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Dual Language Profiles in Spanish-Speaking English Learners

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ABSTRACT

Purpose: The purpose of this study was to identify and describe latent dual language profiles in a large sample of school-age Spanish–English bilingual children designated as English learners (ELs) by their school district.
Method: Data for this study include 847 Spanish-speaking ELs from kindergarten to third grade. Spanish and English narrative retell language samples were collected from all participants. Four oral language measures were calculated in Spanish and English, including the subordination index, moving average type–token ratio, narrative structure scheme (NSS), and words per minute using Systematic Analysis of Language Transcript. These indicator measures were used in a latent profile analysis to identify dual language profiles.
Results: The optimal model represents a four-profile solution, including a Spanish-dominant group (average Spanish, low English), an English-dominant group (low Spanish, average English), and two balanced groups (a balanced-average group and a balanced-high group). Additionally, participants displayed uneven performance across language domains and distinct patterns of unique strength or weakness in a specific domain in one of their two languages.
Conclusions: Findings from this study highlight the large variability in English and Spanish oral language abilities in school-age Spanish-speaking ELs and suggest that a dichotomous classification of ELs versus English-proficient students may not be sufficient to determine the type of educational program that best fits a specific bilingual child's need. These findings highlight the need to assess both languages across multiple language domains to paint a representative picture of a bilingual child's language abilities. The dual language profiles identified may be used to guide the educational program selection process to improve the congruence among the linguistic needs of an individual child, teachers' use of instructional language, and the goals of the educational program (i.e., improving English proficiency vs. supporting dual language development).
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The number of families in the United States who speak a language other than English has tripled in the last several decades (Espinosa, 2015). It is estimated that over 40 million individuals in the United States speak Spanish at home (U.S. Census Bureau, 2015). Although many children raised in these Spanish-speaking families will eventually speak English and become proficient bilingual users, a large proportion of these children will enter school with "limited English proficiency," a descriptive term used by the U.S. Department of Education. These children are often designated as English learners (ELs) and placed in a variety of educational programs designed to instruct the requisite English skills to eventually demonstrate grade-appropriate academic achievement in English. The specific educational program placement is largely determined by program availability and parental choice. Outcome studies that have examined the effectiveness of educational programs for linguistic minority students have found contradictory patterns, which have been attributed to the differences

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in the specific sample studied and methodologies used across studies (Slavin & Cheung, 2005). Rarely has the research community questioned whether the divergent outcomes of the studies are influenced by the potential dual language profiles of the children receiving a particular model of instructions. Identifying and describing dual language profiles would facilitate the placement of educational programs for ELs so that the instructional language aligns with specific types of students' linguistic skills and strengths. The purpose of this study is to identify and describe distinct dual language profiles (i.e., systematic linguistic differences that distinguish one subgroup of children from another) among Spanish–English bilingual children who have been designated as ELs by public school districts upon school entry.

Rationale for the Potential Presence of Distinct Dual Language Profiles

Much attention has been given to the growth of English skills in Spanish-speaking ELs, which is not surprising given that the major goal across educational programs for ELs has been to improve children's oral and literacy skills in English. Significantly less studied are the Spanish proficiency and the potential presence of distinct dual language profiles in these children. The proficiency level in the first language is rarely formally assessed during the educational program placement process for ELs (Boyle et al., 2015). Additionally, even though the notion that bilingual children are not a linguistically homogenous group is no longer a new idea (Cummins & Mulcahy, 1978; Gutiérrez-Clellen, 1999; Hoff & Core, 2015), it is still common for practitioners to consider and treat these children as a homogenous group using a monolithic instructional approach.

However, there is clear rationale for the potential presence of distinct dual language profiles. Previous studies have found a considerable range of linguistic skills across various domains even among monolingual children (Conti-Ramsden et al., 1997; Tomblin & Zhang, 2006). The variability in linguistic skills is likely magnified for bilingual children[1] compared to monolingual children because we would expect three sources of variability, including normal individual variability in linguistic skills across children, variability in individual children's exposure to the two languages, and the potential interaction between the two languages. There are two interrelated components that contribute to the variability in bilingual children's exposure to their two languages. One component is the onset of exposure to the second language. Some children, referred to as simultaneous bilinguals, are exposed to two languages either from birth or shortly after (Genesee et al., 2004; Hoff et al., 2012). Other children, referred to as sequential or successive bilinguals, are first exposed to one language and have made progress toward its acquisition when they begin learning a second language (Genesee et al., 2004). A second component that introduces additional complexity is the amount (i.e., quantity) and the type (i.e., quality) of language exposure in each language, which varies considerably within and across various groups of children acquiring two languages (De Houwer, 2007). Although simultaneous bilinguals have extensive and continuous exposure to both languages from an early age, the quantity and the quality of their exposure to each language is not always equivalent (Genesee et al., 1995; Unsworth, 2016). For sequential bilinguals, the onset, quantity, and quality of exposure to each language are variable across individual children. For both types of bilinguals, their level of performance in each language will vary as a function of their exposure to each language. Theoretically, children categorized as ELs in the school system could be either simultaneous or sequential bilinguals. Regardless of the specific type of bilingual an EL student is, the interaction between the onset of language exposure and the quantity and quality of input results in a myriad linguistic possibilities among ELs. Lastly, there may be various degrees of interaction between the two languages depending on the specific languages a bilingual child is learning (Paradis & Genesee, 1996; Serratrice, 2013). Bilingual children learning two languages with great typological proximity were found to have better vocabulary compared to bilingual children learning two languages that are distant from each other (Blom et al., 2020; Floccia et al., 2018). In summary, by the time these children enter school, it is reasonable to hypothesize that they will have a variety of skills in each language as a function of their individual linguistic experience.

Importance of Identifying Distinct Dual Language Profiles

Identifying dual language profiles within Spanish-speaking ELs carries both practical and clinical significance. Hispanic children are the largest and fastest growing bilingual population in the United States, and those designated as ELs show considerably lower levels of school achievement than their non-EL peers (García et al., 2011; Hernandez et al., 2008; Klingner et al., 2012). Spanish-speaking ELs have the highest high school dropout rate relative to any other group, with 31% failing to complete high school, compared to 10% in monolingual English-speaking peers (U.S. Department of Education,

[1]Throughout this article, we use the term *bilingual children* to refer to children who are exposed to and are learning two languages. We use *English learners (ELs)* to refer to a subset of bilingual children who have been designated as ELs by their school district.

2006). Given language skills highly predict later achievement outcomes in ELs (Hoff, 2013; Kieffer, 2012), more research that seeks to understand this population to better meet their linguistic needs in educational programs are critically needed to address the well-documented achievement gap between Spanish-speaking ELs and their monolingual English-speaking peers.

A variety of educational programs designed to improve student outcomes and close achievement gaps for Spanish-speaking ELs are available. The specific definition of educational programs for ELs varies across states and districts. Generally, these programs can be characterized as programs that focus on either developing students' oral and literate proficiency in two languages (e.g., dual language) or English proficiency whether that be from the onset of schooling (structured English immersion) or a gradual shift from the heritage language to English academic instruction (transitional bilingual; Boyle et al., 2015; Office of English Language Acquisition, 2019). Outcome studies that examined which type of educational programs for ELs is more effective have yielded mixed findings (Calderón et al., 2011; May, 2008; Slavin & Cheung, 2005). However, as Barrow and Markman-Pithers (2016) pointed out, the inconsistency can be attributed to the lack of consensus on the goal of educational programs for ELs among researchers (i.e., improving English proficiency vs. becoming proficient bilingual speakers).

We argue that regardless of the goal of a specific educational program, a program can only be effective when there is congruence among the specified goals of a program, teachers' use of instructional language, and the linguistic needs of the children in the program. This congruence and the fundamental question of whether a particular educational program is appropriate for certain ELs cannot be achieved or answered without assessing both languages to understand the dual language profiles and corresponding linguistic needs of ELs. Currently, Spanish proficiency is not routinely assessed in the EL identification process. Federal policies do not specify particular procedures for identifying students as ELs but only mandate that states or districts have procedures in place for accurately identifying students as ELs "in a timely, valid, and reliable manner so that they can be provided the opportunity to participate meaningfully and equally in the district's educational program" (U.S. Department of Education et al., 2015). All districts require a home language survey to determine the language parents and students use at home, followed by an English language proficiency assessment. Of the 46 states with publicly available information about EL identification procedures, only four states recommend or encourage districts to assess students' home language proficiency as part of the EL identification and program placement process (Boyle et al., 2015). Regarding English proficiency, states or even districts within the same state vary in the proficiency tests administered and the cutoff points or criteria used to determine EL status (Boyle et al., 2015; Tanenbaum et al., 2012), which could potentially result in a student identified as an EL in one district to be considered as a proficient English user in another. Additionally, state policies on the placement of EL students into a particular type of educational program are more flexible: The majority of states do not have formal policies on EL program placement but rather allow local discretion in determining students' placement into the educational programs each district offers (Tanenbaum et al., 2012). To summarize, under current policies, in any given educational program for ELs, teachers may encounter a mixed group of children with varying levels of English and the home language because of (a) the lack of emphasis on testing students' home language, (b) the inconsistency in criteria used to determine EL status at the state level, and (c) the flexibility in student placement in EL programs at the local level.

Understanding whether linguistic variations in Spanish-speaking ELs are due to random individual variability or due to systematic differences across distinct dual language profiles is key to improving the congruence among EL students' linguistic needs, teachers' use of instructional language, and educational programs for student placement. Educationally, if Spanish-speaking ELs exhibit distinct language profiles, identifying these profiles would facilitate the placement of EL students into the most appropriate educational programs so that the instructional language aligns with specific types of students' linguistic strengths and needs. Clinically, understanding language profiles may help identify Spanish-speaking ELs who may be struggling in English and Spanish early on so that their progress in both can be monitored and intervention can be initiated if needed.

Language Profiles Using Latent Profile Analysis

In recent years, some studies have started to use "person-centered" statistical methods, such as latent profile analysis (LPA), to identify language profiles in Spanish–English bilingual children. LPA is a type of finite mixture model used to express the overall distribution of one or more variables as a mixture of a finite number of component distributions (Masyn, 2013; B. O. Muthén, 2004). One feature for all mixture models is that the components or component memberships are not directly observed but are "latent." In other words, mixture models are used to identify some number of unknown subgroups or profiles of persons using individual-level characteristics to express the overall population distribution (Masyn, 2013). Compared to traditional clustering analytic approaches, model-based approaches such as LPA offer greater flexibility in several ways: (a) LPA allows users to include covariates in the models; (b) LPA models allow parameters such as means, variances, and covariances to vary across clusters; and (c) statistical tests of model fit are conducted to aid the process of finding the optimal model solution (Pastor et al., 2007; Woo et al., 2018). Thus, LPA is suitable for testing the presence of latent subgroups or profiles in a population and is a preferred method in psychological and organizational research due to its model-based approach and the flexibility in its model specification procedure (Kapantzoglou et al., 2015; Lubke & B. O. Muthén, 2005; Pastor et al., 2007; Woo et al., 2018).

We identified five studies that investigated language-related profiles in Spanish–English bilingual children in the literature (Gonzalez et al., 2016; Halpin et al., 2021; Kapantzoglou et al., 2015; Lonigan et al., 2018; López & Foster, 2021). These studies vary regarding the age of the participants, the domains included in the profiles (e.g., language, literacy, cognitive, and academic achievements), and whether skills in one or both languages are considered in the analyses (see Table 1 for a summary). Halpin et al. (2021) was the only study that used both Spanish and English oral language skills to identify distinct language profiles based on a sample of 161 bilingual preschoolers (Halpin et al., 2021). This study used scores from six subtests from the Bilingual English–Spanish Assessment (BESA; Peña et al., 2014), including Phonology, Semantics, and Morphosyntax in Spanish and in English. The authors identified a four-profile solution as the optimal solution, including (a) a low-balanced bilingual group with a relative weakness in morphosyntax in both languages, (b) a high-balanced bilingual group, (c) an uneven profile with high Spanish skills and low English skills, and (d) an uneven profile with low Spanish skills and high English skills. Notably, no study has examined the oral language profiles in a school-age sample based on both English and Spanish language abilities.

The Current Study

The objective of this study was to identify and describe potential dual oral language profiles in a large-scale sample of school-age Spanish-speaking children designated as ELs by their school district. This study extends existing work on language profiles in Spanish–English bilingual children in three unique aspects. First, this study focuses on a subset of bilingual children, school-age ELs, a population that has not been examined in previous work using LPA. Identifying distinct dual language profiles in this specific population will provide helpful insights to improve the congruence between EL students' linguistic needs and available educational programs.

Second, this study includes English and Spanish oral language measures derived from narrative language samples. Narrative sample analysis is a recommended approach when assessing children from culturally and linguistically diverse backgrounds (Bedore et al., 2010; Ebert, 2020; Gutiérrez-Clellen, 2002; Rojas & Iglesias, 2006). Narrative sample analysis has high ecological and content validity as it involves eliciting connected language production in functional communication and academic contexts (Castilla-Earls et al., 2020; Gutiérrez-Clellen et al., 2000; Peña et al., 2006). Oral narrative skills are strongly associated with literacy skills in bilingual children (Miller et al., 2006; Rojas et al., 2019). Narrative sample analysis is versatile because it can be used with children from preschoolers to school-age children and can be analyzed in different ways to derive quantitative and qualitative measures to index multiple language domains, providing rich information about a child's expressive language ability (Castilla-Earls et al., 2019; Heilmann et al., 2016). It is also considered as a least-biased assessment approach in comparison to traditional standardized tests as storytelling is common in many cultures (Bitetti et al., 2020; Fiestas & Peña, 2004).

Lastly, when selecting indicator variables for the LPA, we intentionally selected two microstructure measures that index specific language domains and two measures that represent language proficiency and productivity at the global level for each language. At the microstructure level, we focused on syntax as measured by the subordination index (SI) and lexical diversity as measured by moving average type–token ratio (MATTR). These two constructs are commonly examined in previous work that used LPA with Spanish–English bilingual children (Gonzalez et al., 2016; Halpin et al., 2021; Kapantzoglou et al., 2015). At the global level, we included a measure of narrative proficiency using narrative structure scheme (NSS) and a measure of verbal productivity using words per minute (WPM). Both NSS and WPM are developmentally sensitive measures for the targeted age group for both Spanish and English (Heilmann et al., 2010) and have been used as global measures that represent overall integration of the multiple demands of narrative formulation and verbal production (see the works of Bitetti & Hammer, 2021; Lucero, 2015; Méndez et al., 2018, for studies on NSS and see the works of Heilmann et al., 2008; Miller et al., 2006; Rojas & Iglesias, 2013, for studies on WPM). Each of these four selected measures taps a different aspect of language performance and can be compared across languages (Miller et al., 2006). Combined, these measures provide a broad index of oral language ability in each language and were collectively used as indicator variables in the LPA.

We hypothesize that at least three types of dual language profiles may emerge, including a group of children with high proficiency in Spanish and low proficiency in English (Spanish-dominant), a group of children with high proficiency in English and low proficiency in Spanish (English-dominant), and a group of children with relatively

Table 1. Summary of previous studies that used latent profile analysis with Spanish–English bilingual children.

Reference	Age (years)	*N*	Sample characteristics	Domains included	Language(s) examined	Measures included	Number and description of profiles identified
Kapantzoglou et al. (2015)	5–7	471	Predominantly Spanish-speaking children	Language, nonverbal cognition	Spanish	3 Spanish language sample measures (lexical D, grammatical errors per terminal unit, MLUw), 2 language processing measures (Spanish nonword repetition and rapid automatic naming from the SSLIC), and noncognitive ability measured by the WNV	3 profiles: (a) a low-grammaticality group; (b) a low phonological working memory group; and (c) an average group
Gonzalez et al. (2016)	4–6	252	Spanish-dominant preschool-age children from low-income households enrolled in preschool dual language learner classrooms	Language, literacy	Spanish, English	2 code-related measures (Spanish C-PALLS Letters, Spanish C-PALLS Phonological Awareness) and 4 oral language measures (English preLAS, Spanish preLAS, English EVT-2, English PPVT-4)	4 profiles: (a) low English language, average Spanish language, and mixed Spanish literacy; (b) average English language, strengths in Spanish language and Spanish literacy; (c) mixed English and Spanish language, low Spanish literacy skills; and (d) high English language, average Spanish Language, and mixed Spanish literacy skills
Lonigan et al. (2018)	3–5	562	Spanish-speaking language minority preschoolers recruited from Head Start centers	Language, nonverbal cognition	Spanish, English	4 oral language measures including the Auditory Comprehension and Expressive Communication subtests of the English and the Spanish PLS-4 and 1 nonverbal cognitive measure, the Pattern Analysis subtest of SB-IV	9 profiles consolidated into 3 "super profiles": (a) Spanish-dominant (4 profiles); (b) English-dominant (2 profiles); and (c) balanced (3 profiles, including one profile with low skills in both languages, one with low Spanish and average English, one with high skills in both)
López & Foster (2021)	4.75–5.75	320	Spanish–English dual language learners recruited from Head Start programs	Language, literacy, cognition, mathematics	Spanish, English	W scores from the 9 subtests of WJIII	4 profiles: (a) average balanced; (b) high English achievement, low Spanish achievement; (c) high Spanish achievement, low English achievement; and (d) low balanced
Halpin et al. (2021)	3–5	161	Spanish–English dual language learners recruited from Head Start programs	Language	Spanish, English	English and Spanish scores from the Phonology, Semantics, and Morphology subtests from BESA	4 profiles: (a) low balanced with a relative weakness in morphosyntax in both languages; (b) high balanced; (c) high Spanish, low English; and (d) low Spanish, high English

Note. MLUw = mean length of utterance in words; SSLIC = Spanish Screener for Language Impairment in Children (Restrepo et al., 2013); WNV = Wechsler Nonverbal Scale of Ability (Wechsler & Naglieri, 2006); C-PALLS = Circle-Phonological Awareness, Language, and Literacy System (Landry et al., 2009); preLAS = English Language Proficiency Assessment for Early Learners (DeAvila & Duncan, 2000); EVT-2 = Expressive Vocabulary Test–Second Edition (Williams, 2007); PPVT-4 = Peabody Picture Vocabulary Test–Fourth Edition (Dunn & Dunn, 2007); PLS-4 = Preschool Language Scale–Fourth Edition (Zimmerman et al., 2002); SB-IV = Stanford-Binet Intelligence Scales–Fourth Edition (Thorndike et al., 1986); WJIII = Woodcock-Johnson III Complete (Woodcock et al., 2001); BESA = Bilingual English–Spanish Assessment (Peña et al., 2014).

similar English and Spanish proficiency (balanced: proficiency level not specified). Despite the number of profiles identified in previous studies, these three types of profiles have been consistently revealed (Gonzalez et al., 2016; Halpin et al., 2021; Lonigan et al., 2018; López & Foster, 2021).

Method

Participants

This study involved secondary analysis of archival and deidentified data drawn from a large-scale cross-sectional study designed to examine factors that influence language and literacy development of Spanish–English bilingual children during the initial years of schooling (Francis et al., 2005). Secondary analyses were approved by the institutional review board at the University of Delaware and the University of Texas at Dallas. Participants of the large-scale study were children in kindergarten through third grade (N = 1,532) enrolled in 13 different schools in two geographic regions of Texas: a large urban area in southeastern Texas (N = 532 participants in six schools in the Houston Independent School District) and a smaller urban area near the border between Texas and Mexico known as the Rio Grande Valley (N = 1,012 participants in seven schools in the Brownsville Independent School District). All students were designated as ELs whose English skills were deemed to be insufficient to perform adequately in all-English classrooms. All children were enrolled in similar transitional bilingual programs in which they were academically instructed primarily in Spanish at the beginning and then gradually transitioned to English, with the expectation that they would be English proficient by third grade. At the time of recruitment, these children had not been identified as having a present or past disability by their school districts.

A subset of participants from the original study was included for this study based on the following inclusion criteria: (a) contributed narrative samples in English and Spanish and (b) each narrative sample contained at least five complete and intelligible utterances with 75% or more of the number of total words (NTW) produced in the target language. Of the 1,532 children, 595 (235 children from Houston and 359 from Rio Grande Valley) did not contribute a language sample in both languages due to various reasons (e.g., absent during test date and poor audio quality), five had fewer than five complete and intelligible utterances in at least one language sample, and 30 had less than 75% NTW in the target language. Additionally, 37 participants were excluded due to a suspicion of data collection procedure error. The testing procedure in English and Spanish should have been within 2 months apart, yet we found 37 participants who were tested in English more than 3 months later than the Spanish testing procedure. We excluded these participants conservatively to avoid possible confound of maturation effect in one language over the other. An additional 18 participants were excluded as their observations were detected as multivariate outliers (see Results section). We summarized the number of participants excluded in each step of the exclusion criteria and the distribution of excluded participants from each school district in Supplemental Material S1. Thus, the final analysis data set included 847 Spanish-speaking ELs (451 girls, 396 boys) from 173 classrooms from 13 schools, including 125 kindergarteners, 197 first graders, 249 second graders, and 276 third graders.

Procedure

As part of the large-scale study, narrative retell language samples in Spanish and English were elicited from the participants using a wordless picture book, *Frog, Where Are You?* (Mayer, 1969). For all participants, testing sessions were first administered in Spanish and were replicated in English approximately 1 week later. The examiners were proficient Spanish–English bilingual speakers. Different examiners elicited the narrative samples in each language. During the narrative elicitation task, the examiner sat across from the child and read a scripted version of the story in the target language. Then, the examiner gave the child the book and requested that the child retell the story using the following cue: "Now, tell me what happened in the story"/"Ahora, cuéntame lo que pasó en este cuento." Examiners were only permitted to provide back-channel responses (e.g., "aha," "sí," and "yes") or repeat the child's last utterance to encourage continued narration. Examiners were explicitly instructed not to provide additional information or answer questions from the participants.

All narratives were digitally recorded and transcribed using Systematic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2019) transcription format following conventions for bilingual language samples (cf. Rojas & Iglesias, 2013, p. 635). Complete and intelligible utterances were defined based on SALT conventions and excluded utterances with unintelligible segments, abandoned utterances, interrupted utterances, and nonverbal utterances. Code switching was coded at the word level, and sentences where code-switching occurred were included in the analysis set. The mean number of complete and intelligible utterances was 37.33 (SD = 11.25) in English and 38.78 (SD = 11.25) in Spanish. Each transcriber completed an extensive training process requiring approximately 10 hr of working with a lab manager. For all English and Spanish transcripts, an initial transcription was completed by a transcriber, which was reviewed by a second transcriber to correct any transcription errors. The final transcript was then coded for narrative structure using the NSS (Heilmann et al., 2010). Twenty transcripts in English and 20 transcripts in Spanish were randomly selected to determine reliability of the language samples at three levels: protocol accuracy (i.e., adherence to SALT transcription conventions), transcription accuracy (i.e., segmentation of words and utterances), and NSS coding agreement. Protocol accuracy ranged from 98% to 100% in English and 94% to 99% in Spanish. Transcription accuracy ranged from 90% to 98% in English and 91% to 99% in Spanish. For NSS coding agreement, Krippendorff's alpha, a measure of interrater reliability that supports interval data, was calculated (Krippendorff, 2011). Alphas for the NSS were .74 in English and .60 in Spanish.

Measures

Spanish and English oral language measures were calculated from the narrative transcripts using SALT. Four measures were calculated in Spanish and English, including the SI, MATTR, NSS total score, and WPM. As described in detail in the introduction, each measure taps a different aspect of language performance, including syntax, vocabulary diversity, narrative proficiency, and verbal productivity and is comparable across languages (Miller et al., 2006). Combined, these measures provide a broad index of oral language ability in each language and were collectively used in the LPA.

The SI (Scott & Stokes, 1995) is a measure of syntactic complexity that produces a ratio of the total number of clauses (including both main and subordinate clauses) to the total number of C-units. SI is a well-suited and sensitive measure of syntactic complexity that captures complex sentence development in monolingual and bilingual young school-age children (Alt et al., 2016; Gutiérrez-Clellen, 1998; Gutiérrez-Clellen & Hofstetter, 1994; Heilmann et al., 2010). Previous work has also shown that SI continues to develop through the school years for English-speaking and Spanish-speaking children (Castilla-Earls & Eriks-Brophy, 2012; Gutiérrez-Clellen & Hofstetter, 1994).

The MATTR (Covington & McFall, 2010) is a measure of lexical diversity and is derived by using a moving window of fixed length (e.g., 10 words, 20 words) to calculate the ratio of unique words to the NTW for each successive window and averaging the estimated ratios for each window. MATTR was selected as a measure of lexical diversity over number of different words (NDW), type–token ratio (TTR), and lexical *D* because MATTR is particularly robust to variations in language sample length for English and Spanish language samples and was endorsed as a stronger indicator of lexical diversity compared to TTR and lexical *D* (Fergadiotis et al., 2013, 2015; Kapantzoglou et al., 2019). In our analyses, we used a 15-word moving window based on the lowest NTW in the entire sample.

The NSS is a measure of children's ability to produce a coherent narrative (Miller et al., 2006). This measure consists of seven categories including four story grammar categories (introduction, character development, conflict/resolution and event/reaction, and conclusion), and three additional elements (use of mental and emotional states, referencing/listener awareness, and cohesion). Each category was scored on a 6-point scale from 0 to 5. SALT uses scores from the seven categories to calculate a total score (maximum score = 35).

The WPM is a measure of verbal productivity calculated by dividing NTW by the duration of the transcript in minutes. This measure has been proposed as an index of language proficiency for second-language learners (Riggenrach, 1991) and was found to be strongly correlated with age and second-language proficiency in EL students (Miller et al., 2006).

We included code-switched words when deriving SI, WPM, and NSS but excluded code-switched words when calculating MATTR. Considering that SI, WPM, and NSS measure gross language constructs beyond vocabulary, removing code-switched words out of their productive context results in measures not representative of the constructs they intend to measure. A previous study found that including or excluding code switching when calculating MATTR produced different values within the same group of samples (Hiebert & Rojas, 2021). In order to avoid inflating MATTR, we excluded code-switched words when calculating MATTR.

Model Enumeration

We used Mplus (Version 8.5) to run all LPAs. All LPA models were estimated using maximum likelihood estimation with robust standard errors ("Estimator = MLR"), which is the default and recommended estimator for LPA (L. K. Muthén & B. O. Muthén, 2017). To avoid invalid parameter estimates resulting from a local solution, which is a common issue in LPAs, previous studies recommend using multiple random sets of starting values (Berlin et al., 2014; Hipp & Bauer, 2006). Thus, all models were estimated with 500 random starts and 20 iterations at the final optimization stage by using the "Starts = 500, 20" command. We followed recommendations from Masyn (2013) and Nylund-Gibson and Choi (2018) for the model enumeration process. We started with a one-profile model and gradually increased the number of profiles estimated, one profile at a time, until the estimated model ceased to be well defined (e.g., models fail to converge, small condition number, small size of the minimal profile).

Additionally, LPA allows flexible specifications of the within-class variance–covariance structure (i.e., mean/variance/covariance could be set to vary across profiles or constrained to be equal across profiles; Masyn, 2013; Vermunt & Magidson, 2002). Four types of within-class variance–covariance structures (Σ_k) are commonly specified from the most to the least restrictive: (a) class-invariant, diagonal (i.e., means allowed to vary across profiles, variance constrained to be equal, and covariance constrained to be zero; referred to as Model A hereafter); (b) class-varying, diagonal (i.e., means allowed to vary, variance allowed to vary, covariance constrained to zero; referred to as Model B); (c) class-invariant, unrestricted (i.e., means allowed to vary, variance and covariance constrained to be equal; referred to as Model C); and (d) class-varying, unrestricted (i.e., means, variance, and covariance all allowed to vary; referred to as Model D). Masyn recommended that one considers all four within-class variance–covariance structures given that the specification of these parameters can influence the formation of the latent profiles. Thus, we conducted four sets of model enumeration sequences (from one profile until K-profile where the model stopped to be well defined), one set for each of the four types of $\Sigma_{k.}$ From here on, we will refer to each estimated model by using the letter that indicates a particular Σ_k specifications followed by the number of profiles specified (e.g., Model A3 = a three-profile model with class-invariant, unrestricted Σ_k).

Model Interpretation and Selection

All models estimated were first compared within each Σ_k, and the four candidate models were then compared to yield the optimal profile solution (Masyn, 2013). Even though LPA provides a variety of model fit statistics, the selection of the optimal solution is less straightforward than one would expect because the combination of all fit statistics rarely converges on one single model (Nylund-Gibson & Choi, 2018; Nylund et al., 2007). Previous work has recommended that one consider a combination of model fit statistics, classification diagnostics, theoretical justification, and model interpretability when selecting the optimal profile solution (Masyn, 2013; B. O. Muthén, 2003; Nylund-Gibson & Choi, 2018).

We examined all estimated models in four steps to select the optimal solution. First, we excluded models that are not well defined. Indicators of a weakly defined model include failure to converge, lack of replication across a set of number of random starts, and small condition number ($< 10^{-6}$). Second, we examined a variety of model relative fit indices and model classification diagnostic indices. For relative fit indices, we considered the sample size–adjusted Bayesian information criterion (SABIC), consistent Akaike's information criterion (CAIC), approximate weight of evidence criterion (AWE), Vuong-Lo–Mendell–Rubin likelihood ratio test (VLMR-LRT; Lo et al., 2001), bootstrap likelihood ratio test (BLRT), and Bayes factor (BF). SABIC, CAIC, and AWE are the three most common information criteria fit indices used in LPA; lower values of SABIC, CAIC, and AWE indicate better fit than higher values (Masyn, 2013). VLMR-LRT and BLRT are relative fit indices that test two nested models (e.g., K profile model compared to K–1 profile model). A significant *p* value indicates that the model with the additional profile significantly improves upon the previous model. BF is another relative fit index that compares fit between two nested models (e.g., K vs. K + 1). A BF value above 10 is considered a strong evidence for model K over model K + 1. Regarding model classification diagnostic indices, we examined entropy, average posterior probabilities (AvePP), and the minimum estimated profile size in each solution. These three indices provide model classification diagnostic information by evaluating the precision of the latent profile assignment for individual by a specified model (Masyn, 2013). Entropy indicates the overall precision of model classification for the whole sample (Ramaswamy et al., 1993). Entropy is a value between 0 and 1: An entropy value near 1 indicates good posterior classification. AvePP is calculated by averaging the posterior probability for every participant assigned. AvePP values above .70 indicates well-separated profiles and adequate latent profile assignment (Nagin, 2005). The minimum profile size is the smallest estimated profile size among all the latent profiles estimated in each model. A small minimum profile size (e.g., < 3% of the whole sample) can be an indicator of data overextraction (Masyn, 2013; Nylund-Gibson & Choi, 2018).

In addition to the relative fit and model classification indices described above, Masyn (2013) recommends using a one-profile LPA model for class-invariant, unrestricted Σ_k specification (i.e., Model C1) as an absolute fit benchmark. This model specification is considered as a "minimum-goodness-of-fit" (Masyn, 2013, p. 593) because it was only informed by the sample means and covariance. In the third step of the model selection process, we prioritized models with a better (larger) log likelihood (LL) value and better (smaller) relative fit indices compared to the benchmark model. Lastly, once the optimal solution was selected based on model fit indices considered in the first three steps, we examined students' performance on all measures in each profile identified by the optimal solution to confirm that the selected model was theoretically and conceptually meaningful (Grimm et al., 2019; B. O. Muthén, 2003).

Results

Preliminary Data Analysis

Prior to LPA, a series of preliminary analysis of raw data was conducted to check for possible multivariate outliers, skewness, kurtosis, and multicollinearity. Mahalanobis distance was calculated for each observation to detect multivariate outliers: Data from 18 participants had a *p* value of less than .001 and were thus excluded from the analysis (*N* included sample = 865, *N* analysis sample = 847). Next, skewness and kurtosis were examined for each of the eight variables: All values were within acceptable levels (all skewness values < .8 and all kurtosis values < 3; Cain et al., 2017; Tabachnick & Fidell, 2012). Intercorrelations among measures were not sufficiently high to warrant concerns regarding multicollinearity (i.e., $\leq$ 0.8). The highest significant correlation was between English WPM and English NSS score (r = .56, p < .001). After these steps, all variables were standardized into z scores to facilitate model convergence. Descriptive statistics of all variables used in the LPA are reported in Table 2.

Additionally, we examined multilevel dependencies within the data set because participants were nested within classrooms and schools. We used intraclass correlation coefficients (ICCs), which calculate the proportion of overall variance explained in one variable explained by a macro unit (Level 2) and indicate the degree to which data from participants within a classroom and a school are nonindependent (Pornprasertmanit et al., 2014). The ICC values for Level 2 (classroom) and Level 3 (school) are respectively .33 and .05, which indicates nonindependence of participants at the classroom level. Thus, in all LPAs, we added two commands "Type = Complex Mixture" and "Cluster = Class" to adjust standard errors of all parameter estimates and fit statistics to account for the nesting structure of participants within classrooms (López & Foster, 2021; L. K. Muthén & B. O. Muthén, 2017).

LPA Results

We started the model enumeration procedure by fitting a one-profile model for each of four within-class variance–covariance specifications. We stopped the model enumeration process at K = 6 profiles for each of four Σ_k specifications because after K = 6, the model for the most restrictive Σ_k with the least number of parameters estimated (i.e., Model A7) ceased to be well identified, indicated by a lack of replication across the set number of random starts. Fit statistics for all models estimated are displayed in Table 3.

In the first step of the model selection and interpretation process, we excluded models that were not well defined. Among the 24 models estimated (Models A1–D6), 20 models were well defined and were further examined (Models A1–A6, B1–B6, C1–C6, D1–D2; see Table 3). In the second step, we examined model fit indices and classification diagnostic indices within each set of Σ_k specifications to select a preferred model for each set. Regarding information criteria indices, we prioritized models where multiple indices converge (e.g., Model A6, B5, C4). Bolded values in Table 3 indicate the value that correspond to the "best" fit index within each set. Regarding relative fit indices, BLRT was not considered because BLRT values for all models preferred the model with more profiles estimated and accordingly did not provide helpful information. We determined that a preferred model needs to significantly improve upon a previous model based on either VLMR-LRT or BF. Entropy was examined but not used for model selection because it is not a sensitive nor specific index for the goodness of fit: Latent profile assignment error can happen in models with entropy values close to 1, and entropy values can also be low in models with good fit (Masyn, 2013; Nylund-Gibson & Choi, 2018). AvePP values for all models estimated were above .70 (Nagin, 2005; Nylund-Gibson & Choi, 2018). Lastly, we determined that a preferred model required a minimum profile size of 3% of the total sample. Based on all available model fit indices, a preferred model was selected for each set, yielding four candidate models: Models A6, B5, C4, and D2. In the third step, these four models were compared against each other and against the benchmark

Table 2. Correlations and descriptive statistics of variables used.

Variables	Eng SI	Eng MATTR	Eng NSS	Eng WPM	Sp SI	Sp MATTR	Sp NSS	Sp WPM
Eng SI								
Eng MATTR	.57***							
Eng NSS	.54***	.52***						
Eng WPM	.50***	.52***	.55***					
Sp SI	.35***	.25***	.25***	.28***				
Sp MATTR	.20***	.28***	.16***	.13***	.45***			
Sp NSS	.19***	.17***	.27***	.15***	.36***	.34***		
Sp WPM	.20***	.15***	.18**	.42***	.42***	.34***	.38***	
M	1.09	0.79	19	81.61	1.19	0.84	20.96	78.72
SD	0.12	0.05	5.2	27.47	0.11	0.03	4.16	23.79
Max	1.52	0.91	35	161.96	1.56	0.92	35.00	149.49
Min	0.55	0.56	0	19.02	1.00	0.70	6.00	10.71

Note. Eng = English; SI = subordination index; MATTR = moving average type–token ratio; NSS = narrative structure scheme; WPM = words per minute; Sp = Spanish.

**p < .01. ***p < .001.

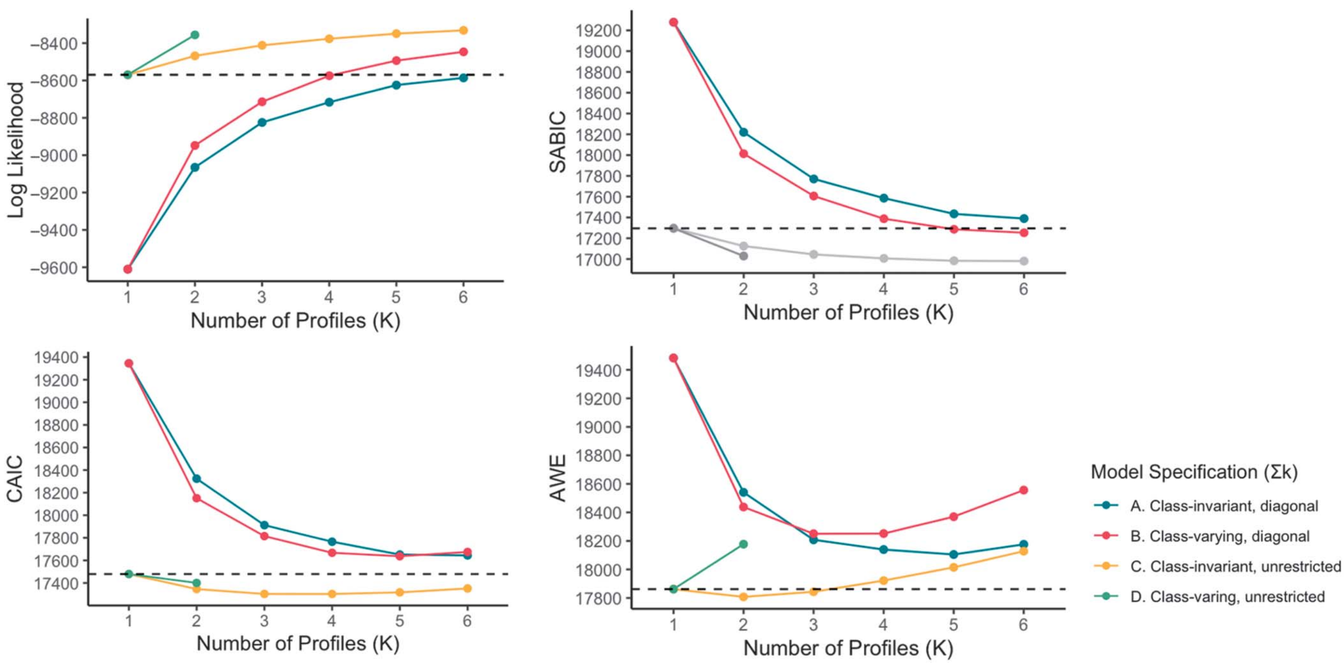
Table 3. Model fit and classification diagnostic indices for all latent profile analysis model estimated.

Σ_k	No. of profiles	LL	Information criteria indices: SABIC	CAIC	AWE	Relative fit indices: VLMR-LRT	BLRT	BF	Overall precision of classification: Entropy	AvePP (%)	Min profile size (%)
Class-invariant, diagonal (Model A)	1	−9610.73	19278.51	19345.32	19483.18	-	-	1.63E-22	1	100.00	847 (100)
	2	−9065.10	18219.35	18323.74	18540.79	**.002****	**< .001*****	5.33E-92	.75	92.24	370 (44)
	3	−8824.60	17770.44	17912.41	18208.01	**< .001*****	**< .001*****	1.37E-34	.81	91.35	79 (9)
	4	−8716.29	17585.91	17765.47	18139.73	**.008****	**< .001*****	2.39E-27	.82	89.69	57 (7)
	5	−8624.65	17434.74	17651.87	**18104.83**	.006**	**< .001*****	1.08E-03	**.81**	87.23	60 (7)
	6	−8585.98	**17389.48**	**17644.20**	18175.93	.24	**< .001*****		.75	82.33	57 (7)
Class-varying, diagonal (Model B)	1	−9610.73	19278.51	19345.32	19483.18	-	-	9.42E-26	1	100.00	847 (100)
	2	−8947.78	18013.24	18151.04	18437.99	**< .001*****	**< .001*****	2.29E-77	.77	93.00	381 (45)
	3	−8714.01	17606.31	17815.10	**18250.64**	**.01***	**< .001*****	1.90E-36	.77	74.39	139 (16)
	4	−8574.46	17387.83	17667.60	18251.75	.04*	**< .001*****	4.97E-11	.77	86.82	106 (13)
	5	**−8493.43**	17286.39	**17637.15**	18369.91	.23	**< .001*****	**3.20E+04**	**.78**	85	70 (9)
	6	**−8446.49**	**17253.15**	17674.90	18556.33	.37	**< .001*****		.74	81.58	83 (10)
Class-invariant, unrestricted (Model C)	1	−8569.39	17295.69	17479.42	17862.05	-	-	1.38E-31	1	100.00	847 (100)
	2	**−8468.00**	17124.99	17346.30	**17807.73**	**< .001*****	**< .001*****	5.40E-12	**.94**	98.00	58 (7)
	3	**−8411.71**	17044.51	17303.41	17843.57	**.03***	**< .001*****	8.78E-03	.91	96.39	48 (6)
	4	**−8376.64**	**17006.46**	**17302.94**	17921.93	**.03***	**< .001*****	**14.22**	.83	90.93	46 (5)
	5	**−8348.96**	16983.20	17317.25	18014.89	.43	**< .001*****	**344551.90**	.85	90.59	23 (3)
	6	**−8331.37**	16980.11	17351.75	18128.07	.79	**< .001*****		.85	89.53	22 (3)
Class-varying, unrestricted (Model D)	1	−8569.39	17295.69	17479.42	**17862.05**	-	-	1.45E-27	1	100	847 (100)
	2	**−8355.90**	**17029.18**	**17400.82**	18177.41	**< .001*****	**< .001*****		**.71**	92.04	169 (20)
	3	Not well-defined: model failed to converge, failed to replicate across random starts, small condition number = 0.10E-04									
	4	Not well-defined: model failed to converge, failed to replicate across random starts, small condition number = 0.13E-04									
	5	Not well-defined: model failed to converge, failed to replicate across random starts, small condition number = 0.10E-09									
	6	Not well-defined: model failed to converge, failed to replicate across random starts, small condition number = 0.10E-09									

Note. Bold values represent the values that correspond to the best or preferred fit index within each Σ_k. For example, for LL, models with a LL value larger than the value associated with the benchmark model were bolded; for BIC, CAIC, and AWE, models with the smallest value among each set were bolded. Bolded boxes correspond to the best fit index within all estimated models. Dashed box highlights the minimum-goodness-of-fit benchmark model. LL = log likelihood value; SABIC = sample-adjusted Bayesian information criterion; CAIC = consistent Akaike's information criterion; AWE = approximate weight of evidence criterion; VLMR-LRT = Vuong-Lo–Mendell–Rubin likelihood ratio test; BLRT = bootstrap likelihood ratio test; BF = Bayes factor; AvePP = average posterior probabilities.

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Figure 1. Log likelihood (LL) and information criteria indices (SABIC, CAIC, and AWE) values for all estimated latent profile analysis models. Dashed lines correspond to the index value of the minimum-goodness-of-fit benchmark model (Model C1: one-profile model with class-invariant, unrestricted Σ_k). SABIC = sample size–adjusted Bayesian information criterion; CAIC = consistent Akaike's information criterion; AWE = approximate weight of evidence criterion.



model, Model C1, which is the one-profile model for the class-invariant, unrestricted Σ_k specification. Figure 1 displays four panels displaying LL, SABIC, CAIC, and AWE values for all estimated models. The dashed lines correspond to the index value of the benchmark model. All information criteria indices favored Model C4, with the lowest SABIC and CAIC values among all estimated models. Though the AWE value for the Model C5 was not the lowest among all estimated models, it was the lowest among the four candidate models. Thus, we selected Model C4 as the final optimal solution.

Profile Characteristics

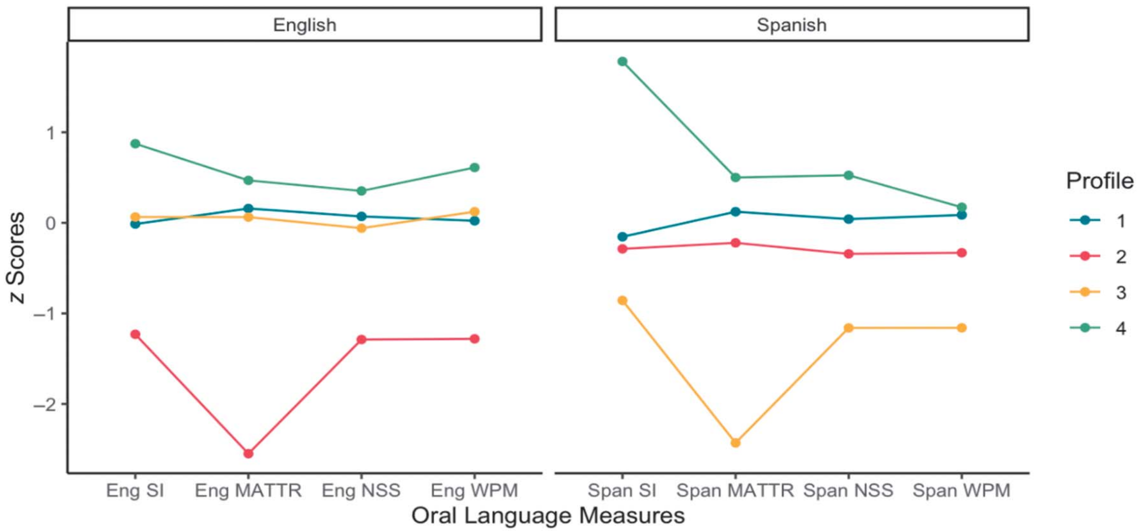
The optimal solution, Model C4, represents a four-profile solution. Means and standard deviations of the English and Spanish oral language measures for each identified latent profile are displayed in Table 4 (raw values

Table 4. Mean and standard deviation for English and Spanish oral language raw scores for Latent Profiles 1–4 identified in the final latent profile analysis solution (Model C4).

Measures	Profile 1 *N* = 655, 77.33% *M* (*SD*)	Profile 2 *N* = 58, 6.85% *M* (*SD*)	Profile 3 *N* = 46, 5.43% *M* (*SD*)	Profile 4 *N* = 52, 6.18% *M* (*SD*)
English measures				
Eng SI	1.09 (0.11)	0.11 (0.95)	1.1 (0.11)	1.2 (0.1)
Eng MATTR	0.8 (0.04)	0.04 (0.66)	0.8 (0.04)	0.82 (0.03)
Eng NSS	19.37 (4.94)	4.94 (12.29)	18.7 (5.13)	20.84 (4.61)
Eng WPM	82.23 (26.12)	26.12 (46.42)	85 (21.74)	98.4 (25.38)
Spanish measures				
Span SI	1.18 (0.08)	1.16 (0.09)	1.1 (0.07)	1.38 (0.07)
Span MATTR	0.84 (0.03)	0.83 (0.03)	0.76 (0.02)	0.86 (0.02)
Span NSS	21.13 (3.87)	19.53 (3.74)	16.13 (4.41)	23.15 (4.25)
Span WPM	80.81 (23.39)	70.86 (19.68)	51.15 (16.06)	82.82 (22.51)

Note. Profile 1 = balanced-average; Profile 2 = Spanish-dominant; Profile 3 = English-dominant; Profile 4 = balanced-high; SI = subordination index; MATTR = moving-average type–token ratio; NSS = narrative structure scheme; WPM = words per minute.

Figure 2. Students' performance on English and Spanish oral language measures as a function of latent profile. Profile 1 = balanced-average; Profile 2 = Spanish-dominant; Profile 3 = English-dominant; Profile 4 = balanced-high. Eng = English; SI = subordination index; MATTR = moving-average type–token ratio; NSS = narrative structure scheme; WPM = words per minute.



are reported to facilitate interpretation). Figure 2 displays students' performance on all measures in English and Spanish for each profile using *z* scores for comparability. Figure 3 represents an alternative view of students' performance, allowing a comparison of dual language proficiency within and across each of the four profiles. It is important to note that students' performance on each measure are relative to the sample (Spanish-speaking ELs). Figure 4 displays grade distribution in each of the four latent profiles identified. Each profile was termed based on the

Figure 3. Comparison of students' performance on English (blue) and Spanish (red) as a function of latent profile. Profile 1 = balanced -average; Profile 2 = Spanish-dominant; Profile 3 = English-dominant; Profile 4 = balanced-high. Eng = English; SI = subordination index; MATTR = moving-average type–token ratio; NSS = narrative structure scheme; WPM = words per minute.

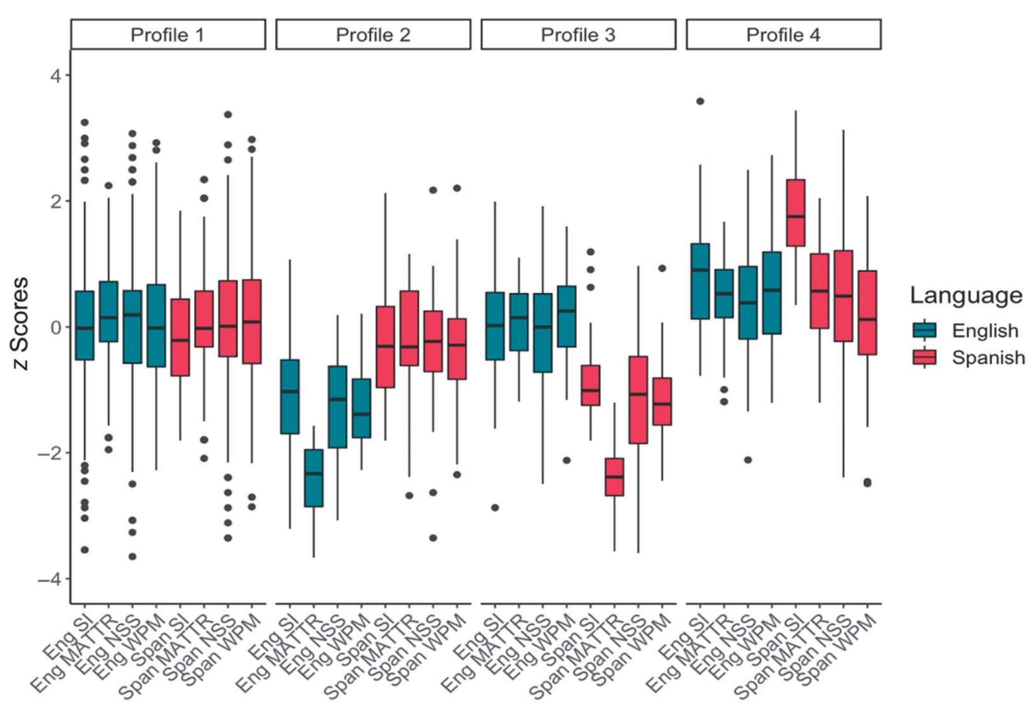
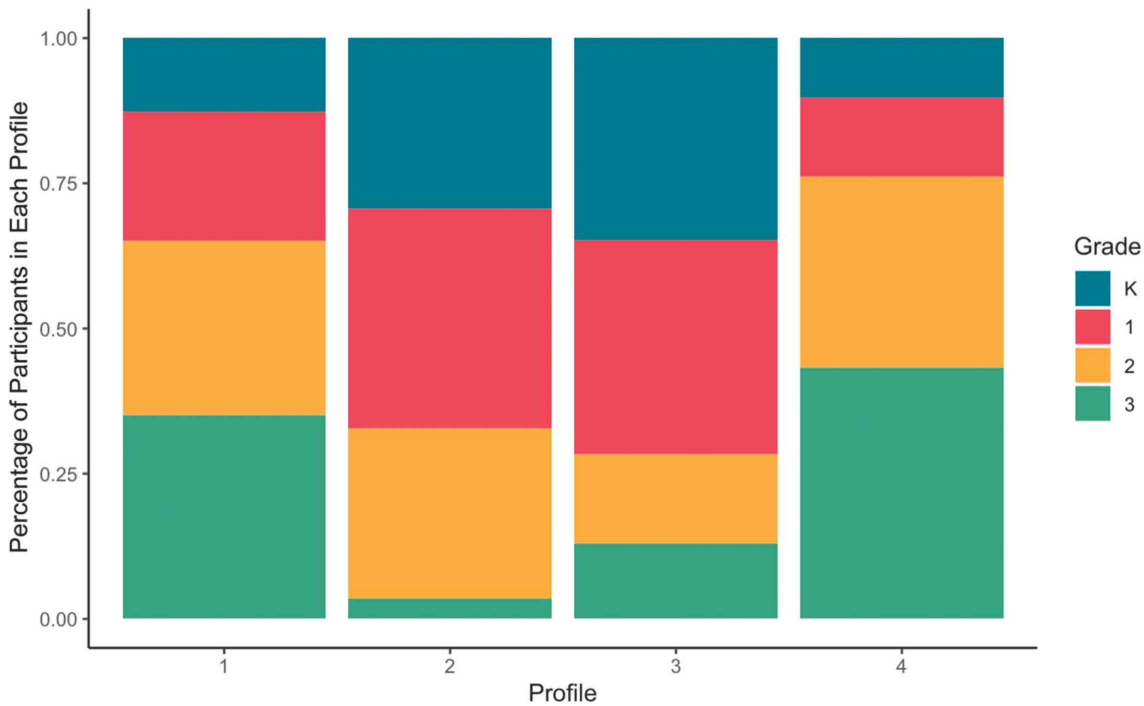


Figure 4. Grade distribution (K–3) as a function of latent profile. Profile 1 = balanced-average; Profile 2 = Spanish-dominant; Profile 3 = English-dominant; Profile 4 = balanced-high.



relative proficiency across English and Spanish, English level, and Spanish level.

Profile 1: Balanced-Average (Average Spanish and English)

Profile 1 was the largest profile in size and included 655 children (77.33% of the sample). There were 83 children in Grade K, 146 in Grade 1, 196 in Grade 1, and 230 in Grade 3. Children with this profile showed similar average levels of English and Spanish performance. *z* scores for Spanish measures ranged from −0.15 to 0.12, and for English measures, they ranged from −0.01 to 0.16.

Profile 2: Spanish-Dominant (Average Spanish, Low English)

Profile 2 includes 58 children (6.85%). This group consists of 17 children from Grade K, 22 from Grade 1, 17 from Grade 2, and two from Grade 3. Children with this language profile displayed average Spanish performance and low English performance. *z* scores for Spanish language measures ranged from −0.34 to −0.22. *z* scores for three English measures were more than 1 *SD* below the sample mean: −1.23 for SI, −1.29 for NSS, and −1.28 for WPM. This group of children also demonstrated a particular relative weakness in English vocabulary: The *z* score for English MATTR was −2.55.

Profile 3: English-Dominant (Low Spanish, Average English)

Profile 3 includes 46 children (5.43%) with 16 from Grade K, 17 from Grade 1, seven from Grade 2, and six from Grade 3. Children in this profile demonstrated the opposite pattern from children in Profile 2. They performed at average levels for English (*z* scores ranged from −0.06 to 0.12) but at low levels for Spanish, showing an English-dominant profile. The relative vocabulary weakness of the weaker language evidenced in Profile 2 was also observed in this profile: Though *z* scores for Spanish SI, NSS, and WPM were, respectively, −0.86, −1.16, and −1.16, the *z* score for Spanish MATTR was −2.43.

Profile 4: Balanced-High (High Spanish, High English)

The last profile includes 88 children (10.39%) and includes nine children from Grade K, 12 from Grade 1, 29 from Grade 2, and 38 from Grade 3. Children in this profile showed high levels of performance in both Spanish and English. Relative to other children in this sample, children in this profile demonstrated the highest scores in all eight measures. *z* scores for English measures ranged from .35 to .87. *z* scores for Spanish measures ranged from 0.17 to 1.78, with a particular strength in Spanish syntax.

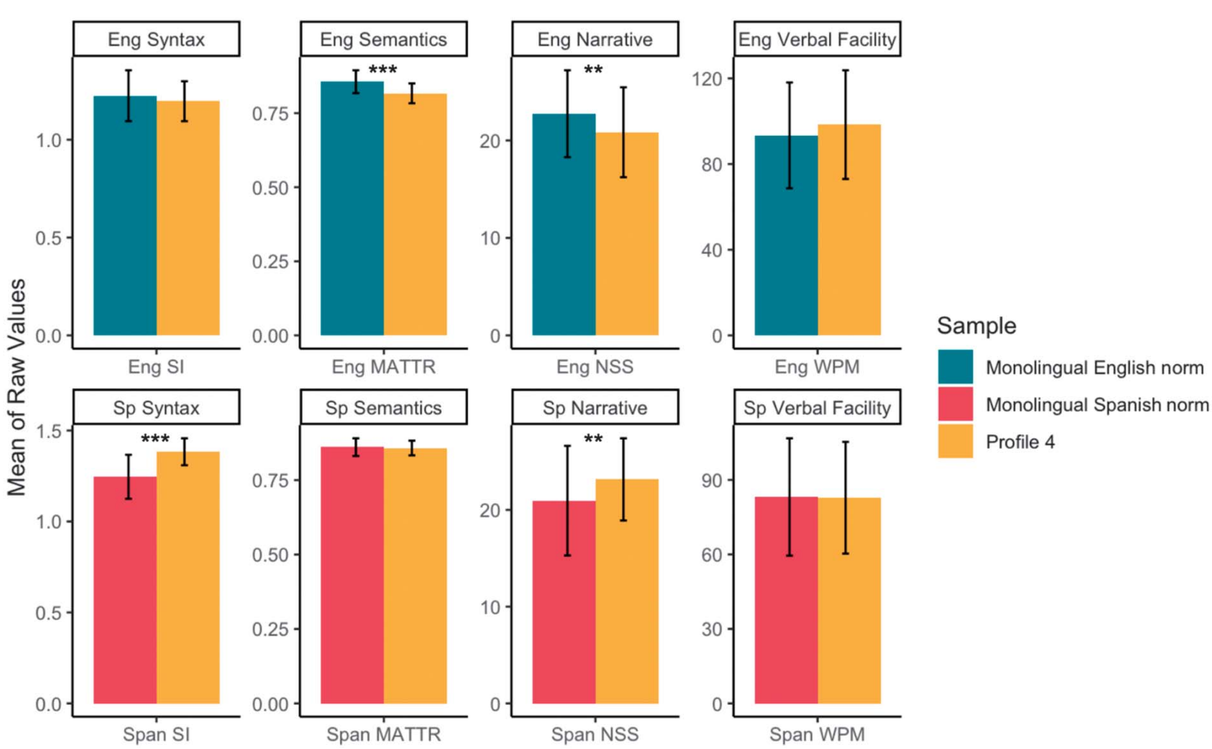
Post Hoc Exploratory Analysis Comparing Profile 4 (Balanced-High) With Monolingual Samples

Children in Profile 4 evidenced the highest levels of both English and Spanish language ability in general *relative to* other ELs in the whole sample. By current federal definition, an EL is a student with "limited English proficiency," which is further defined as a student whose difficulty in using English "may be sufficient to deny the individual the ability to successfully achieve in classrooms where the language of instruction is English" (Linquanti et al., 2016, p. 10). To gain insights into the English and Spanish proficiency of ELs in Profile 4 in comparison to a broader population than the current sample, we conducted post hoc exploratory analyses to respectively compare their language ability with monolingual English-speaking peers and monolingual Spanish-speaking peers. SALT Research Version 2020 features several large normative reference databases and allows users to build a specific comparison database based on language sample context (play, story retell, expository, persuasion, etc.), age, and/or grade criteria (Miller & Iglesias, 2019; see https://www.saltsoftware.com/resources/databases for detailed information of the normative databases available). Samples in the user-built comparison database can also be matched to a given set of language samples on length measured by NTW, the number of utterances, or the amount of elapsed time.

For our purposes, we selected language samples from the monolingual English Narrative Story Retell database and the Monolingual Spanish Story Retell database to build two matched reference data sets, a monolingual English and a monolingual Spanish data set. The Narrative Story Retell database contains transcripts of elicited story retells from 529 typically developing monolingual English-speaking children from preschool to sixth grade located in Wisconsin and California (Miller et al., 2015). The Monolingual Spanish Story Retell contains elicited story retell narratives from 1,068 monolingual Spanish-speaking children from first to third grade residing in Guadalajara, Mexico (Miller et al., 2015; Goldenberg, NIH NICHD R01HD44923). Each student in Profile 4 (balanced-high) was individually matched to a sample from the monolingual English reference data set and a sample from the monolingual Spanish reference data set by sex, grade, and language sample length based on the number of complete and intelligible utterances.

Means and standard deviations of Spanish and English oral language measures for Profile 4 (balanced-high), matched monolingual English samples, and matched monolingual Spanish samples are depicted in Figure 5.

Figure 5. Mean comparison of English and Spanish oral language abilities between children in Profile 4 and sex-, grade-, length-matched samples from SALT monolingual English-speaking norm and monolingual Spanish-speaking norm. Profile 4 = balanced-high. Eng = English; SI = subordination index; MATTR = moving-average type–token ratio; NSS = narrative structure scheme; WPM = words per minute. ** $p < .01$. *** $p < .001$.



Compared to the monolingual English sample, children in Profile 4 achieved comparable levels of English syntax ($M_{Profile4}$ = 1.2, M_{Norm} = 1.22, p = .11) and English verbal productivity ($M_{Profile4}$ = 98.4, M_{Norm} = 93, p = .19) but scored significantly lower on English MATTR ($M_{Profile4}$ = 0.82, M_{Norm} = 0.86, p < .001) and English NSS ($M_{Profile4}$ = 20.84, M_{Norm} = 22.74, p = .006). In terms of Spanish measures, children in Profile 4 performed similarly or better on all Spanish measures compared to the monolingual Spanish normative sample: MATTR ($M_{Profile4}$ = 0.86, M_{Norm} = 0.86, p = .47), WPM ($M_{Profile4}$ = 82.82, M_{Norm} = 83.11, p = .93), with significant differences observed in SI ($M_{Profile4}$ = 1.38, M_{Norm} = 1.25, p < .001) and NSS ($M_{Profile4}$ = 23.15, M_{Norm} = 20.95, p = .004), both favoring children in Profile 4.

Discussion

Summary of Latent Dual Language Profiles

The goal of this study was to identify and describe dual language profiles in English and Spanish oral language skills in a large-scale sample of Spanish-speaking children designated as ELs by their school district. Findings from this study revealed four dual language profiles, including one Spanish-dominant profile (Profile 2 average Spanish, low English), one English-dominant profile (Profile 3 low Spanish, average English), and two balanced profiles (Profile 1 balanced-average; Profile 4 balanced-high). These four dual language profiles confirmed our hypothesis on the types of language profiles that would emerge and are largely consistent with prior studies that examined language-related profiles in Spanish–English bilingual children. In the past 5 years, a small body of literature has emerged to understand the linguistic diversity in Spanish–English bilingual children (Gonzalez et al., 2016; Grimm et al., 2019; Halpin et al., 2021; Kapantzoglou et al., 2015; Lonigan et al., 2018; López & Foster, 2021). These studies have shown that Spanish–English bilingual children display distinct profiles in Spanish oral language and nonverbal cognitive abilities (Kapantzoglou et al., 2015), emergent literacy skills (Gonzalez et al., 2016; Lonigan et al., 2018), Spanish and English reading skills (Grimm et al., 2019), phonology and morphosyntactic skills (Halpin et al., 2021), and academic achievement skills (López & Foster, 2021). The types of dual language profile patterns that this study identified converged with previous studies. López and Foster (2021) found one English-dominant, one Spanish-dominant, and two balanced profiles in the academic achievement of Spanish–English bilingual children enrolled in Head Start programs. In a younger sample of Spanish–English bilingual preschoolers from Head Start programs, Lonigan et al. (2018) identified two English-dominant profiles, three balanced bilingual profiles, and four Spanish-dominant profiles.

Given that most of the previous studies used different indicator measures across domains, we specifically compared our findings with two previous studies that focused exclusively on oral language measures (Halpin et al., 2021; Kapantzoglou et al., 2015). Of the two studies, Halpin et al. (2021) was the only study that examined oral language measures in both English and Spanish. Despite methodological differences—Halpin et al. (2021) used measures from a standardized norm-referenced test (BESA; Peña et al., 2014) and this current study used narrative language sample analyses—both studies revealed two balanced profiles and two uneven profiles with an English-dominant profile and a Spanish-dominant profile, providing convergent evidence supporting the dual language profiles emerged from this study. However, we noted one difference in results between this current study and both Halpin et al. (2021) and Kapantzoglou et al. (2015). Participants in Halpin et al. (2021) displayed the weakest scores in the morphosyntax domain across profiles, yet a similar pattern of a uniform low performance in syntax across profiles was not observed in this study. On the other hand, Kapantzoglou et al. (2015) discovered one small low Spanish grammaticality group with particularly low grammaticality ability and average performance in other measures such as lexical diversity, utterance length, and nonword repetition. These discrepancies across studies in participants' syntax performance may be attributed to the differences in aspects of syntax measured (i.e., morphosyntax in the work of Halpin et al., 2021, grammaticality in the work of Kapantzoglou et al., 2015, and syntactic complexity in this study), tasks used to measure syntax (i.e., standardized assessment vs. language sample analysis), and the chronological age of the sample (preschoolers vs. school-age children). Specifically, Halpin et al. (2021) focused on morphosyntax measured by the morphosyntax subtests from BESA (Peña et al., 2014), which use cloze items as well as sentence repetition to assess specific morphosyntactic structures in English (e.g., regular past tense, negatives) and Spanish (e.g., articles, direct object clitics) selected to differentiate typical language development and language impairment. Kapantzoglou et al. (2015) focused on grammaticality as measured by the number of grammatical errors per terminal unit based on narrative retell samples. This current study focused on syntactic complexity as measured by SI based on narrative retell samples. Additionally, Halpin et al. (2021) involved participants between 3 and 5 years while Kapantzoglou et al. (2015) and this study included young school-age participants. It is reasonable to expect developmental differences in bilingual children's syntactic skills between preschool years and school years even using the same measurement tool, and such differences may be magnified when different aspects of syntax are measured using different measurement tools.

A Unique Focus on ELs

The sample in this study is particularly unique that they constitute a subset of Spanish–English bilingual children that are designated as ELs by their school district. ELs are often considered and treated to be linguistically homogenous as ELs contrast with English-proficient students by definition (National Research Council, 2011). However, findings from this study demonstrated substantial variations in English and Spanish abilities in the current sample of ELs. Even though participants in this study are designated as students with limited English proficiency by definition, participants in the overall best profile (i.e., Profile 4, balanced-high) achieved English performance on par with monolingual English-speaking peers in syntax measured by SI and in verbal productivity measured by WPM. In stark contrast, children in the Spanish-dominant profile (i.e., Profile 2) scored more than 1 *SD* lower than the sample average in English across all measures. Similarly for Spanish, children in Profile 4 scored higher than monolingual Spanish-speaking peers in three out of four measures (SI, MATTR, and NSS), whereas children in the English-dominant profile (i.e., Profile 3) scored more than 1 *SD* lower than the sample average in three out of four measures (MATTR, NSS, and WPM). The observed variability in both languages is concerning because all children in this study were placed into similar transitional bilingual educational programs. In these programs, children initially received academic instruction in Spanish and were transitioned to all English instruction after third grade. Our findings suggest that placing ELs with significantly different profiles into the same kind of transitional program may not be appropriate given that the same model of instruction (i.e., Spanish first and English later) likely will not meet the specific needs of individual students with drastically varied Spanish and English proficiency.

In addition, the presence of an English-dominant profile in our sample of ELs (i.e., Profile 3) cautions against making a priori assumptions regarding the home language proficiency and language dominance pattern in ELs. In most states, the EL identification procedure involves a home language survey that collects information on the language parents and the student use at home and an English language proficiency assessment if a student is considered a linguistic minority based on the survey (Tanenbaum et al., 2012) without testing students' proficiency in home language use. Three states (Connecticut, Rhode Island, and Texas) encourage school districts to assess home language proficiency as part of their EL identification and program placement procedure. Only one state (Nevada) requires districts to test the proficiency in home language in ELs who are placed in dual language program within 60 days of student enrollment (Boyle et al., 2015; Nevada Administrative Code § 388.630, 2018). Despite a growing consensus in the literature that bilingual children should be assessed in both of their languages (Hoff & Core, 2015), this recommendation is not yet reflected in state-level policies. Assessing the home language as well as English before placing ELs in educational programs is crucial for two reasons. First, a comprehensive understanding of language abilities ensures the congruence between students' language knowledge and the use of instructional language. For example, providing academic instruction in only Spanish for a student in Profile 3 who possesses average English but low Spanish ability will not necessarily enhance their access to academic content. Second, assessing both languages is the best way to accurately identify Spanish-English–speaking children who present with true language disorders. For instance, children in Profile 2 (Spanish-dominant) who possess low English skills but adequate Spanish skills may be at risk of being misidentified as having a language disorder if Spanish language skills are not considered during assessment.

Uneven Performance Across Languages and Domains

In addition to the large variability in both languages and distinct dual language profiles identified, children in three profiles displayed uneven performance across language domains and distinct patterns of unique strength or weakness in a specific domain in one of their two languages. Children in Profile 4 (balanced-high) demonstrated a unique strength in Spanish syntax compared to other measures in Spanish and English. Children in Profile 2 (Spanish-dominant) and Profile 3 (English-dominant) demonstrated a mirrored pattern with a relative weakness in vocabulary in the relatively weaker language.

The finding that some children show unique strength or weakness in one domain within one language but not in the other is not that surprising. Previous work that investigated the relations among measures of the same domain across languages in bilingual children has found similar conclusions. Using measures derived from narrative language samples from Spanish–English bilingual kindergarteners, Bedore et al. (2010) found cross-language correlations in syntax (Spanish and English MLU in words were significantly correlated) but not in lexical diversity (Spanish and English NDW did not correlate). Pace et al. (2021) reported a similar pattern where cross-language associations were discovered for syntax but not for vocabulary. This pattern of relative weakness in vocabulary in one language also resonates with a notion from Parra et al. (2011) that vocabulary is relatively language specific because the mapping between a word label and its meaning is unique to each language. Although the interdependence between bilingual children's two languages is not the focus of this article, the distinct strength/weakness patterns we observed suggest that strength or weakness in one domain in one language does not directly translate to strength in the same domain in the other language. This finding also emphasizes the importance of assessing multiple domains to paint a representative picture of a bilingual child's language abilities.

Grade-Based Distribution Across Four Dual Language Profiles

As illustrated in Figure 4, each language profile included children from kindergarten to third grade. For example, there were some third graders with a Spanish-dominant profile and some kindergartners with an English-dominant profile. This finding suggests that the variability across observed Spanish and English skills is not solely due to participants' age or years in school. Though this study is limited by a lack of information on the history of participants' language exposure and current language use in their households, it would be interesting for future studies to collect current and past language use data to better understand factors that contribute to different language profiles.

Additionally, an interesting pattern that emerged is that the two balanced profiles (Profile 1, balanced-average and Profile 4, balanced-high) include predominantly children in Grade 3: 35% of children in Profile 1 (N = 230) and 43% (N = 78) of children in Profile 4 are in Grade 3, whereas 13% (N = 83) of Profile 1 and 10% (N = 9) of Profile 4 are kindergartners. The two uneven profiles (Profile 2, Spanish-dominant and Profile 3, English-dominant) demonstrated the inverse grade-based pattern. Specifically, small proportions of third graders were found in the two uneven profiles, 3% in Profile 2 (N = 2) and 13% in Profile 3 (N = 6). The proportional difference in kindergartners and third graders across the four profiles suggests that Spanish-speaking ELs seem to be moving from uneven skills across Spanish and English toward balanced skills across two languages as they get older. This remains a speculation given that the current study used a cross-sectional data set. We are currently beginning to replicate findings from this study using a longitudinal data set that followed a group of Spanish-speaking ELs from kindergarten to second grade. If a similar pattern is replicated, such findings would suggest that the transitional bilingual education programs that children in this sample are enrolled in were on the right track to support balanced, dual language development.

Practical Implications

The findings from this study provide implications for both policy and practice. At the policy level, our findings suggest that school districts should consider assessing students' linguistic skills in both languages prior to placement in any particular educational program. Focusing solely on their English skills might not capture their linguistic strengths. The dual language profiles from this study may be used to guide the educational program selection procedure to improve the congruence among students' linguistic needs, teachers' use of instructional language, and the goals of the educational program.

At the practice level, our findings suggest that a teacher in a transitional bilingual program may encounter a mixed group of bilingual children with drastically different linguistic abilities across domains and languages. Although alternative programs or classrooms might not be available in all school districts, the language profiles emerged from this study could provide teachers and other professionals (e.g., speech-language pathologists and special educators) guidance as to the best instructional approach to address the linguistic needs of their students. For example, educators who work with bilingual children with different language profiles may intentionally use linguistically responsive teaching strategies, such as learning about students' linguistic backgrounds, identifying content-specific language demands, and providing comprehensible instructional input based on student's language profiles (Krashen, 2003; Solano-Campos et al., 2020). School-based teams may also collaborate to monitor the progress made by students with different profiles in oral language in one or both languages across different educational contexts across the school year to inform instruction.

Limitations and Future Directions

Findings from this study should be interpreted in light of the following limitations. Of the 1,532 children tested as part of the larger project, 595 children were excluded because either the English or the Spanish sample was missing. There are various reasons why these samples could be missing: The child was absent during the test date, the child refused to do the task, or the child did not have the linguistic skills to do the task. The number of participants eliminated from the original pool varied by grades, with the largest number of children excluded being kindergartners and first graders: 158 kindergartners and 112 first graders were excluded because of missing English samples. We are cognizant that eliminating close to one third of the original pool, especially younger children who were disproportionately missing English samples, could introduce sampling bias and limit the external validity of our findings. Because of these missing data, we want to emphasize that the language profiles identified in this study were based on a truncated sample of ELs and may not generalize to represent EL students who function essentially as monolingual Spanish speakers with negligible English skills. Likewise, a group of children with low language skills in both Spanish and English was also not represented in this sample. It is critical that future studies examine language abilities, profiles, and longitudinal development in children with low language skills in both languages. For example, future studies that include bilingual children with a broader range of language proficiency may include a measure of grammaticality to verify the dual language profiles emerged from this study and to identify additional dual language profiles.

Given that this study used a cross-sectional data set, future studies should examine longitudinal language profiles in Spanish-speaking EL students to (a) investigate the stability of the distinct language profiles identified in this study over time; (b) examine the potential shifting of children from one language profile to another profile; (c) identify new profiles that may longitudinally emerge that would not be captured by this data set; and (d) understand long-term academic outcomes, such as literacy, of the students in different profiles.

Lastly, all participants in this study were enrolled in transitional bilingual programs where the instructional language gradually shifted from Spanish to English through third grade. A recent study has shown that Spanish–English bilingual children in English immersion programs demonstrated loss of Spanish syntactic and vocabulary skills (Hiebert & Rojas, 2021). Such findings suggest that Spanish–English bilingual students in transitional bilingual programs and English-focused programs may show different growth trajectories in Spanish and English across grades and thus may display different dual language profiles. Future studies that examine dual language profiles in students in English-focused programs would help us gain a clearer picture on the extent to which the educational program impacts dual language profiles in Spanish–English bilingual students. Related, another area of future research is to examine gains in oral language in one or both languages in students with different language profiles in transitional bilingual programs versus English-focused programs to facilitate program assignment and optimize instruction for different students.

Conclusions

In summary, this study extends the current bilingual literature by demonstrating large variability in both Spanish and English oral language skills in a Spanish-speaking ELs, a subgroup of bilingual children often considered and treated as homogenous. Four distinct latent dual language profiles emerged, including an English-dominant group. Children in different dual language profiles also displayed distinct patterns of unique strength or weakness in specific language domains. Future work could test the replicability of the dual language profiles discovered in this study in a different subgroup of bilingual children (e.g., bilingual children designated as English-proficient students), extend these findings in additional educational contexts (e.g., ELs in a different educational program), and examined the stability of dual language profiles across grades. Refinements of the empirically based dual language profiles may facilitate the educational program placement procedure for bilingual children to precisely identify educational programs best suited for children's linguistic needs. For researchers, the dual language profiles emerged may also be used to guide participant selection process to create better defined samples of bilingual children.

Data Availability Statement (DAS)

The data sets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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