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Early Literacy Skill Growth in Spanish-Speaking Children With and At Risk for Disabilities in Early Childhood

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Abstract

For young Spanish–English dual language learners (SE-DLLs), early literacy skills, including phonological awareness and alphabet knowledge in Spanish as well as English, are crucial to their reading success. However, there is a lack of research about how SE-DLLs develop early literacy skills, and how their rates of performance can inform evidence-based intervention. This article examined to what degree SE-DLLs with disabilities or at risk for later reading difficulties on early literacy skills demonstrated growth on English and Spanish measures of early literacy when compared with their typically developing peers. Hierarchical linear modeling was used to analyze growth for 325 SE-DLLs on four Individual Growth and Development Indicators that assessed phonological awareness and alphabet knowledge in English and Spanish. Results indicated that at-risk and typically developing children showed significant slopes for all measures and that at-risk children grew faster than typically developing children on Spanish alphabet knowledge measures.

Keywords

literacy, assessment, at risk for developmental delays/disabilities, disability populations, bilingual, development, screening

Foundations for reading success include early literacy skills such as phonological awareness (PA) and alphabet knowledge (AK) that establish the prerequisite skills necessary to learn to read (National Early Literacy Panel, 2008; Storch & Whitehurst, 2002; Whitehurst & Lonigan, 1998). For bilingual children who are learning English in U.S. classrooms, early literacy skill development is affected by their proficiency in both English and Spanish. Research indicates that the development of PA and AK in Spanish and English are important contributors to later reading success in English (August & Shanahan, 2006; Solari et al., 2014). Indeed, there is strong evidence of cross-linguistic transfer of these discrete skills between Spanish and English (Dickinson et al., 2004; Melby-Lervåg & Lervåg, 2011). Therefore, attending to the development of Spanish and English PA and AK is important to improve the reading outcomes of Spanish–English Dual Language Learners (SE-DLLs).

Information about how SE-DLLs with disabilities and those at risk for low reading performance develop early literacy skills in English and Spanish is important to determining how and when to intervene during preschool. When the academic environment does not adequately foster early literacy skills in Spanish and English, bilingual children can fall behind their monolingual peers in reading. As a result, these limited early literacy skills contribute to a deficit that is not easily resolved. This experience creates a *Matthew Effect* that may be exacerbated simply by being bilingual in school systems that are not well equipped to meet the learning needs of Spanish-speaking children, particularly in the area of reading instruction (Gunderson & Siegel, 2001; Martínez et al., 2014; Stanovich, 2009). Preschool children identified with developmental delay or speech and language impairment are known to have an elevated risk of poor reading outcomes and are often identified with learning disabilities in the area of reading (Catts et al., 2008). Given their level of risk, it is crucial to understand how to accelerate their growth in PA and AK, with the long-term goal of preventing reading problems.

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We are aware of no studies that examine growth rates of SE-DLLs on early literacy skills that systematically compare children with disabilities or who are at risk for low reading performance with their typically developing peers. Researchers have examined the role of tier-level benchmark performance (e.g., seasonally) for both monolingual children (Kaminski et al., 2014; McConnell et al., 2014) and SE-DLLs (Dickinson et al., 2004; Durán et al., 2010). However, there are far fewer studies in which researchers examined early literacy growth for SE-DLLs during the preschool years (e.g., Hammer et al., 2007; Páez et al., 2007), despite findings that show growth may be a better predictor of later reading performance beyond single data point predictions (i.e., Hammer et al., 2007). Therefore, research comparing SE-DLLs with disabilities or at risk for low reading performance with their typically developing peers on growth rates of English and Spanish measures of early literacy skills is needed.

Spanish and English Early Literacy Skill Development

Early literacy skills, including PA and AK, have similar developmental trajectories in Spanish and English, although some conceptual and instructionally salient differences do exist. In English and Spanish, PA can be defined as the "ability to detect and manipulate the sound structure of words independent of their meaning" (Phillips et al., 2008, p. 3). However, Spanish is an orthographically shallow language, where there is a tendency for each letter to associate with only one sound, whereas English is an orthographically deep language, where there are many instances of letters associating with more than one sound. Therefore, when developing measures, English tools must include instances where rules for multiple letter sound associations (i.e., to assess the orthographically deep relations between grapheme and phoneme) can be assessed. In contrast, Spanish tools are developed with a generally consistent set of rules for grapheme and phoneme correspondence because of the orthographically shallow nature of the language. In English, PA is frequently measured with expressive and receptive tasks that target alliteration, rhyming, blending, segmenting, and elision. PA develops along a continuum of largest units to smallest units, typically following a trajectory of compound words, syllables, and then phonemes (Anthony et al., 2003; Moats & Tolman, 2009). In Spanish, PA is frequently measured with a smaller collection of expressive and receptive tasks that target alliteration, blending, and segmenting, typically featuring syllable-level detection and in advanced skills, phoneme-level detection and manipulation (Anthony et al., 2011). For example, rhyming measures do not demonstrate a high degree of salience in Spanish because end-rime is not a strong component of the Spanish language (Gorman & Gillam, 2003).

The second component of early literacy, AK, complements PA because it provides a structure to connect phonemes to symbols. In English, AK is defined as knowledge about the graphemes and sounds of the 26 letters of the alphabet, whereas in Spanish, it is for the 27 letters of the Spanish alphabet. AK contributes to early literacy as it supports development of the alphabetic principle where children develop an initial understanding that letters are represented by symbols and sounds and that when organized together comprise the phonemes and graphemes required to construct words (Jones et al., 2013). Evidence suggests that PA and AK have a bidirectional relation where each affects growth in the other (Lerner & Lonigan, 2016). In English and Spanish, AK is frequently measured with tasks that target symbol and sound recognition, including expressive and receptive letter naming and sound identification. Letters and sounds differ by language with minor differences in graphemes (e.g., ñ) and major differences in phonemes with much of phoneme–grapheme correspondence differing across English and Spanish (Gorman & Kester, 2003).

For practitioners supporting SE-DLLs, understanding both English and Spanish early literacy skill development is important because evidence makes clear that English early literacy skills predict later reading success in English *and* Spanish early literacy skills also predict later reading success in English (August & Shanahan, 2006; Melby-Lervåg & Lervåg, 2011; Solari et al., 2014). Indeed, research indicates that Spanish language and early literacy skill development accelerates English performance (National Academies of Sciences, Engineering, and Medicine, 2017). Although these relations may be mediated by the language proficiency of the participants and the language of instruction (Cárdenas-Hagan et al., 2007; Goodrich et al., 2013), the link between PA in English and Spanish is well established in the literature (August & Shanahan, 2006). The unique features of early literacy in Spanish and English, coupled with the predictive power of each language, demonstrate their importance as key components of preparing SE-DLLs for later reading success.

Spanish-Speaking Children With and At Risk for Reading Disabilities

Although there are many studies of English-speaking children that illustrate important differences in early literacy performance based on disability and risk status (see Al Otaiba & Fuchs, 2002), there are no parallel studies of SE-DLL preschoolers. Emerging studies examining disability based on language impairment have begun to untangle SE-DLL performance on English and Spanish language measures (Peña, 2016), but these studies stop short of examining early literacy skills. Misinformation persists among professionals who support children with disabilities. There

continues to be a tendency to convey to families that it is too difficult for a child with a disability to learn two languages, and therefore, families and schools should only focus on one language (de Valenzuela et al., 2016; National Academies of Sciences, Engineering, and Medicine, 2017). Contrary to these beliefs, studies show children with language impairments and with disabilities are capable of learning two languages (Guiberson & Ferris, 2019; Lund et al., 2017). Furthermore, exposure to two languages does not increase risk for disability and performance on language measures show similar error patterns and accuracy rates for children who are bilingual when compared to monolingual peers (Gutiérrez-Clellen & Simon-Cereijido, 2007). In addition, bilingual interventions with children with language impairment have been found to yield better outcomes than English-only approaches (Durán et al., 2016).

In addition to children who are identified with disabilities, we must also address deficits in early literacy performance for SE-DLLs who are otherwise typically developing but demonstrate low performance relative to their peers or to an identified criterion. Typically, children who fall into this category can be identified through systematic seasonal screening that is integral to multi-tiered system of support (MTSS; Carta & Miller-Young, 2019). In addition to receiving targeted instruction, these children should be monitored to examine to what degree their performance is improving as a result of intervention (McConnell et al., 2014). Although SE-DLLs represent a large proportion of early childhood classrooms across the United States, few MTSS models prescribe dual language assessment and intervention models to support their success (Durán & Wackerle-Hollman, 2018a). Research is needed with children considered at risk for low reading performance in later grades—defined as SE-DLLs with performance below the fall benchmark of the preschool year on early literacy measures in English *and* Spanish. With information about how SE-DLLs who perform below benchmark develop early literacy skills, educators can be better prepared to meet their needs within a differentiated instructional model like MTSS.

Understanding Growth of Spanish-English Bilingual DLLs With or At Risk for Disabilities

There is a convergence of evidence that studying and modeling growth is an important approach in predicting which children are at risk for reading failure (Hoff, 2013). Evidence suggests growth models show value above and beyond that of single data points on standardized measures (Rojas & Iglesias, 2013). To date, about 11 longitudinal dual language growth trajectory studies have been conducted (Durán & Wackerle-Hollman, 2018b). Overall, the corpus of Spanish–English growth studies have included participants beginning as young as 22 months (e.g., Hoff et al., 2014), with most beginning during the preschool years (e.g., Hammer et al., 2007, 2008, 2009; Hoff & Ribot, 2017; Páez et al., 2007; Rinaldi & Páez, 2008). Researchers in half of the studies included early literacy measures, including PA, print awareness, and early reading ability. Across all of the studies, children's performance was found to be below age expected norms in English and Spanish with some studies documenting the mean performance of their sample as low as two standard deviations below the mean in both Spanish and English (Páez et al., 2007). In addition, all studies documented a significant amount of unexplained variance within their sample across and within participants. Hammer and colleagues (2011) specifically called for more longitudinal research on the language and early literacy development of DLLs so that we can accurately predict how much growth should be expected and how interventions might accelerate growth.

In addition, there are no growth studies that specifically compare the development of typically developing SE-DLLs with children with disabilities or those below benchmark. There is little research about the language and early literacy development of SE-DLLs with disabilities (Cheatham et al., 2012; Durán et al., 2016). However, SE-DLLs with disabilities may be most at risk for limited growth because teachers may not realize their potential and may underestimate their ability to gain critical early learning skills. We sought to address the identified gaps in research by answering the following research question:

> **Research Question 1:** To what degree do Spanish-speaking children who perform below benchmark or with a disability demonstrate growth on measures of English and Spanish early literacy as compared with their typically developing and not at-risk peers?

We also sought to describe the language of instruction in the participating classrooms to contextualize the growth results.

Method

Setting

We included 325 Spanish-speaking preschool-age children, from 90 classrooms. Project staff recruited children from private, public, and Head Start programs in the Pacific Northwest, Midwest, and Western regions of the United States across two academic years (2017–2018 and 2018–2019), and the sample was pooled across the years for analysis. This study sought to work with native Spanish-speaking children and did not strategically include bilingual classrooms (although as reported, some of the classrooms were indeed bilingual).

Of the 90 classrooms included in this study, 55 completed questions regarding curriculum and intervention selection for

Table 1. Children by Language of Instruction by Measure.

	First Sounds/Primeros Sonidos				Sound ID/Identificación de los Sonidos			
Variable name	Risk (Tier 2/3)	Risk (IEP)	TD	Total	Risk (Tier 2/3)	Risk (IEP)	TD	Total
English class	27.5% (19)	31.1% (14)	35.2% (43)	32.2% (76)	44.3% (39)	37.0% (10)	39.7% (31)	41.5% (80)
Bilingual class	29.0% (20)	13.3% (6)	14.8% (18)	18.6% (44)	10.2% (9)	3.7% (1)	14.1% (11)	10.9% (21)
Spanish class	18.8% (13)	33.3% (15)	30.3% (37)	27.5% (65)	38.6% (34)	48.1% (13)	21.8% (17)	33.2% (64)
Non-categorized	24.6% (17)	22.2% (10)	19.7% (24)	21.6% (51)	6.8% (6)	11.1% (3)	24.4% (19)	14.5% (28)
Total	100.0% (69)	100.0% (45)	100.0% (122)	100.0% (236)	100.0% (88)	100.0% (27)	100.0% (78)	100.0% (193)

Note. Values in parentheses are sample sizes. Non-categorized were identified as children who were enrolled in classrooms where teachers did not complete a classroom survey. IEP = Individualized Education Program; TD = typically developing.

classroom use. Teachers reported using Creative Curriculum (n = 34), district or program-designed curricula and interventions (n = 6), Discerning Our World 3.0 (n = 1), Easy Street (n = 1), Houghton Mifflin (n = 1), and Reading Streets (n = 2). Sixty-six teachers reported on the language of instruction and selected if they use only English, more English than Spanish, more Spanish than English, only Spanish, or both equally. We coded classrooms as "English Dominant" when teachers reported only English and more English than Spanish responses on the classroom language survey. We coded classrooms as Spanish Dominant when teachers reported only Spanish and more Spanish than English. When teachers reported both equally classrooms were coded bilingual. This yielded 36 English classrooms, 16 bilingual classrooms, and 14 Spanish classrooms. Table 1 depicts the number and percentage of children in each language of instruction by group membership for each measure. In this study, for children who received the First Sounds/Primeros Sonidos measures and were in classrooms that reported there was a slightly higher rate of Spanish being used (bilingual and Spanish; 46%) as compared with English (32%). For children who received Sound Identification/Identificación measures, there was a nearly even split between English (42%) and Spanish and bilingual use (43%) in the classrooms.

Participants

Demographic characteristics of the children enrolled in the study by risk status and early literacy domain are provided in Table 2. All participating children were eligible for kindergarten in the following academic year and were between the ages of 48 and 60 months at the beginning of the study.

This study included children who had companion scores on English and Spanish AK and children who had companion scores on English and Spanish PA measures. In some cases, there were children who had both sets of AK and PA measures. As a result, the total sample size for each group nested some children across measures, and the total values do not add up to the sum of both measures. For example, the sample included 48 total children with identified disabilities, 140 children considered at risk of poor reading outcomes as identified by below benchmark performance, and 137 children who were otherwise typically developing and not identified as below benchmark. However, of the 48 children who were identified with disabilities (27 from 2017 to 2018, 21 from 2018 to 2019), 27 completed the AK measures, and 24 of those children also completed the PA measures. An additional 21 children completed the PA measures set, but did not receive the AK measures, yielding a total of 48 children with disabilities.

Of the 48 children with disabilities, parents and program staff reported that 20 children were identified under speech-language impairment, 14 children were identified under developmental delay, one child was identified under autism and speech-language impairment, one child was identified under gross motor delay, one child was identified under orthopedic impairment, and 11 child's parents only reported their children had an Individualized Education program (IEP) and received special education services, but did not report specific category. However, it is important to note that all children in this study passed four sample items in each early literacy measure used. These sample items required a verbal response or receptive selection of a response. As a result, it is unlikely that children with more severe disabilities who experience more intensive cognitive challenges would be able to actively engage in the assessment.

Measures

All enrolled children completed identical assessment protocols: a PA and/or AK subtest of the English and Spanish Progress Monitoring Individual Growth and Development Indicators (PM-IGDIs-Español and PM-IGDIs; Wackerle-Hollman, Durán, & Rodriguez, 2017; Wackerle-Hollman, McConnell, & Rodriguez, 2017). Parents of participating children also completed family survey and the Language Exposure Evaluation Report (LEER; Durán & Wackerle-Hollman, 2016) to describe children's home language profile. Classroom teachers completed a questionnaire to describe the language environment and intervention supports available in the classroom.

Table 2. Participant Demographics.

	First Sounds/Primeros Sonidos				Sound ID/Identificación de los Sonidos			
Variable name	Risk (Tier 2 or 3)	Risk (IEP)	TD	Total	Risk (Tier 2 or 3)	Risk (IEP)	TD	Total
Sample size	69	45	122	236	88	27	78	193
M age[a] (*SD*)	4.6 (0.31)	4.5 (0.40)	4.7 (0.28)	4.5 (0.35)	4.6 (0.31)	4.7 (0.46)	4.7 (0.33)	4.7 (0.35)
Percent of males (%)	53.1	64.3	50.0	53.8	50.0	62.5	60.3	56.5
Race/ethnicity								
Black (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Asian (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
White (%)	0.0	0.0	2.3	1.1	0.0	0.0	22.2	4.1
Hispanic/Latino (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
American Indian (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Income > US$700 weekly (%)	5.8	2.2	8.2	6.4	4.6	0.0	5.1	4.2
Home size[b]	5.2	5.0	5.1	5.1	4.3	4.9	4.9	4.7
Language[c]								
Spanish dominant (%)	31.9	35.6	26.2	29.7	25.0	40.7	32.1	30.1
Bilingual dominant (%)	31.9	35.6	30.3	31.8	23.9	29.6	23.1	24.4
Non-categorized (%)	36.2	28.9	43.4	38.6	51.1	29.6	44.9	45.6

Note. IEP = Individualized Education Plan; TD = typically developing; LEER = Language Exposure Evaluation Report.
[a]Mean age at the time of the first assessment. [b]Average total of adults and children in the home. [c]Spanish dominant are those who speak in that language during weekends from awake to 9:00 a.m. and 1:00 p.m. to 4:00 p.m., and Non-categorized are for those families who did not return the LEER form and therefore we have no information on their language dominance.

IGDIs. The IGDIs are a group of measures that subscribe to the tenets of general outcome measurement in that they are brief, easy to use, interpretable, technically sound, relate to meaningful long-term outcomes, and provide instructionally relevant information to support instructional modification, typically through MTSS (McConnell et al., 2014). All IGDIs are designed to measure generalized outcomes that align with domain-specific targets but do not map directly onto instructional content. This study included four IGDI measures, two English IGDIs—First Sounds and Sound Identification—and two IGDI-Español measures—Primeros Sonidos and Identificación de los Sonidos. English measures were administered via dual iPads, where the assessor controlled one iPad to provide directions, confirm and score responses for expressive items, and to override child-level responses when necessary. The child's iPad provided the child with stimuli and audio for each item, and recorded and scored the child's selected response for receptive items. The IGDI items are yoked via Bluetooth technology so when the assessor scored a response on their iPad, the child's iPad advanced, and when a child selected a response on his or her iPad, the assessor's iPad displayed the child's selection and score. Spanish measures were administered via paper-pencil format, and all standardized instructions were read aloud by the assessor to the child and the assessor scored each response in real time. Each measure took less than 3 min to administer and score, and all measures adhered to the same sample format where the first four sample items (A, B, C, and D) were used to determine whether a child was ready for test administration. Samples A and B were exemplar items where the administrator presented the item and responded to the item as an illustration of the task and required response behavior. In Samples C and D, the administrator provided an initial prompt and the child responded. If the child responded correctly, he or she moved on to test items. If the child responded incorrectly, he or she was given corrective feedback and asked to engage in another sample trial. If the child responded correctly, he or she moves on to test items, but if the child responded incorrectly, he or she discontinued testing. All items were scored dichotomously, and once testing began, children interacted with all 25 items regardless of response pattern.

First sounds. English IGDI First Sounds is an alliteration measure of PA. Assessors provided children with items that included two or three images. During testing, the assessor read the labels of each image and then started an automated audio recording that provided a standardized prompt. For example, "Snake, Cup, Tree, which one starts with /t/?" The child then selected his or her response and scoring was automated following the selection.

Sound identification. English IGDI Sound Identification measures AK. Children were provided with items that include three or four letter images that varied in upper- and lowercase format. During testing, the assessor provided the

letter images and initiated an audio recording that asked the child to select the letter that matches the sound provided (e.g., "Which letter makes the sound /d/?").

Primeros Sonidos. The IGDI-Español Primeros Sonidos measures PA in Spanish. Children were provided with items that include two, three, or four images, and images included culturally salient content. Item prompts primarily featured syllable-level requests because syllables are more salient in Spanish than phonemes. During testing, the assessor presented the child with each item in an easel format and then read the standardized prompts (e.g., "Reloj, Loro, Pelota. ¿Cuál de estos dibujos empieza con /l/?"). The assessor dichotomously scored each item after administration.

Identificación de los Sonidos. The IGDI Identificación de los Sonidos measures Spanish AK. Items included three or four upper- and lowercase Spanish letters. During testing, the assessor provided the letter images on an easel and then asked the child to select the letter that matches the sound provided (e.g., "D, F, C, ¿Cuál letra hace el sonido /D/?"). The assessor dichotomously scored each item after administration.

LEER. The LEER (Durán & Wackerle-Hollman, 2016) is a survey that includes 16 questions designed to capture the child's home language profile. Questions include parent relation to the child, languages spoken at home, country of birth, language comfort level, languages present in the home at birth, and a time block matrix where parents report what the child hears and speaks across a typical week. The time blocks are separated into four segments: awake to 9:00 a.m.; 9:00 a.m. to 1:00 p.m.; 1:00 p.m. to 4:00 p.m.; 4:00 p.m. to bedtime, for weekdays and weekends. The LEER has an internal reliability of $\alpha = .95$, and cluster analysis demonstrates that it reliably identifies child language profiles into Spanish dominant, balanced bilingual, English, (Wackerle-Hollman et al., 2019).

Family survey. The family survey is a project-designed 12-item survey used to collect date of birth, ethnicity, disability status, income level, and parent education information.

Classroom survey. The classroom survey is a project-designed 20-item questionnaire used to understand the classroom environment and teacher's language experience. It included questions such as what language the teacher is comfortable reading, writing, and speaking; what language is used for instruction, to read books and to assess children; and the teacher's years of experience. The survey also includes a specific set of questions about instructional practices, including "Are you currently using a curriculum to teach early literacy and language (Y/N)?" if yes, "Are you using a published curriculum (Y/N)?" if yes, "Please name the curriculum and publisher" and "On average, how many days per week is each child exposed to the curriculum?"

Procedures

Project staff first connected with site directors and teachers after reaching out to programs that have historically served large populations of SE-DLLs. We provided teachers in interested programs with information about the study and asked them to identify all children who they believed spoke at least some Spanish at home. Teachers sent home institutional review board–approved consent forms (printed in Spanish) with identified children and parents completed and confirmed child language and disability status on the family survey and through the use of the LEER (Durán & Wackerle-Hollman, 2016).

Assessor training. Trained graduate students, research assistants, and community data collectors assessed all children included in the study. All assessors were trained on the IGDI measures in a 3-hr training that occurred twice annually. Assessors were trained on standardization procedures, provided an opportunity to practice with feedback, and were required to achieve 90% fidelity before being approved to engage in child-level assessment. Project staff directly observed all assessors during administration training and completed fidelity checks before moving on to child assessments. English IGDI assessors were trained on the iPad application, monitored during administration, and completed a fidelity checklist to ensure confidence and accuracy with the measures and application. IGDI-Español assessors were trained on the paper-pencil assessments, tracking materials, and sample procedures (that were otherwise automated in the English measures). Each child interacted with a different assessor for English IGDIs and IGDIs-Español to protect against issues resulting from interlocutor sensitivity. Ten percent of data collection assessments were observed for reliability in the field, and when discrepancies occurred, immediate feedback was provided to remedy any administration drift.

Child-level growth assessment. Once child participants were confirmed to be Spanish speakers, they were assigned IGDI-Español and English IGDI forms for each measure. Spanish measures were counterbalanced for administration and paired with the companion English measure. IGDI-Español forms were fixed item sets in paper-pencil format. Primeros Sonidos and Identificación de los Sonidos included six parallel forms with 25 items each that were labeled A to F. Forms A/B were rotated in the fall, C/D were rotated in the winter, and E/F were rotated in the spring (e.g., a child who started on Form A received the form sequence A,B,A,B,C,D,C,D,E,F,E,F). The same forms were

used across both annual samples (2017–2018 and 2018–2019: 4- to 5-year-old cohorts of children).

English IGDI forms were administered via paper-pencil format in 2017–2018 using a form assignment approach that paralleled the Spanish description but included three forms of 25 items instead of six, such that children rotated across forms throughout the year (e.g., a child who started on English Form 1 received the form sequence: 1,2,3,1,2,3,1,2,3). During the 2018–2019 year, English IGDI forms were administered using iPad using Computer Adaptive Testing (CAT), so each child's experience was different from any other based on item response patterns. Paper-pencil and CAT forms both produced Rasch ability scores for children, and data were compiled across years. English CAT forms included 25 administered items, drawn from a CAT item bank of over 80 items per measure. Assessors obtained individual child assent before testing and worked with children in classrooms, immediately outside of classrooms in hallways, or in separate spaces identified for testing by the program. Every effort was made to limit external distractions and facilitate engagement. Data collection occurred monthly beginning in November in the 2017–2018 year and beginning in October in the 2018–2019 year.

Analysis

To model children's growth, we employed hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002). HLM is commonly used to model growth because of its flexibility with missing data and with inconsistencies in the time windows for each data point. All data were collected across 2 years; the 2017–2018 year data collection window occurred between December and May, for a maximum of 6 monthly data points (M = 4.0, SD =1.3), and the 2018–2019 year data collection window occurred between October and April for a maximum of 5 monthly data points (M = 3.3, SD = 1.9). First, to examine the impact of the academic year on the growth model, we included a year variable in the HLM. To test the full model, we employed a random coefficients model to allow intercept and slope parameters to vary. We set Level 1 of the HLM to estimate the intercept (π_0) and slope (π_1) for each child i at time t. Level 2 estimates the intercept (β_{00}) and slope (β_{10}) across children. The time variable, *Month*, was defined as a 30-day period. Month = 0 was centered in the fall, at October 1.

To examine differences between disability and performance below benchmark status and typically developing SE-DLLs' early literacy performance, we included a dummy variable to condition based on risk status, where children with disabilities or who performed below the fall benchmark were at risk, set as the reference group (coded 0), and typically developing children's scores were coded as 1. In this way, we tested whether the referent group (at risk) showed growth significantly different from zero, and whether the referent group's growth was significantly different from the typically developing children.

$$\text{Level}-1\ \text{Model}:\ \text{Measure}_{it} = \pi_{0i} + \pi_{1i}\left(\text{Month}\right)_{it} + e_{it},$$
$$\text{Level}-2\ \text{Model}: \pi_{0i} = \beta_{00} + \beta_{01}\left(\text{Not at risk}_i\right) + r_{0i},$$
$$\pi_{1i} = \beta_{10} + \beta_{11}\left(\text{Not at risk}_i\right) + r_{1i}.$$

Following this process, we reran the analysis reverse coded where typically developing was set as the reference group and at risk was coded as 1. This allowed us to include output with the slope coefficient present for both groups without computing the difference between the referent group (coded as 0) and the secondary group (coded as 1) in Tables 3 and 5. Membership in the at-risk group required a child to have an identified disability or receive a score below the fall benchmark on the English and Spanish companion IGDI measures.

We used HLM 6 software to estimate growth curves for each child for each measure using restricted maximum likelihood methodology. A growth model was estimated for each early literacy domain, pairing English and Spanish IGDI measures: Primeros Sonidos and First Sounds, and Identificación de los Sonidos and Sound Identification. All output is reported in logits.

Results

To examine early literacy growth trends specific to PA for children with disabilities or below beginning of year early literacy benchmarks, we first categorized our sample into three groups. First, we identified all children with IEPs, then for the remainder of the children we examined the first fall data point on the IGDI measures. We selected all children who fell below the fall screening benchmark at the first data point for *both* the English IGDI and IGDI-Español companion measure (e.g., First Sounds and Primeros Sonidos). These children were considered candidates for Tier 2 or 3 intervention in an MTSS model. We combined this subsample with the sample of children with disabilities to create our at-risk group in the HLM analysis, and compared these children with children who were identified as typically developing and had above benchmark IGDI scores at the fall data point. Because our analysis plan relied on the first data point as part of the selection criteria, the intercept value in the HLM does not add value to the interpretation regarding growth. We reported intercepts in the output but did not discuss this component of the analysis in the discussion because of its limited utility given the selection constraints.

Following the identification of group membership, we analyzed Primeros Sonidos and First Sounds; 236 children were identified at risk in both measures or had identified disabilities. Table 3 shows the estimated intercepts and

Table 3. Final Estimation of Fixed Effects (With Robust Standard Errors) for First Sounds and Primeros Sonidos.

Fixed effect	Coefficient	*SE*	*t* ratio	*df*	*p* value
First Sounds					
For intercepts, π_0					
At risk	−0.41	.06	−7.13	234	<.001
Typically developing	0.85	.09	9.31	234	<.001
Effect of the difference between typically developing and at risk	1.26	.11	11.67	234	<.001
For MONTH slope, π_1					
At risk	0.06	.02	4.28	234	<.001
Typically developing	0.10	.02	4.68	234	<.001
Effect of the difference between typically developing and at risk	0.04	.03	1.47	234	.144
Primeros Sonidos					
For intercepts, π_0					
At risk	−0.54	.10	−5.40	234	<.001
Typically developing	0.71	.09	7.83	234	<.001
Effect of the difference between typically developing and at risk	1.24	.13	9.26	234	<.001
For MONTH slope, π_1					
At risk	0.13	.02	5.75	234	<.001
Typically developing	0.09	.02	4.19	234	<.001
Effect of the difference between typically developing and at risk	−0.04	.03	−1.37	234	.170

slopes of both measures for SE-DLLs who had disabilities or achieved fall IGDI scores that fell below benchmark (denoted as at risk) and for typically developing SE-DLLs. These results illustrate for First Sounds, the at-risk group started at a lower intercept than the typically developing group (as expected and defined by the inclusion criteria), and showed significant growth across the academic year. We also examined the degree to which the at-risk growth was significantly different from the typically developing children's growth. Results revealed growth was not significantly different for First Sound (0.10 logits per month, as compared with 0.06 logits per month in the at-risk group; $p = 0.144$). Performance on the Primeros Sonidos measure showed a similar trend, where children in the at-risk group and typically developing group showed statistically significant growth; however, when we compared growth between groups, the effect was insignificant (0.13 logits per month for the at-risk group, as compared with 0.09 in the typically developing group; $p = .17$). Slopes and intercepts are depicted in Figure 1. Variance components for First Sounds and Primeros Sonidos are reported in Table 4. Variance components revealed there was significant variability in individual performance based on the standard deviation of each measure, and that for both measures, there was a sizable proportion of variance that remained unaccounted for in the growth model (44% in First Sounds and 49% in Primeros Sonidos).

Results for Sound Identification and Identificación de los Sonidos provided evidence that the at-risk group grew faster than the typically developing group. Sound Identification showed statistically significant slopes for each group, and when compared, the typically developing group started at a higher intercept than the at-risk group but grew significantly slower (0.09 logits per month) than the children who have disabilities or began the year below fall IGDI benchmarks (0.20 logits per month). Slopes and intercepts are depicted in Figure 2. Variance components for Sound Identification revealed that a significant proportion of the variance was unaccounted for in the model (77%) as shown in Table 4.

The complementary Spanish measure, Identificación de los Sonidos, showed similar patterns. The typically developing group started at a higher intercept than the at-risk group, as expected. However, the typically developing group grew significantly slower (0.07 logits per month) than the group below benchmark (0.22 logits per month). Variance components for Identificación de los Sonidos also showed a significant proportion of variance unaccounted for in the growth model (54%; see Table 4).

Discussion

As early childhood programs become more diverse, it is important to ensure information is available to promote the growth of all learners, including those with disabilities, those who begin the year with early literacy skills that are below established benchmarks, and those who speak a language other than English at home. Without information on how to serve all children, early childhood educational systems will continue to perpetuate the achievement gap, and miss the opportunity to intervene and develop core early literacy skills necessary for later reading success (Murphey et al., 2014). One facet of understanding how to support young SE-DLLs with disabilities and those who begin the

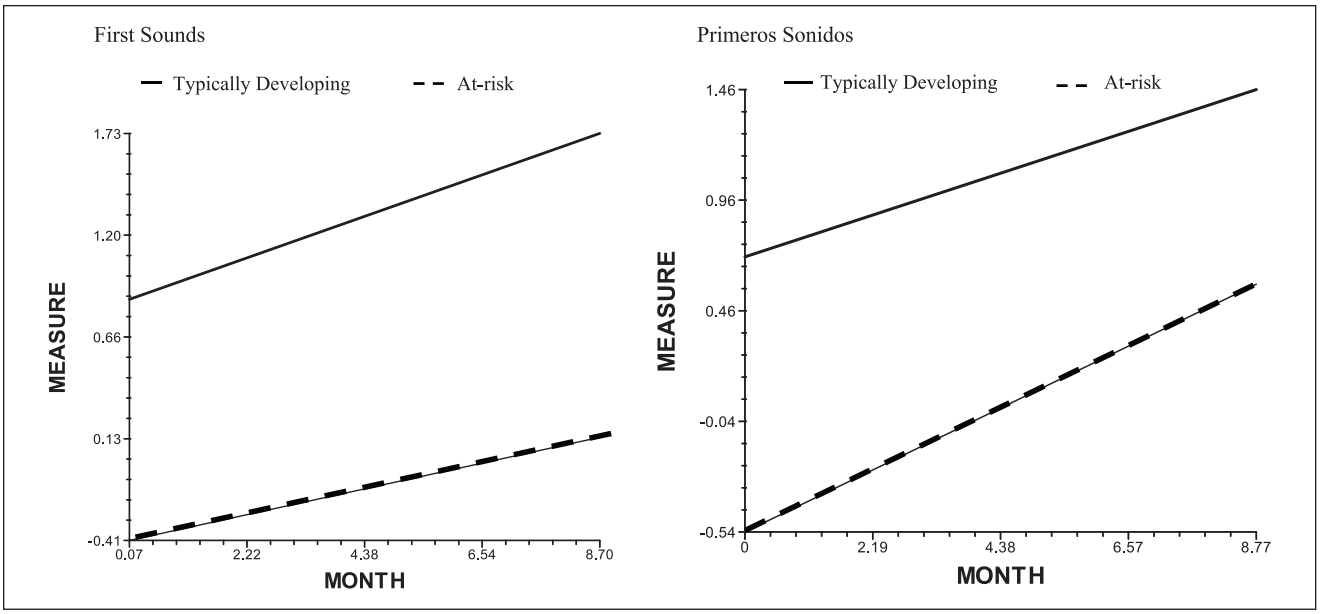

Figure 1. HLM slopes and intercepts for First Sounds and Primeros Sonidos.
Note. HLM = hierarchical linear modeling.

year below benchmark is to understand typical growth on early literacy measures, so expectations for growth can be considered during intervention.

Growth in SE-DLLs With Disabilities and Performing Below Benchmark

We examined how children with disabilities and children who perform below fall benchmarks on early literacy skills grow on English and Spanish measures in comparison with typically developing children who perform above fall benchmarks on early literacy skills. We divided the sample into two comparison groups: children who had identified disabilities in combination with children who performed below benchmarks on both English IGDI and IGDI-Español measures during the fall assessment, and children who were considered typically developing. When we examined these groups of children in the HLM, we found that when tested with the PA IGDIs (First Sounds and Primeros Sonidos), SE-DLLs with disabilities and those with performance below benchmark grew at the same rate as their typically developing counterparts on the First Sounds and Primeros Sonidos measures, and both groups on both measures showed growth significantly different from zero. Given Primeros Sonidos is a direct match to the more dominant language of the children in this study, it stands to reason we would expect stronger growth on this measure than on the English counterpart for both groups. This finding underscores the importance of measuring early literacy skills in Spanish for children with disabilities and those below benchmark to more accurately capture growth in PA and English-only approaches to assessment may underestimate growth rates.

SE-DLLs with disabilities and who performed below fall performance benchmarks showed similar growth rates as compared with their typically developing peers on the First Sounds English measure, despite the fact their initial levels in English (intercept) were significantly lower. These results may be due to the foundation of Spanish skills these children acquired through home language experiences, allowing them to apply and learn the rules for First Sounds in English when being tested. These findings were consistent in Primeros Sonidos, potentially indicating that regardless of disability or at-risk status, the home language environment may serve as a protective mechanism to support early literacy development in Spanish.

Even though we found higher rates of growth in Spanish for the at-risk group on Primeros Sonidos than on First Sounds, the slopes for the typically developing group were comparable across both measures (see Table 3). Children in this sample were exposed to some bilingual and Spanish instruction in the classroom (see Table 1), which may explain why slopes were not significantly different across groups or across measures for the typically developing group. Children's performance may be due to cross-linguistic transfer where instructional experiences in Spanish may benefit their growth on First Sounds in English. These relations have been found to be bidirectional (Lerner & Lonigan, 2016).

For AK, we observed that SE-DLLs with disabilities or who performed below benchmark in the fall had significantly higher slopes than their typically developing peers for both Sound Identification and Identificación de los Sonidos.

Table 4. Variance Components for English IGDIs and IGDIs-Español.

Random effect	*SD*	Variance component	*df*	χ^2	*p* value
First Sounds					
Intercept, r_0	.39	.17	200	259.64	.003
MONTH slope, r_1	.08	.01	200	238.33	.033
Level 1, *e*	.66	.44			
Primeros Sonidos					
Intercept, r_0	.56	.35	227	387.26	<.001
MONTH slope, r_1	.12	.01	227	383.14	<.001
Level 1, *e*	.70	.49			
Sound Identification					
Intercept, r_0	.62	.38	169	255.77	<.001
MONTH slope, r_1	.08	.01	169	207.40	.02
Level 1, *e*	.77	.59			
Identificación de los Sonidos					
Intercept, r_0	.703	.46	168	280.17	<.001
MONTH slope, r_1	.166	.03	168	260.45	<.001
Level 1, *e*	.738	.55			

Note. IGDIs = Individual Growth and Development Indicators.

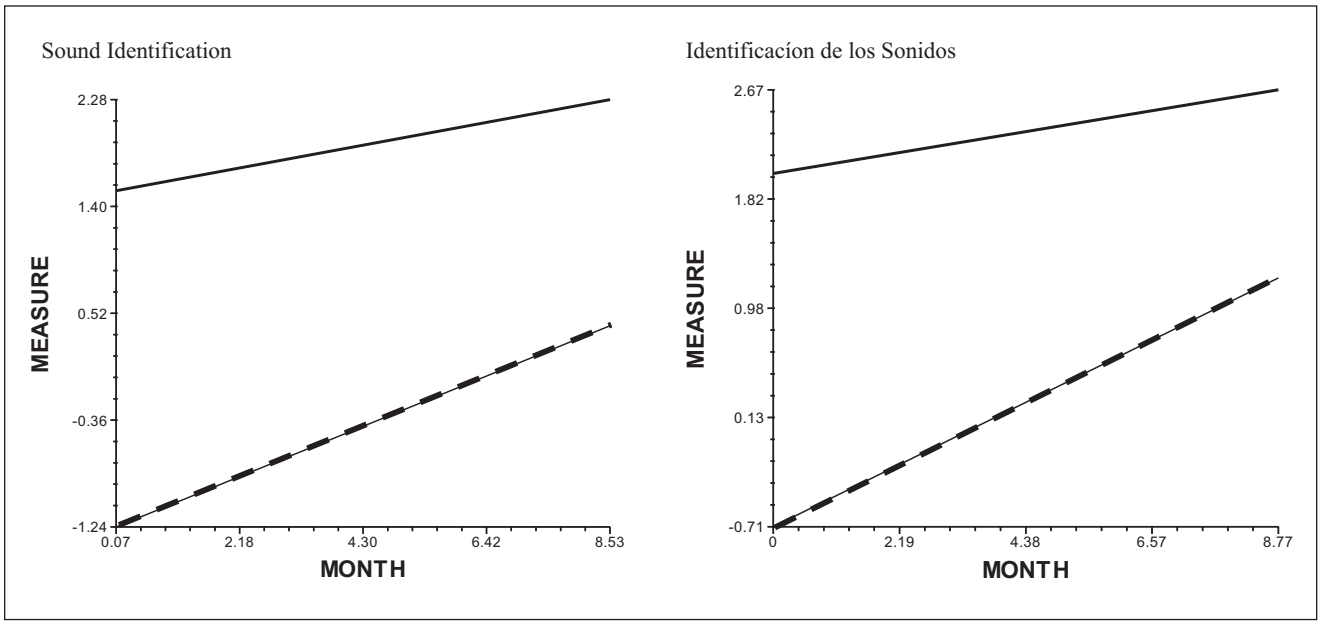

Figure 2. HLM slopes and intercepts for Sound Identification and Identificación de los Sonidos.
Note. HLM = hierarchical linear modeling.

Within this domain, the slopes were very similar across measures (see Table 5), and in both measures, slopes for the at-risk group were more than twice that of the typically developing group, which suggests that if the current pace maintains, these children will catch up to their peers before the end of the next academic year. AK may show a stronger response for children with disabilities or falling below benchmark in English and Spanish because intercepts were very low, demonstrating more room for growth.

Covariates to Explain Variation in Early Literacy Growth

The conditions for growth in this study were observed in classrooms as part of the assessment protocol, and although children who scored below benchmark should have been eligible to receive more targeted instruction in a tiered model, we did not find any evidence in our classroom survey that teachers systematically selected children and intervened

Table 5. Final Estimation of Fixed Effects (With Robust Standard Errors) for Sound Identification and Identificación de los Sonidos.

Fixed effect	Coefficient	*SE*	*t* ratio	*df*	*p* value
Sound Identification					
For intercepts, π_0					
At risk	−1.25	.09	−13.68	191	<.001
Typically developing	1.52	.18	8.40	191	<.001
Effect of the difference between typically developing and at risk	2.78	.20	13.65	191	<.001
For MONTH slope, π_1					
At risk	0.20	.02	8.56	191	<.001
Typically developing	0.09	.03	3.03	191	<.001
Effect of the difference between typically developing and at risk	−0.11	.04	−2.89	191	.01
Identificación de los Sonidos					
For intercepts, π_0					
At risk	−0.71	.10	−6.84	191	<.001
Typically developing	2.02	.16	12.86	191	<.001
Effect of the difference between typically developing and at risk	2.73	.18	14.50	191	<.001
For MONTH slope, π_1					
At risk	0.22	.03	7.95	191	<.001
Typically developing	0.07	.03	2.42	191	.017
Effect of the difference between typically developing and at risk	−0.15	.04	−3.54	191	<.001

on early literacy skills with them in Tier 2 or Tier 3 structured groups. Specifically, none of teachers who reported on their instructional strategies in the classroom survey reported evidence-based curricula or intervention, and despite the inclusion of a question on dosage that aimed to draw out differential dosage patterns for children who received intervention, 80% of the teachers did not complete this question, and of the 20% who did, they reported 3 ($n = 2$), 4 ($n = 2$), or 5 ($n = 12$) days per week.

Although tiered intervention and quality of instruction can be separated as unique constructs, facets of implementation create opportunities for overlap. Specifically, current research indicates that for children with disabilities, early literacy instruction in preschool settings is of low quality and evidence-based interventions are often implemented in ways where procedural fidelity does not translate to quality instruction, potentially hindering maximal gains. Justice et al. (2008) found that in a study of 135 preschool classrooms, language modeling and literacy focus was low for most teachers (as coded during observation). Only four out of 52 language lesson observations were considered high quality and only five out of 83 literacy lesson observations were considered high quality. These findings are consistent with findings specific to SE-DLLs, where explicit practices to support early literacy are even more relevant. Sawyer et al. (2016) observed 72 classrooms serving SE-DLLs and found that bilingual teachers used few practices to support literacy and language experiences of Spanish-speaking children. When rated on literacy activities, Spanish-speaking teachers achieved an average score of 1 on a scale of 0 to 14, and the authors noted the Spanish-speaking teachers were not engaging in any reading activities with the SE-DLLs in their classrooms. Therefore, it is not surprising that none of the teachers in our study reported use of tiered interventions or specific instructional strategies to support children with diverse needs. Nevertheless, it is important to recognize even with the status quo of practice—featuring limited targeted intervention—we still observed elevated rates of growth in this study for children with disabilities and those whose performance fell below benchmark in fall on the IGDI early literacy measures. This finding serves as a catalyst to support future research that can build on this momentum by improving SE-DLLs early literacy skills. Practitioners may be able to implement evidence-based interventions to further accelerate growth in this population.

Another factor that may accelerate growth for children with disabilities or who were below benchmark in the fall is tailoring the language of instruction to meet the language needs of the classroom. The variance components across all four measures showed a large percentage of variability was present in child performance not accounted for in the model. This suggests that other factors, potentially the language of instruction, may play a role in how children with disabilities and those with early literacy performance below fall benchmarks grow in contrast to their typically developing peers.

By matching children's first language with the language of instruction, children may be able to more efficiently learn new concepts, rather than focusing on acquiring the language, and secondarily learning the concepts presented within the new language. Likewise, when SE-DLLs with disabilities or those below benchmark are in English-only classroom environments, they may be doubly taxed in developing the skill because initial performance suggests they are still emerging in their English proficiency (Linan-Thompson & Ortiz, 2009). During this phase, SE-DLLs are tasked with both learning and learning in their second language (i.e., English). Growth may

be even further accelerated when the language of instruction matches the child's first language and there is evidence that supports this approach (Durán et al., 2013).

Another factor that may contribute to the variance unaccounted for in the HLM, and potentially accelerate or depress growth, is the home language profile. Our demographic data show that for the families that completed the LEER, our sample of respondents was nearly split between Spanish Dominant and Balanced Bilingual language profiles across conditions. Specifically, for children assessed with First Sounds/Primeros Sonidos in the at-risk group, 32% were Spanish dominant, 32% were balanced bilinguals, and 36% were non-categorized because parents did not complete the LEER form. For children assessed with Sound Identification/Identificación de los Sonidos in the at-risk group, 25% were Spanish dominant, 32% were balanced bilinguals, and 39% were non-categorized. These results indicate that the even distribution of language profiles was unlikely to differentially affect growth within each group; however, research suggests differences in SE-DLL early literacy performance based on home language profiles have been found (Bedore et al., 2012; Wackerle-Hollman et al., 2019).

Finally, it is important to note that across all measures, children in this study who had disabilities were primarily identified as having speech-language impairments or were developmentally delayed ($n = 34$; 70% of the sample with disabilities). As noted, research shows that children with these disabilities are more at risk for later reading difficulties (Catts et al., 2008). Furthermore, the dominant representation of developmental delay and speech-language impairment in this study may represent a more homogeneous skillset and potentially produce growth metrics that have limited representation from other disability categories. In addition, children with severe language and cognitive disabilities were not included in the sample given the need to pass the two sample items to continue testing. In this way, the dominant disability categories present in this study may uniquely contribute to the growth estimates.

Considerations for Practice

These findings lead to pragmatic questions about how to best support SE-DLLs with disabilities or those who start the year below early literacy benchmarks. Our data suggest that we can expect these children to grow faster than their typically developing counterparts on Spanish early literacy measures, and for AK, they may also grow faster in English. Children with disabilities or who begin the year below benchmark grew at a significant rate on English First Sounds IGDI, just not as quickly as their typically developing counterparts.

Given the nuances of these domains, it is important to consider how to adjust practices as a result of these findings. If we can expect at-risk SE-DLLs to show significant growth on early literacy skills, we must use high-quality progress monitoring tools in both English and Spanish that are designed for use with SE-DLLs to capture their growth and ensure they are achieving expected rates. High-quality progress monitoring tools must be technically adequate, sensitive to changes in performance over brief periods of time, and produce results that are meaningful and interpretable to teachers so that they can adjust and differentiate instructional practices based on the data gathered from the progress monitoring tool (McConnell et al., 2014).

Our findings also emphasize the need to measure PA and AK skills in both English and Spanish to better understand bilingual children's growth in these domains and capture children's performance across their languages, particularly for the at-risk group where growth was more evident on the Spanish measures. At the same time, we must invest in supporting teachers to engage in effective practices to further accelerate growth; to potentially close the gap and allow all SE-DLLs, those at risk and those typically developing; to enter kindergarten with a foundation of strong early literacy skills in English *and* Spanish. For classrooms that include bilingual staff, these practices can include evidence-based curricular supports and interventions (e.g., Literacy Express curriculum in English and Spanish). For classrooms where bilingual staff are not present, it may be important to leverage home-based interventions to facilitate parent or caregiver support of Spanish. In classrooms, with monolingual English staff, teachers can support Spanish-speaking children with interventions that allow for automation without a native speaker in the classroom (e.g., pre-recorded stories in Spanish), with the broader goal of improving AK and PA performance in Spanish and English. Whatever the language strength of teachers in the classroom, it is important to use information about SE-DLLs' potential for growth in AK and PA to adjust instruction and intervention to maximize biliteracy development.

Finally, teachers who work with at-risk children, particularly those with speech-language impairments or developmental delay, could benefit from evidence-based strategies designed to support early literacy performance tailored to their needs. For example, Diamond et al. (2013) noted in their synthesis of Institute of Education Sciences research that intervention that focuses on print-focused conversation can significantly boost AK and PA skills for children with disabilities (Justice et al., 2010). Combining the growth findings present in this study with evidence-based intervention that have been proven successful with children with speech and language impairments and/or developmental delays could serve to bolster early literacy skills and potentially reduce gaps in performance before they become persistent challenges.

Limitations and Future Research

Although our findings bring some light to bear on expectations for growth on early literacy skills for SE-DLLs, several limitations prevent generalized interpretations. First, we provided growth estimates for SE-DLL children who

were at risk and typically developing children. We did not include a monolingual English group of children with and without disabilities. By including a monolingual English group for comparison, this study would benefit from a direct comparison of growth rates for the business-as-usual performance of children who are monolinguals benefiting from English instruction. Using this rate, we could then establish whether the SE-DLL growth rates are on par with monolingual performance, or whether they lag behind English performance, which would provide context to generalize these findings regarding sufficient progress on early literacy skills. Future studies should consider including a monolingual group to facilitate these comparisons.

Second, we provided a cursory overview of the role language of instruction may have on SE-DLL's performance trajectories. We used teacher's self-report to examine language of instruction; however, a more precise approach to understanding what language is used in each classroom would be to use existing measure of classroom quality and classroom language designed for DLLs such as the Early Literacy and Language Classroom Observation–DLL (Castro, 2005) and the Language Interaction Snapshot (Atkins-Burnett et al., 2011). These tools provide in-depth reports of the types of language use and the activities teachers engage in to support DLLs. By contextualizing growth within a systematic quantification of classroom language use and the quality of instruction, future studies could determine which factors are most likely to accelerate growth and which factors hinder early literacy performance.

Third, we examined growth in the context of an academic year by examining data across two cohorts of children. A more parsimonious model would include one academic year with monthly data points. Practical constraints in implementation prevented this approach, but future work could benefit from a cohesive sample that includes the same children across the academic year. Although we tested for effects by year before running the HLM, it is possible that other factors that were unique to the year may have contributed in ways that could have influenced child performance, but remained undetected.

Finally, we examined growth in the PreK year without connecting performance to kindergarten or primary grades. Future studies should examine longitudinal relations between Spanish and English early literacy growth and later reading success in English and Spanish for SE-DLLs. By examining the predictive relation between growth in PreK and performance and growth in the primary grades, we may be able to better equip educators with information not only about status of early literacy skills but the importance of specific trajectories in predicting if they are on track for later reading success.

Conclusion

Despite its limitations, this study provides insight into how SE-DLLs grow on early literacy skills and how rates of growth compare between typically developing children and those who were identified at risk. Moreover, this study solidifies the importance of examining growth for diverse learners; their rates of growth outpaced typically developing peers on AK measures and remained the same as typically developing peers on PA measures. These findings also demonstrate SE-DLLs potential to develop strong early literacy skills over brief periods even in status quo classroom environments. Estimating growth may serve as an important component of progress monitoring in this population beyond simply establishing benchmark scores. This study also bolsters the research literature that provides evidence that measuring SE-DLLs in Spanish and English is an important component to understanding their overall growth as this can differ between languages. The early literacy development of young SE-DLLs remains a critical priority in the United States, and this study addresses an important gap in our knowledge about growth rates in PA and AK in English and Spanish in this population.

Authors' Note

The opinions and recommendations presented in this article are those of the authors alone, and no official endorsement from the Institute of Education Sciences should be inferred.

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Declaration of Conflicting Interests

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