is a major gap in the evidence for language intervention. Critically, speech–language therapists are often required to make clinical decisions for language intervention on specific domains, such as phonology, vocabulary, morphosyntax and literacy.

Aims: To examine evidence for language intervention and cross-language transfer effects in bilingual children with DLD. Specifically, the study aimed to review intervention evidence targeting non-linguistic cognitive skills and six areas of language: phonology, vocabulary, morphosyntax, pragmatics, narrative skills and literacy.

Methods & Procedures: We carried out searches in five electronic databases: CINAHL, Scopus, Psychinfo, Proquest and Sciencedirect. Data from selected papers were extracted and organized into the three following categories: study information, participant information and intervention information. Critical appraisal for selected papers was conducted using a quality assessment tool (QAT).

Outcomes & Results: We included 14 papers in the review. The majority indicated evidence for vocabulary intervention. There was limited evidence for intervention targeting phonology or morphosyntax. Cross-language generalization effects were evident for vocabulary, but in some instances also reported for morphosyntax and literacy.

Conclusions & Implications: The present review indicates that there is a significant gap in the literature regarding language intervention for several key language areas such as morphosyntax, narrative skills and literacy. There are only limited data for the effects of cross-language generalization indicating that more research is needed in this area specifically for skills beyond vocabulary.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial](https://creativecommons.org/licenses/by-nc/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2022 The Authors. *International Journal of Language & Communication Disorders* published by John Wiley & Sons Ltd on behalf of Royal College of Speech and Language Therapists.

KEYWORDS

bilingualism, developmental language disorder, language intervention

What this paper adds*What is already known on the subject*

- Previous studies have examined the effects of bi- and monolingual intervention in bilingual children with DLD. Although the results indicated superior effects for bilingual compared with monolingual intervention, language intervention evidence in specific language domains (e.g., vocabulary, literacy) has not been investigated.

What this paper adds to existing knowledge

- This study will add intervention evidence specific to language domains such as phonology, vocabulary, morphosyntax, pragmatics, narrative skills and literacy. Additionally, we have synthesized intervention evidence on non-linguistic cognition given that these skills are often impaired in bilingual children with DLD. The review has also demonstrated evidence for the effects of cross-language transfer beyond vocabulary skills, especially when the intervention was provided in the home language.

What are the potential or actual clinical implications of this work?

- Although there was a lack of intervention evidence in language domains such as pragmatics, the results indicated some evidence for intervention targeting vocabulary. However, positive effects of cross-language generalization were not constrained to vocabulary but were also reported for intervention targeting mean length of utterance and literacy in the home language. This result indicates an interactive nature of the two languages, as well as provides further evidence for supporting home language(s) in intervention. Finally, intervention targeting non-linguistic cognition may yield additional cross-domain generalization to language skills specifically for bilingual children with DLD.

INTRODUCTION

Although bilingualism has existed since ancient times, in recent times, due to a number of socio-political factors, societies all over the world have been experiencing rapid growth in the number of bilingual speakers. In Asia, which accounts for 10% of the world's languages (Panda & Mohanty, 2015), bilingualism is on the rise. For instance, South Asia, witnessed unprecedented levels of increase in English bilingualism post-colonialization and globalization (see Panda & Mohanty, 2015; and Kachru, 1994, for a history of bilingualism in this region). The European Union currently has 23 official languages,

and 80% of working adult Europeans can communicate in at least one additional language (European Commission, 2016). In the United States, according to the recent American Community Survey, 22% of the population, 5 years and older, speak a language other than English at home (American Community Survey, 2019). With the rise in bilingualism, speech-language pathologists (SLPs) across the globe are increasingly challenged to provide language intervention services for children with language impairment from a variety of bilingual backgrounds. Although the significance of evidence-based practice in speech-language therapy has long been recognized, there is a major gap in the evidence for



language intervention in bilingual children (Thordardottir, 2010).

SLPs often must make clinical decisions for language intervention from a small number of published research studies, and the results from these studies are often contradictory. The main aim of this paper is to synthesize available evidence for language intervention targeting language skills in bilingual children with developmental language disorder (DLD) using a systematic review. In this paper, we use the term ‘developmental language disorder’ for disorders that have been previously referred to as specific language impairment (SLI) in line with Phase 2 of the CATALISE (2017) statement. However, when discussing the original article, wherever possible, we have retained the original terminology (e.g., SLI/primary language impairment—PLI) used by the authors.

Language characteristics in bilingual children with DLD

Although it is often difficult to determine the extent to which each language is affected, in the past two decades there has been a great deal of attention given to examining language impairment in bilingual children with DLD. Bilingual children with DLD showed language-specific errors in L1 and L2. Restrepo and Kruth (2000) reported that Spanish–English bilingual children with DLD exhibited gender agreement errors (using the definite singular masculine article ‘el’ for the definite singular feminine article ‘la’) in Spanish, while difficulty with production of tense-marking (e.g., regular third-person and irregular third-person singular) were frequent in English. Bilingual children with DLD also demonstrate impairments in domains other than morphosyntax, such as weaknesses in vocabulary skills in both languages, difficulties associated with word learning, and poor word-retrieval abilities (see Bedore & Peña, 2008, for a review). In addition to the problems associated with linguistic skills, similar to monolingual children with DLD (Leonard et al., 2007), a number of studies have also suggested a weakness in non-linguistic cognitive skills such as working memory, speed of processing and attention in bilingual children with DLD (e.g., Kohnert et al., 2009; Ebert et al., 2012). It has also been documented that bilingual children with DLD may demonstrate language attrition in L1, especially if the L1 is a minority or non-dominant language of the society (Kohnert et al., 2009; Anderson, 2012).

Given that bilingual children with DLD demonstrate weaknesses across several language skills, such as lexical, semantic and syntactic knowledge, as well as non-linguistic cognitive skills, such as working memory (e.g., Marinis et al., 2017; Talli & Stavrakaki, 2019), it is criti-

cal to understand the specific evidence for interventions targeting these skills. The current review examined intervention evidence in six broad areas of language including phonology, vocabulary, morphosyntax, pragmatics, narrative skills and literacy. Our reasoning for the inclusion of these six areas was based on previous literature demonstrating impairments in these specific domains for children with DLD (e.g., Bedore & Peña, 2008). We aimed to capture evidence of intervention effects in these specific language areas. Additionally, we included non-linguistic cognition because of the strong evidence that children with DLD show weakness in this domain (e.g., Ebert et al., 2019). It is important to note that language intervention studies can have multiple outcome variables, and therefore it is challenging to classify studies into specific language domains. Instead of using outcome variables, we categorized studies based on the intervention type. For example, if a particular study focused on narrative intervention and measured its effects through improvements in grammar, we considered this as evidence for an intervention targeting narrative skills. Whilst this approach can pose challenges because language domains can overlap during intervention (e.g., intervention targeting vocabulary can involve phonology and morphology), we were concerned about the application of intervention that would aim to improve a specific language domain as a whole (e.g., vocabulary) rather than its component parts. This approach will provide evidence for the efficacy of intervention targeting these six language domains.

Cross-language transfer of linguistic skills

A key issue debated in the bilingual literature related to intervention is cross-language transfer effects (e.g., Dam et al., 2020). In typical children, cross-language transfer is defined as the interaction between two typologically distinct languages with features from one language transferring to another (e.g., transferring Spanish /x/ phoneme to English) (Kohnert, 2010). Cross-language transfer can occur in multiple language domains such as in semantic knowledge. For example, evidence indicates that cross-language transfer of paradigmatic knowledge (e.g., *magenta*, *purple*, *beige*; all belonging to the category colour) may occur in languages such as Spanish–English (Ordóñez et al., 2002). Pham et al. (2018) investigated cross-language transfer effects and observed these effects only in highly proficient speakers of typologically similar languages (Spanish–English). In their study, these effects were not found in speakers of structurally dissimilar languages (e.g., Vietnamese–English) or in low-proficiency bilingual speakers of structurally similar languages (Spanish–English).

Only a limited number of studies have examined cross-language transfer effects in children with DLD. Specifically, in the context of intervention, cross-language transfer is reported as the generalization of treatment gains from the treated to the untreated language (e.g., Goral et al., 2010). For example, studies have reported that treatment targeting verbs (e.g., drop) in a treated language (L2 English) can generalize and improve similar words or semantic categories in an untreated language (e.g., L1 Arabic) (e.g., Knoph, 2013). Preliminary evidence shows that intervention using structurally similar vocabulary (e.g., cognate words) may promote cross-language transfer and vocabulary knowledge in children with DLD (Dam et al., 2020). While there is evidence for cross-language effects, it is most often reported in vocabulary intervention using cognate words (e.g., Dam et al., 2020). Cognates are translation pairs that are phonologically and semantically similar in both languages (e.g., *elephant* and *elefante* in English and Spanish) (e.g., Costa et al., 2005). Although the directionality (L1 → L2; L2 → L1) of cross-language transfer in intervention is unknown, few studies report transfer of vocabulary skills from L1 to L2 following intervention in L1 (e.g., Dam et al., 2020).

It has been argued that cognates have a facilitative effect during word retrieval and naming because of the shared phonological and semantic representations between languages (e.g., Costa et al., 2005). These facilitative effects have been reported not only for full cognates such as *elephant* and *elefante* but also for partial cognates that may have some semantic overlap (e.g., 'grave' in both English and Spanish means serious but 'grave' in English has an additional meaning as the 'place for burial') (Sunderman & Schwartz, 2008). Although there is evidence for a cognate facilitation effect, it is unclear if cross-language transfer is found beyond words (cognates) in bilingual children with DLD. For example, intervention targeting narrative skills could lead to cross-language transfer of microstructures (e.g., clauses, noun/verb phrases) to the untreated language. Similarly, intervention targeting phonology, syntax, morphosyntax or literacy could lead to transfer effects in these domains. Therefore, in addition to identifying intervention evidence for specific language domains, we were also interested in examining evidence for cross-language transfer effects in domains beyond cognate vocabulary intervention such as syntax, morphosyntax, literacy and narrative skills.

Evidence for language intervention

Recently, a number of review articles were published in order to provide a better understanding of evidence for language intervention and guidelines for clinicians working

with bilingual children (e.g., Bird et al., 2016; Durán et al., 2016; Ebert & Kohnert, 2016; Harvey et al., 2018; Guiberson & Ferris, 2019; Larson et al., 2019; Lim et al., 2019). For example, Durán et al. (2016) reviewed intervention studies in bilingual children with language impairment or children who were at risk of language impairment. They found that bilingual intervention focused on L1 facilitated the development of the home language and did not have a detrimental effect on the majority language. Whilst these reviews attempt to highlight clinical considerations for providing language intervention, most of them focus on typically developing (TD) bilingual children (Guiberson & Ferris, 2019; Larson et al., 2019), bilingual children who are at risk of language impairment (Durán et al., 2016) or children with DLD with associated conditions, such as autism or Down syndrome (Bird et al., 2016; Lim et al., 2019). Ebert and Kohnert (2016) conducted a narrative synthesis of theoretical and pedagogical issues related to bilingualism and DLD. They argued in favour of supporting two languages in intervention for bilingual children with DLD. Harvey et al. (2018) specifically examined the effects of L2 intervention only, and bilingual intervention for children with DLD. There was no difference between bilingual intervention and L2 only intervention for outcomes in L2. However, the authors noted that the dosage of intervention is likely to impact the intervention outcomes. For instance, for bilingual intervention, even when the L1 dosage was double that of the L2 dosage, there was a greater improvement in L2 abilities across studies. No study reported improvements in L1 for intervention targeting L2. The gains in L2 for bilingual intervention could be a result of within language intervention effects in L2 (albeit with lower dosage) or between language intervention effects from L1 to L2. Although both Ebert and Kohnert (2016) and Harvey et al. (2018) have reviewed intervention studies in bilingual children with DLD, both studies have included studies published until 2015. Additionally, intervention evidence for specific language domains, such as phonology, vocabulary morphosyntax, pragmatics, narrative skills and literacy, has not been addressed in previous reviews, making it difficult to identify the evidence (or lack of evidence) for targeting specific language skills. Furthermore, while there is evidence for cross-language transfer effects for cognate words, it is unclear if studies have reported similar effects for intervention targeting skills such as phonology, morphosyntax, literacy or narrative skills. Our current review focused on bilingual children with DLD until 15 years of age. We were primarily interested in reviewing evidence in children up to 15 years of age because studies have shown that intervention may work differently for older adolescents and adults (e.g., McKenzie et al., 2019). While these claims have been made in the context of pharmacological intervention, the



scope and type of language intervention in older children are likely to be varied (e.g., less focus on targeting discrete linguistic structures to a more holistic academic or literacy-related support). Although evidence in older children is critical, to be consistent with the targeted language domains and reduce huge variability in the intervention type we focused on data from children until 15 years of age.

Aim of the current study

The aim of the current systematic review was to identify and synthesize intervention evidence in six major language areas that are known to be affected in children with DLD: phonology, vocabulary, morphosyntax, pragmatics, narrative skills and literacy. In addition to these six language areas, we also aimed to identify intervention evidence in the area of non-linguistic cognition, given that studies have reported a deficit in non-linguistic cognitive skills (e.g., speed of processing) in bilingual children with DLD. We asked the following research questions:

- What is the available evidence for effects of intervention focused on phonology, vocabulary, morphosyntax, pragmatics, narrative skills, literacy and non-linguistic cognition in bilingual children with DLD?
- Is cross-language transfer effect specific to vocabulary intervention or does it occur regardless of the language skills targeted?

METHOD

Literature search

The current review was carried out in accordance with the systematic review process developed by Pickering and Byrne (2013) and reported based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), wherever possible (see Supplementary material S1 in the additional supporting information for the PRISMA checklist). The review was registered in the international prospective register for systematic reviews (PROSPERO) and can be accessed via https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=99923.

A number of keywords such as bilingualism, language intervention, specific language impairment, primary language impairment, developmental language disorder and language disorders were used to identify research relating to language intervention in bilingual children with DLD. The search was carried out in five electronic databases (CINAHL, Scopus, Psychinfo, Proquest and Scencedirect), as well as using additional hand searches of intervention

studies using the keywords. The keywords were entered into each database to create a search string (e.g., 'language' OR vocabulary OR morphosyntax OR phonology or literacy OR narrative OR cognitive or non-linguistic cognition AND intervention OR treatment OR therapy AND ('developmental language disorders' +) OR specific language impairment OR primary language impairment or language disorders AND bilingualism* for CINAHL). We included intervention studies that were published until December 2020 (see Supplementary materials S2 and S3 in the additional supporting information for a list of keywords and an example search strategy).

One of our primary inclusion criteria was to include studies with the diagnostic label DLD, PLI, SLI and language disorders. In order to maximize the evidence for intervention effects, we also included studies with the diagnostic label 'language delay'. This enabled identification of language intervention studies published with diagnostic labels other than SLI. Additionally, for study inclusion, we also considered the diagnostic criteria pertaining to SLI/DLD. Although we could not identify a rigid set of similar characteristics for diagnostic labelling across studies, the studies included had common characteristics such as diagnostic confirmation from a speech-language pathologist or performance of children at two SD below mean on a standardized language test (e.g., Clinical Evaluation of Language Fundamentals) in both the languages. We classified intervention type based on the language or cognitive domains targeted in the study design. For instance, if a study provided intervention related to working memory, we classified this as evidence for intervention targeting non-linguistic cognitive skills. If the intervention targeted multiple skills such as vocabulary and mathematics, we considered this to be evidence for vocabulary intervention as this was our primary area of interest. Given that intervention is a broad term, we included only studies that provided intervention in any of our target domains and measured a behavioural change in language or cognitive abilities post-intervention. Studies with varied intervention designs (e.g., randomized control trial, single case studies, etc.) were included, as well as studies that investigated bilingual participants from all language backgrounds. To the best of our knowledge, no co-occurring conditions were reported except for one child in a single study. This child had a diagnosis based on language, visuo-motor and attention disorder, however, cognitive abilities were within the normal range. Although more details are unknown, this study had a sample size of a total of 18 children. This indicates that except for one child none of the other children in that study had any co-occurring condition. We included this study in the review.

Given that the review focused on bilingual children with DLD (or SLI), we excluded intervention studies in



children with autism, Down syndrome, hearing loss or other neurodevelopmental disorders, such as cerebral palsy. We did not include intervention studies that targeted academic or literacy skills in TD dual-language learners who were emerging bilinguals with no language disorders. Similarly, we excluded bilingual children with weak language skills with no explicit diagnosis or clear description of criteria for language disorder. We also excluded bilingual children who were classified as at risk because it was unclear if these children had a language disorder. Our reasoning is supported by recent research indicating that terms such as 'bilingual children at risk' presents a deficit perspective and favour English monolingualism given these studies do not describe why there is a risk. This perspective implies that bilingualism is a risk factor, which further stigmatizes linguistically minoritized communities (see Soto-Boykin et al., 2021, for a discussion of this issue). We also excluded non-intervention studies, review papers, grey literature (e.g., conference presentations) and studies published in a language other than English.

Data extraction

We created a Microsoft Excel Spreadsheet with the following categories: (1) study information, (2) participant information and (3) intervention information. From this spreadsheet several broad subcategories were developed that would elicit key information, such as the theory underpinning the study, methodology, aim, intervention design, results, discussion and limitations. Initial searches of research were conducted by two undergraduate research assistants. Following this search, a title and abstract screening was conducted and any disagreements arising at this stage were resolved by reaching a consensus between the first and last authors. Once the selected papers were identified, the data were extracted to the Excel sheet by the first author. When studies targeted multiple skills consistent with the study domains (e.g., vocabulary and syntax), we did not count the study twice in the spreadsheet. However, we extracted the data indicating the study to be providing evidence for both intervention types in the relevant study section. Overall, data from 14 papers were extracted. Figure 1 depicts the review process in a PRISMA flow diagram.

Quality assessment

Critical appraisal of selected papers was conducted using a quality assessment tool (QAT) developed by Sirriyeh

et al. (2012). This tool allows researchers to evaluate the published research with diverse designs (e.g., randomized control trial, single case studies) and rate the quality of papers in 14 categories using a four-point rating scale (0–3). The categories ranged from theoretical framework, data collection and analysis, to validity of the measurement tools used, results, discussion and limitations. We scored categories that were designed for quantitative studies only. This means that we excluded scoring of categories that were meant to measure evidence for qualitative studies (e.g., the fit between research question and qualitative method of analysis). We assigned an individual quality score for each criterion and calculated the total quality score for each paper. The first author conducted the quality assessment, and a reliability check was carried out for 50% of the papers by the second and last authors. The second and last authors conducted reliability check for different papers. This indicates that these authors did not check the reliability for the same paper twice but compared their scores with the initial quality assessment scores assigned by the first author. The reliability check resulted in matching 85% of the scores, and any mismatches were resolved by reaching a consensus between the authors. We calculated total raw scores and a percentage quality for each study. The percentage quality ranged between (range = minimum 40%–maximum 81%) (see Supplementary material S4 in the additional supporting information for a detailed description of individual study scores).

RESULTS

In order to examine the evidence for language intervention effects in bilingual children with DLD, we carried out a systematic review using five electronic databases. A total of 14 papers with a wide range of intervention designs (e.g., single case, quasi-experimental designs) were included in the review. Spanish was the L1 for 57.14% of the studies reported. Two studies, Kambanaros et al. (2017) and Pihko et al. (2006), reported two L1s (Bulgarian–Cypriot Greek; and Finnish–Swedish, respectively). Thordardottir et al. (2015) had children from a variety of different language backgrounds as L1 (e.g., Arabic, Bengali, Chinese, Dutch). The remaining studies had participants from language backgrounds such as Vietnamese, Icelandic and French as L1. Although 85% of the studies had English as the L2, some studies had children with more than one L2 (Swedish, English, Russian; and English and Standard Modern Greek) (see Table 1 for summary characteristics of the included studies).

TABLE 1 Overview of the studies included in the review

Study	Age/number of participants	Groups of participants	Language(s) L1	Language(s) L2	Intervention type	Intervention duration and dosage	Diagnosis
Dam et al. (2020)	72–96 months/5 boys and 7 girls	Experimental: 6 children with developmental language disorder (DLD) Comparison: 6 typically developing (TD) children	Spanish	English	Cognate-based vocabulary intervention (Mediated Learning Experiences)	3 times weekly for 4 weeks, 70-min sessions	DLD
Ebert et al. (2014)	66–134 months/50 boys and 9 girls	Non-linguistic cognitive therapy treatment: 16 children English treatment: 17 children Bilingual treatment: 15 children Control: 11 children	Spanish	English	Cognitive processing and language (PLI)	4 times weekly for 6 weeks, 75-min sessions ^a	Primary language impairment (PLI)
Ebert et al. (2012)	100 months and 89 months/2 boys	Both children received treatment	Spanish	English	Cognitive processing	4 times weekly for 5 weeks (– 1 day), 75-min sessions	PLI
Gutiérrez-Clellen et al. (2012)	53 months/113 boys and 72 girls	Bilingual treatment: 90 children English-only treatment: 95 children ^b	Spanish	English	Academic enrichment programme	4 times weekly for 12 weeks, 45-min sessions	Specific language impairment (SLI)
Ijalba (2015)	42.5 months/17 boys and 7 girls	Intervention: 9 boys and 3 girls Control: 8 boys and 4 girls	Spanish	English	Early literacy intervention	Bi-weekly for 16 weeks, 120-min sessions ^c	Language delay
Kambanaros et al. (2017)	102 months/1 girl	Single subject	Bulgarian and Cypriot Greek	English and Standard Modern Greek	Cognate therapy	3 times weekly for 4 weeks, 20-min sessions	SLI
Petersen et al. (2016)	71–116 months/37 boys and 36 girls	Treatment: 42 children (9 with language impairment, 33 typical) Control: 31 children (8 with language impairment, 23 typical)	Spanish	English	Narrative intervention	2 days, 25-min sessions	Language impairment

(Continues)

TABLE 1 (Continued)

Study	Age/number of participants	Groups of participants	Language(s) L1	Language(s) L2	Intervention type	Intervention duration and dosage	Diagnosis
Pham et al. (2015)	66–135 months/41 boys and 7 girls	English-only treatment: 17 children Bilingual treatment: 15 children Non-linguistic cognitive processing treatment: 16 children	Spanish	English	Language and non-linguistic cognitive processing	4 times weekly for 6 weeks, 75-min sessions	PLI
Pham et al. (2011)	47 months/1 boy	Single subject	Vietnamese	English	Receptive vocabulary	2 times a day, 2 days a week, 10-min sessions ^d	Language impairment
Pihko et al. (2006)	62 months/18 children ^e	Phonological intervention (PHONO) Physical exercise (MOTOR, served as control) ^f	Finnish, Swedish	Swedish, English, Russian ^g	Phonological and physical exercise	3 times weekly for 8 weeks, 20–30-min sessions	SLI
Restrepo et al. (2013)	43–68 months/144 boys and 112 girls	Bilingual vocabulary: 52 children English-only vocabulary: 45 children Bilingual mathematics: 53 children English-only mathematics: 52 children Control: 54 children	Spanish	English	Vocabulary and mathematics	4 times weekly for 12 weeks, 45-min sessions	Language impairment

(Continues)

TABLE 1 (Continued)

Study	Age/number of participants	Groups of participants	Language(s) L1	Language(s) L2	Intervention type	Intervention duration and dosage	Diagnosis
Stanford et al. (2019)	62–151 months/75 children	Working memory treatment: 42 children Scholastic training comparison: 33 children	French	Not mentioned	Working memory and scholastic training	3 times weekly for 8 weeks, 30-minute sessions	DLD
Thordardottir et al. (2015)	59.56 months/26 boys and 3 girls	Monolingual treatment: 11 children Bilingual treatment: 9 children Control: 9 children	Several languages ^b	French	Vocabulary and syntax	1 time weekly for 16 weeks, 50-min sessions	PLI
Thordardottir et al. (1997)	59 months/1 boy	Single subject	Icelandic	English	Vocabulary	2 times weekly for 7 weeks, 50-min sessions	Language impairment

Notes: aFour times weekly for 6 weeks, 75-min sessions: The number of treatment sessions the participants attended varied from 13 to 24. This was due to the participants' attendance and the time of year they participated; some occurred during an after-school programme, while others were during summer school.

^bBilingual treatment group: 90 children; English-only treatment group: 95 children: It was originally 91 children and 97 children, respectively, but three children did not finish the study because of familial issues.

^cBi-weekly for 16 weeks, 120-min sessions: This is the intervention duration and dosage the mothers received. They agreed to read for at least 15 min every day with their child and to document the interaction.

^dTwo times a day, 2 days a week, 10-min sessions: Four studies were conducted, times for these varied. Study 1 was 2 weeks with 10 sessions; study 2 was 4 weeks with 12 sessions; study 3 was 3 weeks with 12 sessions; and study 4 was 2.5 weeks with 11 sessions.

^eA total of 62 months/18 children: gender not mentioned.

^fPhonological intervention group (PHONO) and Physical exercise group (MOTOR group, served as control group): the number of participants in each group was not stated.

^gSwedish, English and Russian: a minimum of one parent from each family spoke Swedish. In 11 families the other parent spoke Finnish, in five families the other parent also Swedish, in one family the other parent spoke Russian, and in one family the other parent spoke English. According to the parents, 11 children had Swedish as the dominant language, two children had Finnish as the dominant language, and three children were balanced bilinguals. Two participants' main language was not reported.

^hSeveral languages: Arabic (one participant), Bangla (1), Bengali (3), Chinese (3), Dutch (1), English (1), Japanese (1), Korean (1), Punjabi/Urdu (8), Russian (2), Sinhalese (1), Spanish (4) and Tamil (3).

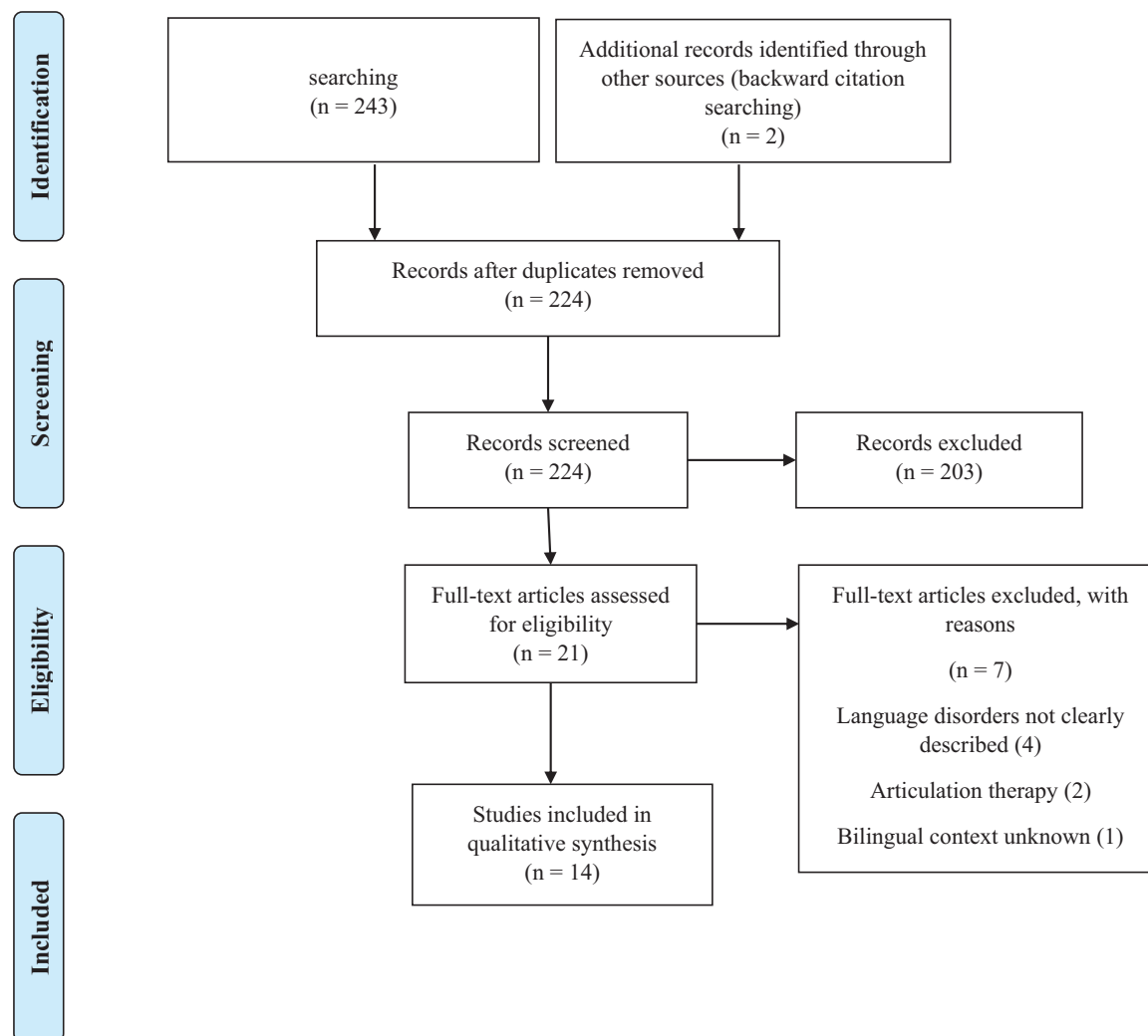


FIGURE 1 PRISMA flow diagram explaining the methodological process [Colour figure can be viewed at wileyonlinelibrary.com]

What is the available evidence for the effects of intervention focused on phonology, vocabulary, morphosyntax, pragmatics, narrative skills, literacy and non-linguistic cognition in bilingual children with DLD?

Vocabulary was the most frequently targeted skill (nine out of 14 studies), although a few studies targeted vocabulary along with a combination of other skills such as syntax (e.g., Thordardottir et al., 2015). Three studies (e.g., Kambanaros et al., 2017) investigated the effects of vocabulary intervention using cognate words (words that are similar in form and meaning in different languages). Four studies included syntax as part of their intervention, and only one study (Pihko et al., 2006) targeted phonological skills. Ijalba (2015) provided intervention targeting literacy skills, whereas Petersen et al. (2016) investigated the effects of

narrative intervention. No studies examined intervention effects of pragmatics abilities. Interestingly, a number of studies examined non-linguistic cognitive skills, such as selective attention, speed of processing, and working memory (e.g., Stanford et al., 2019). Tables 2 and 3 provide a summary of the specific skills targeted for intervention as well as a description of outcome measures used in the studies.

Domain-specific intervention effects

Studies examining the effects of vocabulary intervention

Overall, the studies that targeted vocabulary reported improvements following intervention. For example, Thordardottir et al. (1997) provided vocabulary intervention in

TABLE 2 Summary of language and cognitive skills targeted in the intervention studies

Study	Language/cognitive skills targeted	Intervention stimuli/materials	Bi- or monolingual intervention	Language of intervention	Cross-language generalization
Dam et al. (2020)	Vocabulary: Cognate based, Tier-2 words targeted using mediated learning experiences promoting intentionality, meaning, transcendence and competence	Vocabulary: Storybooks, story scripts, iPad, whiteboard, tabletop game activities (pre-made vocabulary cards, sentence strips, board games)	Bilingual	Spanish (home language)/English ^a	Spanish to English generalization was measured, but English performance of definition quality for cognates was not measured before the intervention so generalization was hard to establish
Ebert et al. (2014)	Cognitive processing: Attention and processing speed using non-linguistic stimuli (shapes, colours, tones, noises) English language: Vocabulary, morphosyntactic constructions, following directions (auditory comprehension) Bilingual: Spanish vocabulary and morphosyntactic skills, using English to make cross-linguistic connections	Cognitive processing: Locoutour Multimedia Attention and Memory: Volume II software package (Scarry-Larkin & Price, 2007): <i>Scan</i> , <i>Dominoes</i> , and <i>Change</i> . Also used <i>Blink</i> (Staue, 2001), <i>Bop-It</i> , and <i>Simon Trickster</i> English language: Laureate Learning Systems: <i>Swim</i> , <i>Swam</i> , <i>Swum</i> and <i>Adjectives & Opposites</i> ; Earobics: <i>Calling All Engines</i> . Linui Systems, Inc. games: <i>Category Card Games</i> , <i>Gram's Cracker</i> , and <i>Plunk's Pond</i> Bilingual: <i>Category Cards</i> , <i>Gram's Cracker</i> , and <i>Plunk's Pond</i> (translated to Spanish and replaced certain words with their own). <i>Calling all Engines</i> (Earobics in English). <i>Rosetta Stone Spanish (Latin American)</i> : <i>Early Classifying Games</i> (MagneTalk) or <i>My House, My Town, My School Bilingual Package</i> (Laureate Learning Systems)	Both (bi- and monolingual)	English only and Spanish (home language)/English	Bilingual treatment group (treatment primarily in Spanish) made significant gains in English; cross-linguistic transfer from Spanish to English
Ebert et al. (2012)	Cognitive processing: Non-linguistic stimuli (tones, shapes, colours, and musical notes) for processing speed and sustained selective attention	Cognitive processing: Locoutour Multimedia Attention and Memory: Volume II software package (Scarry-Larkin & Price, 2007): <i>Scanning</i> , <i>Dominoes</i> , and <i>Change</i> . Also used <i>Blink</i> (Staue, 2001), <i>Bop-It</i> , and <i>Simon Trickster</i>	n.a.	n.a.	n.a. ^b

(Continues)



TABLE 2 (Continued)

Study	Language/cognitive skills targeted	Intervention stimuli/materials	Bi- or monolingual intervention	Language of intervention	Cross-language generalization
Gutiérrez-Clellen et al. (2012)	Vocabulary: Lesson plans followed by hands-on activities that were curriculum-based: picture sorting, manipulatives, and storytelling	Vocabulary and MLU: Academic Enrichment Program using curriculum-based hands-on activities; included books in English and Spanish (<i>Little Red Riding Hood</i> ; Grimm et al. 1999)	Both (bi- and monolingual)	English only and bilingual Spanish–English	Transfer of syntactic knowledge (MLU) from Spanish to English
Ijalba (2015)	Literacy: Trained caregiver in language-literacy strategies to use at home using interactive picture books. Play and target words were used repeatedly by the caregiver within context. Developmental approach based on social constructivism	Literacy: six interactive picture books focused on themes of daily activities (playing, mealtimes, bathing, birthdays, shopping, learning letters) were developed after interviewing the mothers	Monolingual	Spanish (home language)	Transfer of expressive vocabulary from Spanish to English
Kambanaros et al. (2017)	Cognate therapy: Cognate word triplets from Bulgarian, English and Greek were chosen ^c (non-treatment words from the three languages were also incorporated). Phonological-based naming therapy and form-based strategies were used	Cross-linguistic phonological overlap was determined by using a modified version of the Crosslinguistic Overlap Scale for Phonology (COSP; Kohnert, 2004) for the treatment words. The non-treatment words were from the Word Finding Vocabulary Test (WFFT; Renfrew, 1997)	Monolingual	English	Cross-language generalization effect from treated language (English) to non-treated languages (Bulgarian and Greek)
Petersen et al. (2016)	Narrative intervention: Complex syntax, narrative schemas, causal subordination, and story grammar	Narrative: Story Champs (Spencer & Petersen, 2012)	Monolingual	English	Children in the treatment group had significantly greater cross-linguistic transfer from English to Spanish across both causal subordination and story grammar than the control group. This was only significant for TD children in the treatment group not for LI children

(Continues)

TABLE 2 (Continued)

Study	Language/cognitive skills targeted	Intervention stimuli/materials	Bi- or monolingual intervention	Language of intervention	Cross-language generalization
Pham et al. (2015)	Language: English-only and bilingual groups: Vocabulary, grammar, and listening comprehension Non-linguistic cognitive processing group: Non-linguistic stimuli targeting attention and processing speed	Treatment procedure same as Ebert et al. (2014)	Both (bi- and monolingual)	English only and Spanish/English	English only treatment did not promote gains in Spanish. Bilingual condition (therapy primarily in Spanish) promoted cross-language generalization from Spanish to English
Pham et al. (2011)	Receptive vocabulary: Vocabulary from Vietnamese and English were recorded, along with instructions to point to the vocabulary word. This was made into a PowerPoint, which showed four pictures to choose from	Receptive vocabulary: Target words were recorded with a digital audio recorder and trimmed to be 3 s each with GoldWave 5.55 software (Gold Wave, 2009). Black and white line drawings from the International Picture Naming Project (Szekely et al., 2004) and digital colour pictures from the Internet were used to represent the target words	Both (bi- and monolingual)	Vietnamese only and Vietnamese/English	n.a. ^b
Pihko et al. (2006)	Phonological intervention: Speech and articulation, phoneme discrimination, and phonological and linguistic awareness training and rapid processing Physical exercise programme: Motor activities	Phonology: Adapted from previous published intervention programmes (Korkman & Peltomaa, 1993, Häggström & Lundberg, 1994, Mickos & Carlson, 2003). Used minimal pair picture cards, picture cards for other words, and other sound related exercises Physical exercise: Played flying airplanes, danced, balanced, etc.	Monolingual	Swedish	n.a. ^b

(Continues)



TABLE 2 (Continued)

Study	Language/cognitive skills targeted	Intervention stimuli/materials	Bi- or monolingual intervention	Language of intervention	Cross-language generalization
Restrepo et al. (2013)	Vocabulary: Receptive, expressive and conceptual vocabulary (pointing to words in pictures/objects, producing words/definitions in questioning with a script, words/sentences in scripted play and book reading) based on books Mathematics: Counting while clapping, counting objects, tracing numbers, and reading number books, etc.	Vocabulary: Language of book based on the type of intervention that day (bilingual or English only). Expository books: <i>Slugs/La Babosa</i> (Schaefer, 2002a) and <i>Jellyfish/La Medusa</i> (Schaefer, 2002b). Narrative books: <i>Frog in Love/El Sapo Enamorado</i> (Velthuijs, 2003) and <i>Floppy in the Dark/Floppy en la Oscuridad</i> (Van Genechten, 2002). Mathematics: <i>Big Math for Little Kids</i> programme (Ginsburg et al., 2003)	Both (bi- and monolingual)	English only and English/Spanish (home language)	n.a. ^b
Stanford et al. (2019)	Working memory: Targeted weaknesses of working memory in children with developmental language disorder (DLD), clefts production, Scholastic training: Educational games of spelling, history, geography, etc.	Working memory: Magic Memory (application created for this study), including these activities: Serial Order Memory, WM Updating, Serial Order and Complex WM, Simple and Complex Span Scholastic training: Scula (http://www.scula.fr)	Monolingual	French (home language)	n.a. ^b
Thordardottir et al. (2015)	Vocabulary: Each session four verbs and six nouns were selected from a list of 47 age-appropriate vocabulary items for each subject Syntax: Production of a basic sentence with SVO structure (some had longer sentences) using a story retell probe	Vocabulary: Chosen specifically for each child based on their level from the MacArthur-Bates CDI in Quebec French (Trudeau et al., 1999) Syntax: Story retell probe following the Lahey (1988) guidelines were used to analyse	Both (bi- and monolingual)	French only and French/home language	n.a. ^b
Thordardottir et al. (1997)	Vocabulary: Functional target vocabulary from school and home words targeted during semi-structured play with actions and objects	Vocabulary: Functional vocabulary was chosen based on the client's specific environments (home and school) with help from parents	Both (bi- and monolingual)	English only and English/Icelandic (home language)	n.a. ^b

Notes: aSpanish (home language)/English: Outcomes were measured bilingually in both of their languages, English and Spanish. Most of the intervention was conducted in Spanish.

^b 'n.a.' indicates the study did not examine cross-language generalization.

^c Cognate therapy: Cognate word triplets from Bulgarian, English and Greek were chosen. These words were equivalents in the three languages and had cross-linguistic phonological overlap.

TABLE 3 Summary of outcome measures from all studies

Study	Intervention type	Outcome measures used
Dam et al. (2020)	Cognate-based vocabulary intervention	Word definition task of 32 target words in Spanish and English. Scoring consisted of syntagmatic knowledge and communicative adequacy. Cognate facilitation using a picture-naming task in Spanish and English. A total of 28 items (14 cognate, 14 non-cognates) in each task
Ebert et al. (2014)	Cognitive processing and language	Language: EOW-E, EOW-S, ROW-E, ROW-S, CELF-4E, CELF-4S and a non-word repetition task. Non-linguistic cognitive: Measured processing speed with a choice visual detection task, sustained selective attention with a continuous performance task, and working memory using auditory serial memory task
Ebert et al. (2012)	Cognitive processing	Repeated measures: Choice visual detection (non-linguistic cognitive processing speed), rapid automatic naming (English lexical processing efficiency), sentence repetition (English access to lexical and morphosyntactic knowledge), and non-word repetition (English and Spanish phonological working memory). Pre/post-measures: CELF-4E, CELF-4S, EOWPVT-E, EOWPVT-S and ROWPVT-E
Gutiérrez-Clellen et al. (2012)	Academic enrichment programme	English picture description task measured a child's use of verb and arguments. English narrative sample measured MLU _w (mean length of utterance in words), MLU _m (mean length of utterance in morphemes), NDW (number of different words) and TNV (total number of verbs)
Ijalba (2015)	Early literacy intervention	MacArthur Inventarios del Desarrollo de Habilidades Comunicativas (IDHC), PLS-4 (Spanish expressive and receptive language), EOWPVT-4 (Spanish and English), Experimenter Created Vocabulary Test (ECVT, Spanish and English), Parent Home Language and Literacy questionnaire (PHILL), Parent Evaluation Scale (PES)
Kambanaros et al. (2017)	Cognate therapy	Cognate words constructed for the study, Renfrew Action Picture Test in English and Greek and the adapted Bulgarian version of the Action Picture Test were used to measure expressive and grammatical abilities for each language
Petersen et al. (2016)	Narrative intervention	Language samples elicited using the narrative language measures kindergarten benchmark test of narrative retell subtest (TNR). Total number of casual subordinate clauses produced and nine story grammar elements (character, setting, problem, emotion, plan, attempt, consequence, ending, and ending emotion) were analysed from three narratives in English and Spanish
Pham et al. (2015)	Language and non-linguistic cognitive processing	The measures were given pre-, post- and 3 months after intervention in Spanish and English. Language: EOW, ROW, CELF and non-word repetition tasks. Non-linguistic cognitive processing: choice visual detection (processing speed), auditory serial memory (working memory for non-verbal auditory information) and sustained selective attention (selective attention)
Pham et al. (2011)	Receptive vocabulary	Vocabulary (e.g., adjectives) comprehension (number of items correctly identified)
Pihko et al. (2006)	Phonological and physical exercise	Syllable discrimination
Restrepo et al. (2013)	Vocabulary and mathematics	Expressive and receptive vocabulary tests in English and Spanish developed by the authors, which included the target vocabulary words from the intervention. Conceptual vocabulary was calculated in expressive and receptive tests across languages
Stanford et al. (2019)	Working memory and scholastic training	Working memory: Three verbal short-term memory (forward digit recall, serial order word span, non-word repetition) and three verbal short-term memory and executive control (backward digit recall, counting span and running span). Syntax: Production Probe for Pronoun Clitics task eliciting nominative and accusative pronouns
Thordardottir et al. (2015)	Vocabulary and syntax	French: Receptive and expressive vocabulary probes, story retell probes, standardized tests—EVIP (Échelle de vocabulaire en images Peabody), EWOPVT, RDSL (The Reynell Developmental Language Scale), mean length of utterance in words. Home language: Mean length of utterance in words
Thordardottir et al. (1997)	Vocabulary	Acquisition of correct target words in English

Note: CELF-4, Clinical Evaluation of Language Fundamentals—4th Edition; EOW-E, Expressive One-Word Picture Vocabulary Test; EOWPVT-E, Expressive One-Word Vocabulary Test; EOWPVT-S, Expressive One-Word Picture Vocabulary Test—Spanish-Bilingual Edition; EOW-S, Expressive One-Word Picture Vocabulary Test—Bilingual Edition; PLS-4, Preschool Language Scale—4 Spanish.; ROW-E, Receptive One-Word Picture Vocabulary Test; ROWPVT-E, Receptive One-Word Vocabulary Test; ROW-S, Receptive One-Word Picture Vocabulary Test—Bilingual Edition.



a 4;9-year-old Icelandic–English bilingual child. The target vocabulary was categorized depending on the words used at home (home words) and school (school words). The authors examined the effects of bi- and monolingual intervention for 14 sessions. The results indicated improvements in vocabulary following intervention in both language conditions although home words improved more in the bilingual condition. Similarly, Pham et al. (2011) conducted a case study examining the effects of receptive vocabulary intervention in a 3;9-year-old Vietnamese–English bilingual child. Intervention was carried out in a special education classroom by the special education teacher. The results indicated that, following intervention in both languages, the child made improvements in receptive vocabulary in both Vietnamese and English. In one of the largest studies, Restrepo et al. (2013) examined 202 3;5 to 5;6-year-old Spanish–English bilingual children with language impairment and reported improvements in L1 and L2 receptive, L1 expressive, and conceptual vocabulary following 12 weeks of bilingual intervention.

Studies targeting vocabulary intervention have used cognate words because these words are likely to activate shared phonemes in both languages. For instance, Dam et al. (2020) provided cognate intervention in Spanish to 6–8-year-old children with DLD and measured vocabulary knowledge and cognate facilitation effects (calculating the accuracy of cognate compared with non-cognate words). Although the study could not establish any cross-language generalization effects to the untreated language (Spanish to English), overall, children with DLD improved in their vocabulary knowledge (small effect size: $d = 0.4$) and demonstrated a cognate facilitation effect (large effect size: $d = 0.9$) in the treated language. Kambanaros et al. (2017) found that cognate intervention effects were maintained for 1 month post-intervention for their 8;5-year-old Bulgarian–Greek–English trilingual child with SLI.

Studies examining the effects of intervention targeting morphosyntax

Although there were only four studies that included syntax as part of the intervention, all studies reported a positive intervention effect on syntactic skills, such as morphosyntax or mean length of utterance. For instance, Gutiérrez-Clellen et al. (2012) conducted an experimental study on the intervention effects of an academic enrichment programme on vocabulary and MLU in words and morphemes. Spanish–English bilingual preschoolers (188 children) with SLI aged 4;4-year-old were randomly assigned to English only or bilingual (English and Spanish) intervention. Their results indicated improvement for both the English only and the bilingual condition;

however, children in the bilingual group demonstrated large effect sizes (> 1) for MLU in words ($d = 1.79$) and MLU in morphemes ($d = 1.69$). Ebert et al. (2014) also targeted a number of morphosyntactic structures (e.g., plural clitics, regular and irregular verbs, noun–verb agreement, and definite and indefinite articles) in a group of 5;5–11;1-year-old bilingual children with PLI. The participants were divided into an English only and a Spanish–English bilingual condition. Participants in both conditions showed improvements for the outcome variables measured through a core language composite score. The core language composite scores for both English and Spanish (e.g., total scores for word classes, recalling sentences, etc.) were derived from the Clinical Evaluation of Language Fundamentals—4th Edition (CELF-4E, Semel et al., 2003; CELF-4S, Wiig et al., 2006). Children demonstrated a medium effect size for the English core language composite score for both conditions (English only: $d = 0.60$; bilingual: $d = 0.50$) and a weak effect size for the Spanish core language composite score ($d = 0.19$) following intervention.

Studies examining the effects of phonological intervention

Only one study examined the effects of intervention targeting phonology. Pihko et al. (2006) studied a group of 5-year-old bilingual children with SLI. The children had either Finnish or Swedish as their L1 and Swedish, English or Russian as their L2. The primary purpose of the study was to examine changes in brain plasticity (using magnetoencephalography—MEG) associated with phonological intervention. The phonological intervention included a number of strategies, such as targeting speech and articulation exercises, phonological awareness, and phoneme discrimination based on Swedish phonology. The results indicated that the intervention was effective, especially for phonological discrimination abilities for two-syllable pairs. The MEG data showed changes in amplitude and latency for phonological encoding and phonological discrimination, indicating changes in brain plasticity in the auditory cortex as a result of phonological intervention.

Studies examining the effects of literacy intervention

Only Ijalba (2015) examined the effects of literacy intervention in 3;5-year-old bilingual children with language impairment. A parent-mediated literacy intervention was designed in the home language (Spanish), bi-weekly for 16



weeks. All children were from low-income families. The author specifically designed a literacy intervention technique containing a parent education curriculum and an interactive picture book reading. The results indicated that children's knowledge of expressive vocabulary and conceptual vocabulary increased post-intervention, and they were able to generalize expressive vocabulary from the treated home language to the untreated second language (English). Additionally, the frequency of book reading (weekly) at home increased three times post-intervention.

Studies examining the effects of narrative intervention

Petersen et al. (2016) provided narrative intervention in English to a group of 5;9–9;6-year-old Spanish–English bilingual children with language impairment. Children with language impairment and a group of TD bilingual children were randomly assigned to the treatment or the control group. An individualized intervention was given for 2 days, lasting 25 min, targeting story grammar and sentences with causal subordinate conjunction (e.g., because). The results indicated that children with language impairment in the treatment group improved significantly more than children with language impairment in the control group for the English causal subordination ($d = 1.31$) and English story grammar ($d = 1.21$). When comparing cross-language generalizations from treated L2 (English) to untreated L1 (Spanish), these effects were found only for TD children in the treatment group. The TD children in the treatment group were able to generalize story grammar ($d = 1.08$) and causal subordination ($d = 1.28$) from English to Spanish; however, the cross-language generalization effect was non-significant for bilingual children with language impairment.

Studies examining the effects of non-linguistic cognition

Generally, studies investigating the effects of non-linguistic cognitive skills, such as speed of processing, have reported improvements in this domain as well as a cross-domain transfer effect to language skills following intervention. Ebert et al. (2014) targeted speed of processing in a group of 5;5–11;1-year-old bilingual children with PLI. The results showed that not only did speed of processing improve from pre- to post-intervention ($d = 0.78$), but there was a cross-domain effect to specific language skills such as for the core language scores in Spanish CELF-4E ($d = 0.33$) and non-word repetition in Spanish ($d = 0.54$). Similar effects were reported by Ebert et al. (2012) who targeted non-linguistic

cognitive processing in two bilingual children, aged 7;4 and 8;3 years, with PLI. The non-linguistic cognitive processing was measured by speed of processing indexed through a choice visual detection task. The results indicated that the two participants improved from baseline to treatment for the visual detection task (large effect sizes; $d = 1.61$ and 1.81). Results also indicated a cross-domain treatment effect. Participants performed better in a non-word repetition task (English and Spanish), as well as increased the percentage of words repeated correctly in a sentence repetition task in English. Positive cross-domain effects were also found in a recent study investigating the effects of working memory training. Stanford et al. (2019) investigated 5;1–12;5-year-old mono- and bilingual children with DLD by targeting four key areas of working memory: serial order memory, working memory updating, serial order and complex working memory, as well as simple and complex span. Participants received 30-min intervention for three times a week over a period of 8 weeks. Children with DLD improved on all four key areas of working memory post-intervention (all $d > 1$). They demonstrated a cross-domain effect for expressive syntax, specifically a significant pre- to post-test improvement in a clitic production task in French, albeit with a weak effect ($d = 0.36$).

Studies examining intervention across multiple domains

There were several studies that examined interventions targeting skills in more than one domain. For example, Thordardottir et al. (2015) targeted both vocabulary (verb and noun production) and syntax (production of SVO sentences) in 5;9-year-old bilingual children who were exposed to French as L2. The results indicated that although there was an improvement in French vocabulary, there was no significant improvement observed for syntax. Similarly, Ebert et al (2014) and Pham et al. (2015) used the same participants and examined the effects of intervention in language (vocabulary) and non-linguistic cognition (speed of processing) in Spanish–English bilingual children. Ebert et al. (2014) found evidence for improvements in both English ($d = 0.55$) and Spanish vocabulary ($d = 0.043$). Their results also indicated that there was an improvement in non-linguistic cognitive skills (speed of processing: $d = 0.78$) following non-linguistic cognitive intervention. Pham et al (2015) examined changes in vocabulary and non-linguistic cognitive skills following 3 months of intervention using the same participants. The results indicated that the participants showed improvements in non-linguistic cognition and English vocabulary, but no changes were observed for Spanish vocabulary.



Is the cross-language transfer effect specific to vocabulary intervention or does it occur regardless of the language skills targeted?

Seven studies examined cross-language generalization during language intervention. Among these studies, Kambanaros et al. (2017) and Dam et al. (2020), investigated direct vocabulary intervention effects using cognate words. Two studies (Pham et al., 2015; Ebert et al., 2014) included a combination of different interventions, such as vocabulary, grammar and non-linguistic cognition. Petersen et al. (2016) measured cross-language effects using narrative language intervention. Gutiérrez-Clellen et al. (2012) reported that children with language impairment with strong Spanish syntactic knowledge (e.g., mean length of utterance (MLU) and knowledge of lexical and auxiliary verbs) can generalize their syntactic knowledge from L1 to English (L2). No study examined the cross-language transfer of phonological skills, for example, phonological awareness or discrimination.

Overall, the pattern of cross-language generalization effects were mixed for bilingual children with DLD. For studies that targeted vocabulary, only Kambanaros et al. (2017) could establish a cross-language generalization effect for cognate words from L2 (English) to L1 (Bulgarian and Greek). Ijalba (2015) reported transfer of expressive vocabulary skills from L1 (Spanish) to L2 (English) after an L1 literacy intervention. Similarly, Ebert et al. (2014) reported more pronounced transfer effects for vocabulary and morphosyntax when language intervention was provided primarily in L1. L2 intervention did not result in any transfer effects from L2 to L1. For the study that targeted narrative abilities, there was no cross-language transfer effect reported from English to Spanish in bilingual children with DLD (Petersen et al., 2016) (see Table 2 for a summary of cross-language generalization effects for the studies included).

DISCUSSION

The aim of the current systematic review was to synthesize the available evidence on intervention targeting six broad areas of language (phonology, vocabulary, morphosyntax, pragmatics, narrative skills and literacy) and non-linguistic cognition. We included 14 papers with a wide range of intervention types and research designs (e.g., single case, experimental, quasi-experimental, etc.). Overall, our review indicated that although there is evidence for the language and cognitive domains targeted, the number of studies targeting each domain is limited, making it difficult to draw specific conclusions regarding

the effectiveness of a specific intervention. In the following section we will first discuss evidence for different intervention types followed by quality appraisal and study characteristics.

Evidence for intervention type

A number of studies examined the efficacy of vocabulary intervention using cognate words. In bilingual research, the use of cognate words for intervention is not uncommon, although much of the evidence for a cognate facilitation effect comes from bilingual individuals with aphasia (e.g., Kohnert, 2004). Some experimental tasks with bilingual adults also indicate a cognate inhibition effect, such as slower naming of cognate words compared with non-cognate words (Broersma et al., 2016). Data from both Kambanaros et al. (2017) and Dam et al. (2020) appear to replicate a cognate facilitation effect (rather than inhibition) in bilingual children with DLD. This finding is interesting given that Kambanaros et al. (2017) found a cognate facilitation effect in two untreated languages (Bulgarian and Greek). This indicates that intervention of the treated language (English) can activate phonological structures in that language, and this can further activate the lexical systems of both Bulgarian and Greek. The results also provide evidence of the interactive nature of the phonological-lexical system between these three languages. It follows then, that while vocabulary intervention is generally effective for improving receptive, expressive, and conceptual vocabulary, using cognate words might be a viable option especially if bilingual resources are limited (e.g., lack of bilingual SLPs). It should be noted that this type of intervention may only work with structurally similar languages (e.g., English and Spanish) that have more cognate words than languages where cognate words are harder to find (e.g., Cantonese and English or Malayalam and English). Therefore, it is unclear if cognate intervention can be used across different language combinations. More research is needed to understand whether intervention targeting cognate words can facilitate phonological and lexical production in structurally similar languages. Although there were a number of studies that targeted vocabulary in bilingual children with DLD, the evidence base is still weak. Most studies have explicitly taught words to children and then tested their production skills using standardized tests. It is unclear if teaching words in isolation is helping children to use them in a functional communicative context or aiding their literacy skills. Further, it limits bilingual children's ability to draw upon resources from all available words in both languages to support their communication. It seems reasonable to argue



that future studies can learn from the emerging body of research on translanguaging. Translanguaging is a theory that views bilingual languages as a unitary system with no separate coded linguistic boundaries (García, 2009). Bilingual children can select features of different languages to support their communication in a given context. Use of translanguaging not only acknowledges the rich linguistic repertoire of the bilingual child but has also been found to be an effective technique to support literacy skills (e.g., Velasco & García, 2014). This is highly relevant in bilingual children with DLD because instead of teaching vocabulary in one language, they can be taught and encouraged to use their entire linguistic repertoire and words in a functional context (see Wei, 2018, for a more detail on translanguaging as a linguistic theory).

It is critical to mention that there were only a handful of studies examining the effects of intervention for morphosyntactic skills. Whilst some studies noted improvements in MLU in words and morphemes following the intervention (e.g., Gutiérrez-Clellen et al., 2012), there were no studies that specifically examined the intervention effects of specific morphosyntactic forms such as inflectional morphology. This lack of evidence for morphosyntax is crucial for two reasons. First, it is well-known that inflectional morphological errors (e.g., third-person singular 's' or regular past tense forms such as 'ed') are challenging for English-speaking children with DLD (Leonard & Kueser, 2019). Second, such difficulties vary greatly cross-linguistically; children exhibit more gender agreement errors in Spanish and tense marking errors in English (e.g., Restrepo & Kruth, 2000). English-speaking children are also likely to have more problems with definite articles than their Swedish peers (e.g., Leonard & Kueser, 2019), and Kannada-speaking children demonstrate fewer grammatical morphology deficits than English-speaking children (e.g., Tiwari et al., 2017). With such dramatic differences in the error patterns between languages, it is important to understand how children respond to intervention targeting morphosyntax in both languages. These typological differences also pose challenges to implement a direct intervention task targeting these skills. One way to mitigate this issue is to target meta-linguistic awareness through direct teaching of differences in syntactic structures between languages (Pham et al., 2018). It is also suggested that along with direct instruction, limiting adult utterances that do not have any overt tense morphology (e.g., I want that ball now) and increasing input with tense morphology and agreement (e.g., That horse runs fast), may help children improve their morphosyntactic skills (see Leonard & Kueser, 2019; and Hadley & Walsh, 2014, for more detail on this).

In our review we found no evidence for pragmatic intervention in children with DLD. The lack of evidence in

this domain is concerning because it is reported that pragmatic abilities are often ignored or not clinically assessed in children with DLD (e.g., Osman et al., 2011). Interestingly, there was one study that directly examined the effects of literacy intervention. Ijalba (2015) investigated the effects of literacy intervention in the home language (Spanish) through a parent mediated intervention. The results demonstrated that the intervention not only improved literacy skills in both Spanish and English, but following intervention, parents changed their perception of the home language intervention from one that is undervalued to a strength-based one.

Studies that targeted non-linguistic cognitive processing have generally found an improvement in skills such as (but not limited to) speed of processing, serial order working memory, and working memory span (e.g., Ebert et al., 2014). Although these results must be interpreted with caution, preliminary evidence from this domain seems encouraging given that training related to executive functioning skills such as speed of processing may be beneficial. This line of intervention may be particularly relevant for bilingual children with DLD who demonstrate specific deficits in attention or other non-linguistic processing skills (e.g., Ebert et al., 2019).

Petersen et al. (2016) provided evidence for a narrative intervention targeting causal subordinates and story grammar in English. The story grammar in their study was individualized depending on the needs of each child. The results indicated an improvement in causal subordination and story grammar following intervention. This is significant because there was only one study that targeted narrative abilities in bilingual children with DLD. Studies that targeted narrative abilities in monolingual children with DLD indicates a huge individual variability as to how children respond to intervention (e.g., Pauls & Archibald, 2021). For example, a recent narrative intervention targeting story grammar and complex syntax demonstrated that out of 10 children, 80% improved on language and literacy measures and 60% on a working memory measure. It was also indicated that children with poorer receptive language and verbal short-term memory at baseline responded poorly to treatment. Intervention targeting narrative skills is complex and more studies examining factors such as linguistic skills at baseline and type of outcome measures are needed in bilingual children with DLD. Similar to narrative skills, there was only one study that examined phonological intervention effects (Pihko et al., 2006). While the major focus of the study was to investigate changes associated with neuroplasticity, their behavioural intervention found that bilingual children improved in their phonological discrimination abilities for two-syllable pairs based on Swedish phonology. It is unclear if similar treatment effects can be generalized to other items



such as polysyllabic words or real words, but preliminary data from this study indicates that intervention targeting phonology can be useful, especially for improving discrimination abilities of shorter syllables.

Evidence for cross-language transfer

One of the central questions in the current review was to examine whether cross-language transfer effects are specific to cognate words. The findings from Petersen et al. (2016) are important because this was the only study that examined narrative abilities. The study demonstrated that a cross-language generalization effect from L2 (English) to L1 (Spanish) was limited only to TD children from the treatment group and did not include children with DLD. The cross-language generalization was found specifically for story grammar and causal subordination. We suspect that this may be due to the short duration and dosage of the treatment (2 days and 25 min). In other words, if the treatment had lasted longer with a larger dosage, bilingual children with DLD might have demonstrated a significant cross-language transfer from L2 to L1, similar to the TD children. However, it is unclear if other factors such as providing intervention in L2 (as opposed to L1) had restricted cross-language generalization outcomes in this study. While we could not find a specific cross-language generalization in narrative abilities for children with DLD, overall, our evidence indicates that there is evidence for cross-language generalization beyond vocabulary intervention using cognate words such as for MLU (e.g., Gutiérrez-Clellen et al., 2012) and literacy (e.g., Ijalba, 2015). Ijalba (2015) reported transfer of expressive vocabulary from L1 to L2 after a parent implemented literacy intervention in L1 Spanish (e.g., book reading). Although this transfer was found to be at the level of vocabulary, this indicates an effect of literacy intervention on expressive vocabulary (non-cognates). Gutiérrez-Clellen et al. (2012) noted that transfer of syntactic skills from L1 to L2 is possible in children with language impairment especially if the languages share similar syntactic structures (e.g., Spanish and English). They argued that the ability to use multiword utterances in Spanish may lead to higher MLU in English.

It is important to highlight that most of the studies reporting cross-language transfer implemented a home language L1 intervention. While Petersen et al. (2016) demonstrated transfer of syntactic skills from L2 to L1 in typical children, this was not evident for children with DLD. Ijalba (2015) and Gutiérrez-Clellen et al. (2012) demonstrated a cross-language transfer effect from L1 to L2 following an intervention in L1. While the aim of this review was not to focus on the effectiveness of monolin-

gual L2 versus L1 home language or bilingual intervention as this has been discussed elsewhere (Durán et al., 2016), the evidence shows that a home language intervention is likely to generate cross-language transfer compared with an intervention in L2. However, given the evidence is limited, caution must be applied when making predictions regarding the directionality of transfer effects in intervention.

Findings from Ebert et al. (2012) and Stanford et al. (2019) indicate that targeting non-linguistic cognitive skills (e.g., speed of processing) may not only bring positive change in that domain, but also a positive transfer effect on composite language scores and on grammatical tasks, such as a clitics production task. A cross-domain effect in bilinguals is important because, potentially, such intervention can be carried out by a monolingual SLP, especially when bilingual resources (e.g., lack of certified bilingual SLPs) are scarce. Yet, there have been recent suggestions to abandon investigating the near transfer effects of non-linguistic cognitive intervention in children with DLD (Marshall, 2020). However, language and cognitive processing are more intricately associated in bilingual than monolingual children (e.g., Ebert et al., 2014; Barac & Bialystok, 2011). It remains to be seen if intervention involving non-linguistic cognitive skills, such as inhibitory control, selective inhibition and selective attention will bring forth cross-domain effects in bilingual children with DLD.

Evidence for intervention targeting multiple domains

It is critical to point out that intervention targeting multiple domains (e.g., vocabulary and non-linguistic cognition) have generally reported improvements in these domains (e.g., Ebert et al., 2014; Pham et al., 2015). However, there are exceptions to this finding. For instance, Thordardottir et al. (2015) conducted a randomized control study examining the effectiveness of bi- and monolingual intervention. The intervention targeted both vocabulary and syntax. The authors found no significant difference between bi- and monolingual intervention on vocabulary or syntax. They reported improvements in vocabulary in both groups of children. The gains in syntax were not statistically significant between the intervention and control groups. It is unclear why intervention did not yield significant gains in syntax, but the authors reasoned that the specific intervention strategy used (focused stimulation) may not have been effective in promoting gains in syntax. Additionally, the current review also found a mismatch between the type of intervention provided and the outcome variables used in studies. For example, Gutiérrez-Clellen et al. (2012), conducted a randomized

control trial and implemented an academic enrichment programme in Spanish–English bilingual children with SLI. The academic enrichment programme targeted vocabulary through book reading activities. The teachers who conducted the training were encouraged to use recasting and repetition of child utterances to enhance language stimulation. The outcome variables measured bilingual children's use of transitive and intransitive verbs using a picture description task and MLU using elicitation of narrative samples. It is unclear how 'an intervention targeting academic enrichment program' could result changes in MLU or use of transitive/intransitive verbs. Given that this is a curriculum-based large-scale randomized control trial, it is understandable that the study employed a broad range of language abilities as outcome measures. However, future studies should align the intervention type and outcome measures more closely or explain why language skills (e.g., intransitive verbs) that has not been directly targeted improve because of intervention targeting a different skill (e.g., vocabulary).

Quality appraisal

In the current review, we critically appraised each article using QAT developed by Sirriyeh et al. (2012). QAT was specifically designed for intervention studies with diverse designs (e.g., randomized control trials or single case studies). The QAT evaluation included a number of factors (but not limited to) such as theoretical reasoning and rationale, description of the data collection, statistical methods and description of results and discussion. The majority of the studies ranged from moderate to high percentages.

While this appears to be encouraging, it must be noted that most studies scored poorly on two items in QAT: Clearly providing a rationale for the specific sample size selected for analysis and indicating statistical data for the reliability and validity of the measurement tools used for the intervention. A clear reasoning for the inclusion of a specific sample size is critical, even in a single case study, to understand why a particular intervention was effective in a given context. For example, in many other fields (e.g., medicine), randomized control trials (RCTs) is considered the gold standard for investigating efficacy of intervention (Howard et al., 2015). However, it is well known that there is huge variability in the language abilities of children with DLD (e.g., Bedore & Peña, 2008). This variability will have a critical impact on intervention effects in group studies. Although RCTs have a large sample size, the effects of intervention may not be evident in all participants. RCTs are not considered to provide best evidence in a behavioural field such as speech and language therapy due to the heterogenous nature of par-

ticipant characteristics (Howard et al., 2015). In contrast, small group studies, case series and single case studies are highly relevant in language intervention given that these studies can provide a clearer description of individual participant characteristics. This is critical for relating intervention effects to a specific participant as well as for understanding why some interventions may or may not work in some individuals. Additionally, most studies have failed to indicate the validity and reliability of outcome measures. These measures are extremely important given that non-valid measures (e.g., translation of standardized tests in English to other languages) can introduce cultural and linguistic bias for bilingual children. While our intention is not to be overly critical about past studies, future intervention design should explicitly justify the outcome measures used to capture intervention change to improve the internal validity of the results.

Age range of the participants

The studies included in the review had a wide range of participants from 3;5 to 12;5 years of age. Although this indicates that studies have examined diverse age groups, a closer examination of the data revealed that children with ages ranging from 3 to 4 years were underrepresented in the studies. It is unclear why this age group was underrepresented in this research. One reason could be that children with DLD may be categorized as late talkers initially (e.g., Sansavini et al., 2021). A lack of awareness for DLD could potentially delay the diagnosis and chances for early intervention in younger children. Whilst this may partially explain the under representation of 3–4-year-old children in research, more research is needed to understand issues related to early intervention (e.g., access, representation, etc.). It was also noted that vocabulary intervention was mostly implemented in comparatively older children (6 years or above) although a few studies included children in the age range of 3;5–6 years (e.g., Pham et al., 2011; Restrepo et al., 2013). All other types of intervention, such as intervention targeting narrative or phonology included children above 5 years of age. Although we were not able to identify any specific age-related trends associated with cross-language transfer, Ijalba (2015) indicated that children as young as 3;5 years were able to transfer expressive vocabulary from L1 Spanish to L2 English following a literacy intervention.

Limitations

Although we provided effect sizes for some studies, it was not possible to aggregate the effect sizes for all studies given



the marked difference in methodological characteristics. Reporting effect sizes is crucial not only for identifying the magnitude of intervention evidence but also for examining the evidence in future replication studies. However, comparison of effect sizes across intervention studies can be challenging because of the heterogeneity associated with the intervention task, the intervention type as well as the population studied. A second limitation is related to the long-term effects of intervention. There was one follow-up study of participants after an intervention targeting language and non-linguistic processing (Pham et al., 2015). This study indicated maintenance of Spanish and English language skills and non-linguistic processing following 3 months of intervention. However, with the exception of this study, the review did not offer a definite conclusion regarding the long-term maintenance of treatment effects. A final limitation is the lack of diversity in relation to the background languages of the participant groups. Not surprisingly, we found Spanish as the majority L1 and English as the most reported L2 for the participants. A general lack of language diversity of the clinical population studied, bias towards English and other Indo-European languages (specifically Western European), along with the limited information regarding the bilingual language background is often reported as problematic in the bilingual literature (e.g., Durán et al., 2016; Beveridge & Bak, 2011). This further exacerbates problems with external validity of the intervention effects. Although there is evidence from languages such as Vietnamese–English or Bulgarian–Greek–English, it is imperative to have more speaker groups and languages spoken in the continent of Africa, as well as from regions such as Eastern Europe, South-east Asia, South Asia and East Asia represented in future studies to reflect the diversity of languages.

CONCLUSIONS

The results from 14 papers indicate the need for more evidence for language intervention with bilingual children with DLD. The review revealed that the majority of studies targeted vocabulary skills, and there is weak intervention evidence for other domains such as phonology, morphosyntax, literacy, and narrative skills. The review did not identify any studies examining intervention effects of pragmatic abilities. Nonetheless, overall, vocabulary intervention yielded positive intervention effects especially when cognate words were used as treatment items. Preliminary evidence from the other four domains indicates a positive intervention effect on the specific skills targeted, as well as evidence for cross-language generalization mostly from L1 to L2. Whilst a cross-language generalization was evident for vocabulary intervention as well

as for MLU and literacy, a cross-domain generalization was present in studies examining the effects of non-linguistic cognition. It is, however, necessary to have more intervention studies exclusively examining domains other than vocabulary (e.g., morphosyntax) in order to improve evidence-based service delivery in bilingual children with DLD.

ACKNOWLEDGEMENTS

The authors thank Ashley D'Agosto, Carol Baingana, Danielle Pretre and Hanh My Agustin for their assistance in data collection, organizing the data and formatting the paper.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- American Community Survey (2019) Retrieved from: <https://data.census.gov/cedsci/table?q=bilingual%20speakers&tid=ACSSST1Y2019.S1601&hidePreview=false>
- Anderson, R.T. (2012) First language loss in Spanish-speaking children. In Goldsetin (Eds), *Bilingual language development and disorders in Spanish–English speakers*. Baltimore, MD, Brookes Publishing, pp. 193–212
- Barac, R. & Bialystok, E. (2011) Cognitive development of bilingual children. *Language Teaching*, 44(1), 36–54. <https://doi.org/10.1017/S0261444810000339>
- Bedore, L.M. & Peña, E.D. (2008) Assessment of bilingual children for identification of language impairment: current findings and implications for practice. *International Journal of Bilingual Education and Bilingualism*, 11(1), 1–29. <https://doi.org/10.2167/beb392.0>
- Beveridge, M.E.L. & Bak, T.H. (2011) The languages of aphasia research: bias and diversity. *Aphasiology*, 25(12), 1451–1468. <https://doi.org/10.1080/02687038.2011.624165>
- Bird, E.K.R., Genesee, F. & Verhoeven, L. (2016) Bilingualism in children with developmental disorders: a narrative review. *Journal of Communication Disorders*, 63, 1–14. <https://doi.org/10.1016/j.jcomdis.2016.07.003>
- Bishop, D.V.M., Snowling, M.J., Thompson, P.A., Greenhalgh, T. & CATALISE-2 consortium (2017) Phase 2 of CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development: terminology. *Journal of Child Psychology and Psychiatry*, 58(10), 1068–1080. <https://doi.org/10.1111/jcpp.12721>
- Broersma, M., Carter, D. & Acheson, D.J. (2016) Cognate costs in bilingual speech production: Evidence from language switching. *Frontiers in psychology*, 7, 1461. <https://doi.org/10.3389/fpsyg.2016.01461>
- Costa, A., Santesteban, M. & Caño, A. (2005) On the facilitatory effects of cognate words in bilingual speech production. *Brain and language*, 94(1), 94–103. <https://doi.org/10.1016/j.bandl.2004.12.002>
- Dam, Q., Pham, G.T., Pruitt-Lord, S., Limon-Hernandez, J. & Goodwiler, C. (2020) Capitalizing on cross-language similarities in intervention with bilingual children. *Journal of Communication Disorders*, 87, 106004.

- Durán, L.K., Hartzheim, D., Lund, E.M., Simonsmeier, V. & Kohlmeier, T.L. (2016) Bilingual and home language interventions with young dual language learners: a research synthesis. *Language, Speech, and Hearing Services in Schools*, 47(4), 347–371. https://doi.org/10.1044/2016_LSHSS-15-0030
- Ebert, K.D. & Kohnert, K. (2016) Language learning impairment in sequential bilingual children. *Language Teaching*, 49(3), 301. <https://doi.org/10.1017/S0261444816000070>
- Ebert, K.D., Kohnert, K., Pham, G., Rentmeester-Disher, J. & Payesteh, B. (2014) Three treatments for bilingual children with primary language impairment: examining cross-linguistic and cross-domain effects. *Journal of Speech, Language, and Hearing Research*, 57(1), 172–186. [https://doi.org/10.1044/1092-4388\(2013/12-0388\)](https://doi.org/10.1044/1092-4388(2013/12-0388))
- Ebert, K.D., Rak, D., Slawny, C.M. & Fogg, L. (2019) Attention in bilingual children with developmental language disorder. *Journal of Speech, Language, and Hearing Research*, 62(4), 979–992. https://doi.org/10.1044/2018_JSLHR-L-18-0221
- Ebert, K.D., Rentmeester-Disher, J. & Kohnert, K. (2012) Nonlinguistic cognitive treatment for bilingual children with primary language impairment. *Clinical Linguistics & Phonetics*, 26(6), 485–501. <https://doi.org/10.3109/02699206.2012.660226>
- European commission (2016) Foreign language skills statistics. Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php/Foreign_language_skills_statistics
- Fey, M.E., Leonard, L.B., Bredin-Oja, S.L. & Deevy, P. (2017) A clinical evaluation of the competing sources of input hypothesis. *Journal of Speech, Language, and Hearing Research*, 60(1), 104–120. https://doi.org/10.1044/2016_JSLHR-L-15-0448
- García, O. (2009) Education, multilingualism and translanguaging in the 21st century. In: Skutnabb-Kangas, T., Phillipson, R. & Mohanty, A (Eds), *Social justice through multilingual education*. UK, Multilingual Matters, pp. 140–158. <https://doi.org/10.21832/9781847691910-011>
- Ginsburg, H. P., Greenes, C., & Balfanz, R. (2003). *Big math for littlekids*. Parsippany, NJ: Dale Seymour Publications.
- Gold Wave, Inc. (2009). GoldWave (Version 5.55) [Computersoftware]. Retrieved from www.goldwave.com
- Goral, M., Levy, E.S. & Kastl, R. (2010) Cross-language treatment generalisation: a case of trilingual aphasia. *Aphasiology*, 24(2), 170–187. <https://doi.org/10.1080/02687030902958308>
- Grimm, J., Grimm, W., & Estrada, P. (1999). *Little Red Riding-Hood/Caperucita Roja*. San Francisco, CA: Chronicle Books.
- Guiberson, M. & Ferris, K.P. (2019) Early language interventions for young dual language learners: a scoping review. *American Journal of Speech-Language Pathology*, 28(3), 945–963. https://doi.org/10.1044/2019_AJSLP-IDLL-18-0251
- Guiérrez-Clellen, V., Simon-Cerejido, G. & Sweet, M. (2012) Predictors of second language acquisition in Latino children with specific language impairment. *American Journal of Speech-Language Pathology*, 21(1), 64–77. [https://doi.org/10.1044/1058-0360\(2011/10-0090\)](https://doi.org/10.1044/1058-0360(2011/10-0090))
- Hadley, P.A. & Walsh, K.M. (2014) Toy talk: simple strategies to create richer grammatical input. *Language, Speech, and Hearing Services in Schools*, 45(3), 159–172. https://doi.org/10.1044/2014_LSHSS-13-0055
- Haggstrom, I., & Lundberg, I. (1994). *Språklear efter Bornholmsmodellen*. Umea, Sweden: Centraltryckeriet.
- Harvey, H., Allaway, H. & Jones, S. (2018) The effectiveness of therapies for dual language children with developmental language disorder: a systematic review of interventional studies. *International Journal of Bilingual Education and Bilingualism*, 24(7), 1043–1064. <https://doi.org/10.1080/13670050.2018.1536112>
- Howard, D., Best, W. & Nickels, L. (2015) Optimising the design of intervention studies: critiques and ways forward. *Aphasiology*, 29(5), 526–562. <https://doi.org/10.1080/02687038.2014.985884>
- Ijalba, E. (2015) Effectiveness of a parent-implemented language and literacy intervention in the home language. *Child Language Teaching and Therapy*, 31(2), 207–220. <https://doi.org/10.1177/0265659014548519>
- Jordaan, H. (2008) Clinical intervention for bilingual children: an international survey. *Folia Phoniatrica et Logopaedica*, 60(2), 97–105. <https://doi.org/10.1159/000114652>
- Kachru, B.B. (1994) English in South Asia. *The Cambridge History of the English Language*, 497–553. <https://doi.org/10.1017/CHOL9780521264785.011>
- Kambanaros, M., Michaelides, M. & Grohmann, K.K. (2017) Cross-linguistic transfer effects after phonologically based cognate therapy in a case of multilingual specific language impairment (SLI). *International Journal of Language and Communication Disorders*, 52(3), 270–284. <https://doi.org/10.1111/1460-6984.12270>
- Korkman, M., & Peltomaa, A. K. (1993). Preventive treatment of dyslexia by a preschool training program for children with language impairments. *Journal of Clinical Child Psychology*, 22(2), 277–287.
- Knoph, M.I.K. (2013) Language intervention in Arabic–English bilingual aphasia: a case study. *Aphasiology*, 27(12), 1440–1458. <https://doi.org/10.1080/02687038.2013.832139>
- Kohnert, K. (2010) Bilingual children with primary language impairment: issues, evidence and implications for clinical actions. *Journal of Communication Disorders*, 43(6), 456–473. <https://doi.org/10.1016/j.jcomdis.2010.02.002>
- Kohnert, K., Windsor, J. & Ebert, K.D. (2009) Primary or ‘specific’ language impairment and children learning a second language. *Brain and Language*, 109(2–3), 101–111. <https://doi.org/10.1016/j.bandl.2008.01.009>
- Kohnert, K. (2004). Cognitive and cognate-based treatments for bilingual aphasia: A case study. *Brain and language*, 91(3), 294–302. <https://doi.org/10.1016/j.bandl.2004.04.001>
- Lahey, M. (1988). *Language disorders and language development*. New York, NY: Macmillan.
- Larson, A.L., Cycyk, L.M., Carta, J.J., Hammer, C.S., Baralt, M., Uchikoshi, Y., An, Z.G. & Wood, C. (2019) A systematic review of language-focused interventions for young children from culturally and linguistically diverse backgrounds. *Early Childhood Research Quarterly*, 50, 157–178. <https://doi.org/10.1016/j.ecresq.2019.06.001>
- Leonard, L.B. & Kueser, J.B. (2019) Five overarching factors central to grammatical learning and treatment in children with developmental language disorder. *International Journal of Language and Communication Disorders*, 54(3), 347–361. <https://doi.org/10.1111/1460-6984.12456>
- Leonard, L.B., Weismer, S.E., Miller, C.A., Francis, D.J., Tomblin, J.B. & Kail, R.V. (2007) Speed of processing, working memory, and language impairment in children. *Journal of Speech, Language, and Hearing Research*, 50(2), 408–428. [https://doi.org/10.1044/1092-4388\(2007/029\)](https://doi.org/10.1044/1092-4388(2007/029))



- Lim, N., O'Reilly, M.F., Sigafoos, J., Ledbetter-Cho, K. & Lancioni, G.E. (2019) Should heritage languages be incorporated into interventions for bilingual individuals with neurodevelopmental disorders? A systematic review. *Journal of Autism and Developmental Disorders*, 49(3), 887–912. <https://doi.org/10.1007/s10803-018-3790-8>
- Marinis, T., Armon-Lotem, S. & Pontikas, G. (2017) Language impairment in bilingual children: state of the art 2017. *Linguistic Approaches to Bilingualism*, 7(3–4), 265–276. <https://doi.org/10.1075/lab.00001.mar>
- Marshall, C. (2020) Investigating the relationship between syntactic and short-term/working memory impairments in children with developmental disorders is not a straightforward endeavour. *First Language*, 40(4), 491–499. <https://doi.org/10.1177/0142723720922197>
- McKenzie, J., Brennan, S., Ryan, R., Thomson, H., Johnston, R. & Thomas, J. (2019) Defining the criteria for including studies and how they will be grouped for the synthesis. In Higgins, P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. & Welch, A. V. (Eds), *Cochrane handbook for systematic reviews of interventions*. Wiley Blackwell, UK. <https://doi.org/10.1002/9781119536604.ch3>
- Mickos, A., & Carlson, I (2003). *Språkplantan – lekar och övningar som stöder barns språkutveckling*. Helsinki: Folkhallsan Mittnyland Ab.
- Ordóñez, C.L., Carlo, M.S., Snow, C.E. & McLaughlin, B. (2002) Depth and breadth of vocabulary in two languages: which vocabulary skills transfer? *Journal of Educational Psychology*, 94(4), 719–728. <https://doi.org/10.1037/0022-0663.94.4.719>
- Osman, D.M., Shohdi, S. & Aziz, A.A. (2011) Pragmatic difficulties in children with Specific Language Impairment. *International Journal of Pediatric Otorhinolaryngology*, 75(2), 171–176. <https://doi.org/10.1016/j.ijporl.2010.10.028>
- Panda, M. & Mohanty, A.K. (2015) Multilingual education in South Asia. *The Handbook of Bilingual and Multilingual Education*, 542–553. <https://doi.org/10.1002/9781118533406.ch34>
- Pauls, L.J. & Archibald, L.M. (2021) Cognitive and linguistic effects of narrative-based language intervention in children with Developmental Language Disorder. *Autism & Developmental Language Impairments*, 6, 23969415211015867.
- Petersen, D.B., Thompsen, B., Guiberson, M.M. & Spencer, T.D. (2016) Cross-linguistic interactions from second language to first language as the result of individualized narrative language intervention with children with and without language impairment. *Applied Psycholinguistics*, 37(3), 703–724. <https://doi.org/10.1017/S0142716415000211>
- Pham, G., Donovan, D., Dam, Q. & Contant, A. (2018) Learning words and definitions in two languages: What promotes cross-language transfer? *Language Learning*, 68(1), 206–233. <https://doi.org/10.1111/lang.12274>
- Pham, G., Ebert, K.D. & Kohnert, K. (2015) Bilingual children with primary language impairment: 3 months after treatment. *International Journal of Language and Communication Disorders*, 50(1), 94–105. <https://doi.org/10.1111/1460-6984.12123>
- Pham, G., Kohnert, K. & Mann, D. (2011) Addressing clinician–client mismatch: a preliminary intervention study with a bilingual Vietnamese–English preschooler. *Language, Speech, and Hearing Services in Schools*, 42(4), 408–422. [https://doi.org/10.1044/0161-1461\(2011/10-0073\)](https://doi.org/10.1044/0161-1461(2011/10-0073))
- Pickering, C. & Byrne, J.A. (2013) The benefits of publishing systematic quantitative literature reviews for PhD candidates and other early-career researchers. *Higher Education Research and Development*, 33(3), 534–548. <https://doi.org/10.1080/07294360.2013.841651>
- Pihko, E., Mickos, A., Kujala, T., Pihlgren, A., Westman, M., Alku, P., Byring, R. & Korkman, M. (2006) Group intervention changes brain activity in bilingual language-impaired children. *Cerebral Cortex*, 17(4), 849–858. <https://doi.org/10.1093/cercor/bhk037>
- Renfrew, C (1997). *The Renfrew Language Scales—Bus Story Test: A Test of Narrative Speech/Word Finding Vocabulary Test/Action Picture Test*, 4th edn (Milton Keynes: Speechmark).
- Restrepo, M.A. & Kruth, K. (2000) Grammatical characteristics of a Spanish–English bilingual child with specific language impairment. *Communication Disorders Quarterly*, 21(2), 66–76. <https://doi.org/10.1177/152574010002100201>
- Restrepo, M.A., Morgan, G.P. & Thompson, M.S. (2013) The efficacy of a vocabulary intervention for dual-language learners with language impairment. *Journal of Speech, Language, and Hearing Research*, 56(2), 748–765. [https://doi.org/10.1044/1092-4388\(2012/11-0173\)x](https://doi.org/10.1044/1092-4388(2012/11-0173)x)
- Sansavini, A., Favilla, M.E., Guasti, M.T., Marini, A., Millepiedi, S., Di Martino, M.V., Vecchi, S., Battajon, N., Bertolo, L., Capirci, O., Carretti, B., Colatei, M.P., Frioni, C., Marotta, L., Massa, S., Michelazzo, L., Pecini, C., Piazzalunga, S., Pieretti, M., Rinaldi, P., Salvadorini, S., Termine, C., Zuccarini, M., D'Amico, S., De Cagno, A.G., Levorato, M.C., Rossetto, T. & Lorusso, M.L. (2021) Developmental language disorder: early predictors, age for the diagnosis, and diagnostic tools. A scoping review. *Brain Sciences*, 11(5), 654. <https://doi.org/10.3390/brainsci11050654>
- Scarry-Larkin, M., & Price, E. (2007). *LocuTour multimedia attention and memory* (Vol. 2) [Computer software]. San Luis Obispo, CA: Learning Fundamentals.
- Schaefer, L. M. (2002a). *La babosa* [Slugs]. Chicago, IL: Reed Educational & Professional.
- Schaefer, L. M. (2002b). *La medusa* [Jellyfish]. Chicago, IL: Reed Educational & Professional.
- Semel, E., Wiig, E.H. & Secord, W.A. (2003) *Clinical evaluation of language fundamentals* (4th ed.). San Antonio, TX: The Psychological Corporation.
- Sirriyeh, R., Lawton, R., Gardner, P. & Armitage, G. (2012) Reviewing studies with diverse designs: the development and evaluation of a new tool. *Journal of Evaluation in Clinical Practice*, 18(4), 746–752. <https://doi.org/10.1111/j.1365-2753.2011.01662.x>
- Soto-Boykin, X.T., Larson, A.L., Olszewski, A., Velury, V. & Feldberg, A. (2021) Who is centered? A systematic review of early childhood researchers' descriptions of children and caregivers from linguistically minoritized communities. *Topics in Early Childhood Special Education*, 41(1), 18–30. <https://doi.org/10.1177/0271121421991222>
- Stanford, E., Durrelman, S. & Delage, H. (2019) The effect of working memory training on a clinical marker of French-speaking children with developmental language disorder. *American Journal of Speech–Language Pathology*, 28(4), 1388–1410. https://doi.org/10.1044/2019_AJSLP-18-0238
- Staupe, R. (2001). *Blink*. Madison, WI: Out of the Box Publishing.
- Sunderman, G. & Schwartz, A.I. (2008) Using cognates to investigate cross-language competition in second language processing. *Tesol Quarterly*, 42(3), 527–536. <https://doi.org/10.2307/40264482>

- Szekely, A., Jacobsen, T., D'Amico, S., Devescovi, A., Andonova, E., Herron, D., ... Bates, E. (2004). A new on-line resource for psycholinguistic studies. *Journal of Memory and Language*, 51, 247–250. <https://doi.org/10.1016/j.jml.2004.03.002>
- Talli, I. & Stavrakaki, S. (2019) Short-term memory, working memory and linguistic abilities in bilingual children with developmental language disorder. *First Language*, 40(4), 437–460. <https://doi.org/10.1177/0142723719886954>
- Thordardottir, E. (2010) Towards evidence-based practice in language intervention for bilingual children. *Journal of Communication Disorders*, 43(6), 523–537. <https://doi.org/10.1016/j.jcomdis.2010.06.001>
- Thordardottir, E., Cloutier, G., Ménard, S., Pelland-Blais, E. & Rvachew, S. (2015) Monolingual or bilingual intervention for primary language impairment? A randomized control trial. *Journal of Speech, Language, and Hearing Research*, 58(2), 287–300. https://doi.org/10.1044/2014_JSLHR-L-13-0277
- Thordardottir, E.T., Weismer, S.E. & Smith, M.E. (1997) Vocabulary learning in bilingual and monolingual clinical intervention. *Child Language Teaching and Therapy*, 13(3), 215–227. <https://doi.org/10.1177/026565909701300301>
- Tiwari, S., Karanth, P. & Rajashekar, B. (2017) Specific language impairment in a morphologically complex agglutinative Indian language—Kannada. *Journal of Communication Disorders*, 66, 22–39. <https://doi.org/10.1016/j.jcomdis.2017.03.002>
- Trudeau, N., Frank, I., & Poulin-Dubois, D. (1999). Une adaptation en français québécois du MacArthur Communicative Development Inventory [An adaptation in Québec French of the MacArthur Communicative Development Inventory]. *Journal of Speech-Language Pathology and Audiology*, 23, 31–7.
- Velasco, P. & García, O. (2014) Translanguaging and the writing of bilingual learners. *Bilingual Research Journal*, 37(1), 6–23. <https://doi.org/10.1080/15235882.2014.893270>
- Velthuis, M. (2003). *Frog in love*. New York, NY: Henry Holt.
- Wei, L. (2018) Translanguaging as a practical theory of language. *Applied linguistics*, 39(1), 9–30. <https://doi.org/10.1093/applin/amx044>
- Wiig, E.H., Secord, W.A. & Semel, E. (2006) *Clinical evaluation of language fundamentals* (4th ed., Spanish). San Antonio, TX: The Psychological Corporation

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: KK Nair, V., Clark, G.T., Siyambalapitiya, S., Reuterskiöld, C. (2022) Language intervention in bilingual children with developmental language disorder: A systematic review. *International Journal of Language & Communication Disorders*, 1–25. <https://doi.org/10.1111/1460-6984.12803>