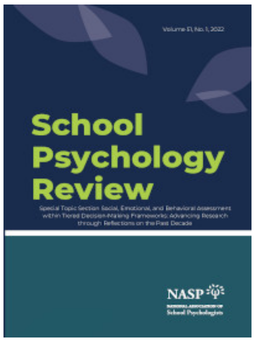

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Longitudinal Predictors of Bilingual Language Proficiency, Decoding, and Oral Reading Fluency on Reading Comprehension in Spanish and in English

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ABSTRACT
This study examined the longitudinal prediction of decoding, oral reading fluency (ORF), and bilingual language proficiency (BLP) on student reading comprehension (RC) outcomes in Spanish and in English. Participants were first-grade Latinx students attending bilingual programs. Findings indicated that BLP initial status and gains were significant predictors of Spanish and English RC at the end of second grade. English and Spanish decoding in first grade, in addition to BLP, explained 27 percent of the variance in English reading comprehension. However, only Spanish decoding was a significant predictor of Spanish reading comprehension. Once English and Spanish second grade ORF scores were added to the model, decoding no longer explained any of the variance in RC. BLP, English ORF initial status and gains, and Spanish gains explained 47 percent of the variance in English reading comprehension. BLP and Spanish ORF initial status explained 46 percent of the variance in Spanish RC.

IMPACT STATEMENT
The findings from this study provide school psychologists and teachers relevant information on the importance of measuring bilingual student decoding and oral reading fluency in Spanish and in English as well as bilingual language proficiency to ensure students are comprehending what they read in both languages. There are differences between the predictive utility of these variables on Spanish and English reading comprehension that should be considered when making instructional decisions for bilingual students. For researchers, more measures are needed that can assess student bilingual language proficiency briefly, efficiently, and reliably, as well as additional studies examining how bilingualism can benefit and enrich bilingual student reading comprehension.

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Learning to read in two languages requires the reader to navigate two different spaces, two different reading scripts, and different brain activations (Bialystok et al., 2009; Kroll et al., 2006). As many years of research have indicated, the mind of a bilingual or a multilingual child works differently than that of a monolingual child. Thus, knowing and using two languages can affect the phase in which children learn to read in each language differently (Lado, 1964), but it can also connect the two languages in a way where one supports the other (Cummins, 1979). Therefore, when studying how bilinguals acquire reading comprehension, it is necessary to consider (a) the relation between language and reading processes within each language and across languages; and (b) how the two target languages, alone and in combination, affect student reading and understanding. The purpose of this study is to examine the longitudinal predictions of bilingual language proficiency, decoding, and oral reading fluency (ORF) on English and in Spanish reading comprehension outcomes for Latinx bilingual children from the beginning of first grade to the end of second grade.

In this study, the term *Latinx bilingual students* refers to students whose native language is Spanish and who are attending a bilingual program where reading is taught in Spanish and in English at different times of the day. All Latinx bilingual children who spoke Spanish at home were eligible to participate independently of how they were learning English. Although it is possible that some of the students in the study also spoke a native indigenous language at home such as Quiché (i.e., an indigenous language spoken in Guatemala), we did not take languages other than Spanish and English into account given that our purpose was to better understand the relation between Spanish and English language proficiency and literacy.

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Theoretical Framework

The present study is anchored in Gough and Tunmer (1986) simple view of reading (SVR), and Cummins' (1979) interdependence hypothesis. We also draw from Perfetti's (1999) components of reading to explain the relation between grapheme-phoneme correspondence, and from Kintsch's (1998) comprehension model that includes a text-base, and a situational model for inference-making. The SVR describes the processes by which early readers become proficient readers (Gough & Tunmer, 1986). In the SVR, reading is the result of the multiplication of decoding and linguistic comprehension. A child with strong decoding skills but weak linguistic comprehension might demonstrate difficulties with reading comprehension. In turn, a child with strong linguistic comprehension but weak decoding skills may also struggle with reading comprehension because both skills are necessary to build comprehension.

Hoover and Gough (1990) tested the SVR with a sample of Spanish-speaking bilingual students and found that the SVR model is not only predictive of reading comprehension for monolingual children but also for bilingual children. Moreover, they found that the predictive values were accurate when linguistic comprehension and decoding were considered together, but not separately. Essentially, for bilingual children learning to read in English and Spanish, decoding skills are not as strong of a predictor of reading comprehension without including linguistic comprehension. The SVR is also useful as a predictive model of reading in other widely used languages. In a meta-analysis of 210 studies that measured decoding, language comprehension, and reading comprehension skills in Chinese, Peng et al. (2021) found a moderate correlation between Chinese decoding and language comprehension skills and that together they predicted 52.7% of the variance in Chinese reading comprehension.

The interdependence hypothesis (Cummins, 1979) suggests that language and literacy skills in the second language depend on student language and literacy in the first language. Students with stronger native language skills are more likely to transfer these skills to their second language than students with weak native language skills. According to Perfetti (1999), readers who have mastered decoding and understand the meaning of a word in isolation and in context are more likely to comprehend the text they are reading compared to readers who have a partial understanding of decoding and who do not know the meaning of the words they read. Weaker readers then spend a higher proportion of cognitive load in decoding words, which detracts from their focus on understanding the meaning of the text (Sweller, 2011). For bilingual students, reading words automatically and fluently in English and in Spanish provides them the opportunity to understand connected text from different perspectives based on the language of the text, potentially deepening their reading comprehension. Perfetti and colleagues further hypothesized that semantic, morphological, and syntactic knowledge were key contributors to linguistic comprehension, reaffirming the powerful role of language in reading comprehension (Perfetti & Hart, 2002; Perfetti & Stafura, 2014).

In Kintsch's (1998) situation model, readers comprehend what they read in the context of understanding how the words read connect to a specific situation with which they are familiar. Thus, for bilingual students, it implies also understanding the context in which they are learning and the languages they are being exposed to. Therefore, bilingual students who are receiving bilingual language instruction are more likely to understand text in the languages they are being exposed to, than bilingual students who are taught in only one of their languages (Grant et al., 2011).

Longitudinal Research Investigating Cross-Linguistic Transfer of Reading Skills in Spanish and English

Cross-linguistic transfer refers to a reader's ability to use language skills in one language to understand the linguistic system in another language. For example, if a student understands phoneme-grapheme letter-sound correspondence in Spanish, then it will be easier to transfer this knowledge to English because the alphabetic system is very similar, and in both languages, letters are symbols for sounds (Ehri, 2005). For example, in English and in Spanish, most consonants have the same sound (e.g., the first sound/k/in *coat* is the same as in the word *cuadro* [painting]. Other consonants that have the same sound in both languages are b, c, d, f, k, l, m, n, p, q, r, s, t, w, x, y, and z with some variations depending on where Spanish is spoken. Nonetheless, reading in English is not the same as reading in Spanish because the English phoneme-grapheme letter-sound correspondence is significantly more complex than in Spanish (e.g., the vowels in English can have more than one sound depending on the combination of letters that surround them, while in Spanish vowels only have one sound). These differences need to be considered when teaching reading in bilingual settings (Honig et al., 2018).

Metalinguistic awareness suggests that there is an underlying language and literacy process common across languages, particularly alphabetic languages, that supports second language acquisition (Bialystok et al., 2005; Verhoeven, 1994). Children who acquire high levels of language and reading proficiency in their native language, *before or while* learning to read in a second language, develop metalinguistic awareness more rapidly than other children. This awareness can facilitate the continuous acquisition of literacy skills in the native language and the second language.

An example of metalinguistic awareness is the conscious recognition and manipulation of morphemes that change the meaning of words (e.g., recognizing that adding the prefix "-im" to certain adjectives [e.g., to *posible* in Spanish or *possible* in English] changes the meaning of the word in both languages; Seymour, 2006). Although substantial evidence exists about cross-linguistic transfer of lower-level processes such as phonological awareness and decoding (see Melby-Lervag & Lervag, 2011), few studies have examined the transfer of higher-level processes across languages (e.g., ORF and language comprehension).

Spanish and English Language Proficiency as a Predictor of Reading Comprehension

Several studies have examined the contribution of language proficiency to reading comprehension in the early grades. Miller et al. (2006) found that oral language in English and Spanish was a significant contributor to reading comprehension within and across languages for Spanish-speaking students in grades K–3. Mesa and Yeomans-Maldonado (2019) found that Spanish and English language proficiency had a significant effect on reading comprehension in English in grade 3. Similarly, Relyea and Amendum (2020), and Kieffer (2012) also found that Spanish and English language proficiency are significant predictors of English reading comprehension in the upper elementary grades and middle school. None of these studies, however, examined the effect of bilingual language proficiency on reading comprehension in Spanish and English, and three of the four studies examined the effects of language proficiency on English reading comprehension only.

The current study presents a unique opportunity to closely examine the interconnection of language proficiency and decoding, two components in the SVR that are necessary to attain reading comprehension. In this study, a combination of English and Spanish oral skills determined bilingual language proficiency. The reason to measure bilingual language proficiency instead of student language proficiency in each language was to ensure that we considered student bilingual assets in both languages.

Spanish and English Oral Reading Fluency as a Predictor of Reading Comprehension

ORF has been used in multiple studies to determine student reading performance. ORF has also been used as one of the measures that indicate the success of a decoding intervention (Solari et al., 2018). Moreover, ORF has been frequently referred to as the bridge between word automaticity and reading comprehension. According to LaBerge and Samuels (1974), students who read fluently understand the alphabetic principle (i.e., that words are made of sounds that, when combined, allow the reader to read words), and how words combined in a passage can then be used to understand the meaning of the passage. Additionally, some studies have indicated that ORF and reading comprehension have a reciprocal relation within languages, and across languages (Baker et al., 2011). In other words, ORF significantly predicts reading comprehension within and across languages, but reading comprehension also predicts ORF within and across languages. These findings suggest that ORF might measure more than just decoding.

Moreover, not only ORF initial status, but gains in ORF can be powerful and significant predictors of reading comprehension in the early grades in English (Kim et al., 2010), as well as in Spanish (Baker et al., 2010, 2012). For example, Baker et al. (2012) measured the relation between reading comprehension and ORF for bilingual students enrolled in a bilingual program in first, second, and third grade ($N = 471$). Results indicated that ORF was a strong predictor of reading comprehension in English and in Spanish within languages, but not across languages.

Although it stands to reason that in alphabetic languages a reader can read words in a language that uses a similar alphabetic system as their native language (e.g., a native Spanish-speaker reading words in English), it is less obvious whether the reader understands what the passage is about unless they have enough vocabulary to understand the meaning of the words. In the Baker et al. (2012) study it is possible that the readers' ORF and reading comprehension skills in both languages were not strong enough for cross-linguistic transfer to occur.

Proctor et al. (2006) examined the role of oral language on reading comprehension after taking decoding into account. Participants were 135 4th-grade Spanish-speaking bilingual students in a transitional bilingual program. The authors measured ORF, alphabetic knowledge, vocabulary, listening comprehension, decoding, oral language proficiency, and reading comprehension in Spanish and English. Findings suggested that decoding was related to reading comprehension within and across English and Spanish. Oral language proficiency, however, did not affect reading comprehension, although vocabulary did. Moreover, gains on English ORF promoted the cross-linguistic relation between reading comprehension and vocabulary knowledge. Similar studies that have corroborated the relation between Spanish and English reading

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components also include studies by Lindsey et al. (2003), Manis et al. (2004), and Nakamoto et al. (2007, 2008, 2012).

In summary, bilingual students who are fluent in two languages and who are receiving bilingual instruction are potentially in a unique position of being able to do both, read the words in the native or the second language fluently, and understand the meaning of these words in context in the first and second language. However, the extent to which student decoding and ORF initial status and gains in the two languages predict reading comprehension within and across languages when also taking language proficiency in both languages into account is still not clear.

Current Study

In the current study, we examined the longitudinal prediction of bilingual language proficiency and Spanish and English reading skills on Spanish and English reading comprehension for Spanish-speaking bilingual students attending bilingual programs in the U.S. We followed students from first grade to second grade. Specifically, we attempted to answer the following questions:

1. Does bilingual language proficiency and Spanish and English literacy skills at the beginning of first grade significantly predict reading comprehension at the end of second grade?
2. Do gains in Spanish and English literacy skills in first and second grade predict reading comprehension outcomes at the end of second grade?
3. Does bilingual language proficiency at the beginning of first grade and English and Spanish literacy initial status and gains in first and second grade predict reading comprehension outcomes at the end of second grade?

Our study used a language proficiency score that included the combined effect of Spanish and English language proficiency. This measure can help the field understand student bilingual language proficiency independently from the type of bilingual program they are attending. Currently, there is substantial variability between the amount of instruction students receive in Spanish and in English in bilingual programs in the U.S. This makes it very difficult to determine the exact amount of time students spend hearing and speaking Spanish versus English, and how the amount of exposure affects their language and reading skills in both languages (Baker et al., 2016). Thus, by accounting for levels of bilingualism and biliteracy independently of the bilingual program, researchers can better measure the contribution that language and reading fluency skills make on reading comprehension outcomes.

METHOD

Overview

The data reported in the present study were collected as part of a research project investigating the effects of systematic and explicit teaching routines on the literacy and language outcomes of students in grades 1-3 in comparison to a business as usual control condition. The current study included all students, independent of condition, across grades 1 and 2 on the measures of interest for this study.

Participants

Schools

In this study, schools ($n = 35$) were located in either the Pacific Northwest or in Texas. Forty-three percent of schools were in a rural setting, 27% were in an urban setting, and 30% were in a suburban or near-urban area. The percentage of students by school who received free or reduced-price lunch ranged from 33.2% to 92.8%. The percentage of Latinx students in the schools ranged from 19.9% to 83.3%.

Students

Participants were Latinx Spanish native speakers as indicated by a home language survey. The total student sample was comprised of 600 Spanish-speaking students with complete first and second-grade data. Approximately 7% of the participants were receiving special education services. The home survey was conducted by the schools, and the main question asked was related to the language spoken at home. We do not know if students were sequential or simultaneous bilinguals but given our large sample size, the sample should be representative of bilingual students enrolled in bilingual programs. Students in our sample showed low English language proficiency as measured by the Bilingual Verbal Ability Test (BVAT; Muñoz-Sandoval et al., 1998). Their average English language proficiency scores in the beginning of first grade as well as in the end of second grade were more than one standard deviation below the mean of the normative sample (i.e., general U.S. population). Only 4% of the students in the beginning of first grade and 6.3% in the end of second grade had English language proficiency scores at the mean of the normative sample or higher. Although we do not have their Spanish language proficiency scores, their bilingual language proficiency scores from the BVAT were also low compared to the normative sample. The students in our sample, however, still had a wide variation in their English and bilingual language proficiency, showing about 80 point gaps in their BVAT standard scores. Next, we describe the literacy instruction in English and Spanish students were receiving.

Spanish and English Literacy Instruction

***Spanish Literacy Instruction in First Grade*.** The quantity of Spanish literacy instruction in first grade ranged from approximately 40 minutes to 140 minutes per day. In schools where Spanish literacy instruction in first grade was provided for only 40 minutes per day, students received also English literacy instruction. In schools where Spanish literacy instruction in first grade was provided for more than 90 minutes per day, students also received English second language acquisition instruction. Teachers used either published curriculum programs, published curricula and their own materials, or a diverse collection of materials created by them or the district.

For example, in Texas, the majority of the schools used *Scott Foresman Lectura* (Blanco et al., 2000), and *Esperanza as a Supplemental Material* (Cárdenas-Hagan, 1996). In the Pacific Northwest, *Houghton Mifflin Lectura* (Houghton Mifflin, 2005a) was used by the majority of the schools. Some schools used *Estrellita* (Myer, 1990) for interventions with struggling readers.

***English Literacy Instruction in Second Grade*.** The quantity of English literacy instruction in second grade ranged from approximately 50 minutes to 150 minutes per day. In schools where English literacy instruction was provided for only 50 minutes per day, students received also Spanish literacy instruction. In schools where Spanish instruction in second grade was provided for more than 90 minutes per day, students also received English second language acquisition instruction. In terms of literacy curricula, there was more consistency in the curricula in English than the one observed during Spanish literacy instruction. Most schools used *Houghton Mifflin Reading* (Houghton Mifflin, 2005b), *Treasures* (Bear, 2007), *Trophies* (Harcourt 2002), *Reading Street* (Afflerbach, 2011), or *SRA Open Court Reading* (McGraw-Hill, 2005).

Measures

To measure bilingual language proficiency, we used the English and Spanish responses of the BVAT (Muñoz-Sandoval et al., 1998). Student Spanish literacy skills were assessed using the Indicadores Dinámicos del Éxito en la Lectura (IDEL, Baker et al., 2006), and the Aprenda: La Prueba de Logros en Español, Tercera Edición (Aprenda-3; Harcourt Brace Educational Measurement, 2005). Student English literacy was assessed with the Dynamic Indicators of Basic Early Literacy Skills, 6th edition (DIBELS, Good & Kaminski, 2002), and the Stanford Achievement Test, Tenth Edition (SAT-10; Harcourt Brace Educational Measurement, 2003).

Bilingual Language Proficiency

The BVAT (Muñoz-Sandoval et al., 1998) is a measure of student ability to use two languages to negotiate the meaning of academic content. The BVAT consists of three subtests from the Woodcock-Johnson Tests of Achievement-Revised Picture Vocabulary, Oral Vocabulary, and Verbal Analogies (Woodcock & Johnson, 1989). The test yields an English language proficiency score as well as a bilingual language proficiency (i.e., bilingual verbal ability) score that considers additional information about the language skills the child has in his or her first language. The norming sample included 5,602 participants from over 100 different U.S. communities. Subsets of the norming sample representing populations with low percentages of occurrence in the United States were oversampled. Concurrent validity of the BVAT with the Language Assessment Scales (Duncan & De Avila, 1985) and the Woodcock Muñoz Language Survey Reading–Writing cluster (Woodcock & Muñoz-Sandoval, 1993) in kindergarten was within the range of .6 to .9. The median alternate form reliability observed across 12 grade levels was .84 in a sample of 542 bilingual participants. We administered the BVAT at the beginning of grade 1, and the end of grade 2. For this study, we used the BVAT standard scores which were standardized with a mean of 100 and a standard deviation of 15.

Spanish Literacy Measures

***Spanish Nonsense Word Fluency*.** Fluidez en las Palabras sin Sentido (FPS; Plasencia-Peinado et al., 2006) is a test of alphabetic knowledge (i.e., decoding and encoding) in Spanish. Students read nonsense words aloud for 1 minute, either by recognizing and reading aloud the individual sounds in the word or by reading the whole word. The total score is the number of letter sounds read correctly in one minute. Three-week, alternate form reliability of FPS in the middle of first grade was .76 (Watson, 2004). The correlation between FPS and the Woodcock-Muñoz Pruebas de Aprovechamiento subtest of Análisis de Palabras was .72 at the end of first grade (Watson, 2004). FPS was administered in the beginning, middle, and end of first grade.

***Spanish Oral Reading Fluency*.** Fluidez en la Lectura Oral (FLO; Baker et al., 2006) is a test of fluency in reading connected text. Students are asked to read aloud three passages for one minute. The median number of words read correctly (WRC) across the three passages is

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the final score. To calculate the WRC, data collectors subtract the number of errors from the total words read. Errors include words overlooked, substituted, and pauses of more than three seconds. Alternate-form reliability of different reading passages from the same level of difficulty ranged from .88 to .94 (Crespo, 2014; Watson, 2004). The correlation between ORF and the Woodcock-Muñoz Reading was .75 (Watson, 2004). Criterion validity of FLO with the Aprenda-3 (Harcourt Brace Educational Measurement, 2005) total score was .67 at the end of first grade (Baker, 2009), and .64 with the Aprenda comprehension subtest at the end of second grade (Baker et al., 2011). Students were assessed with this measure in the middle and end of first grade, and in the beginning, middle, and end of second grade.

Spanish Reading Comprehension. The Aprenda-3 is a standardized, norm-referenced test of academic achievement (Harcourt Brace Educational Measurement, 2005). The Aprenda–3 is group administered and untimed. The test was standardized with 73,000 students from 131 school districts in 13 states in the U.S., Puerto Rico, and Mexico. Kuder-Richardson reliability coefficients for the Spanish-speaking school population at the end of kindergarten and first grades ranged from .93-.96. Inter-rater reliability on the Aprenda-3 ranged from .90 to .98. The reading comprehension subtest is a multiple-choice test where students read 10 short texts from different genres (e.g., literary, informational, functional). In general, students complete this test in approximately 40 minutes. We administered this test at the end of first grade and second grade.

English Literacy Measures

English Nonsense Word Fluency. The DIBELS Nonsense Word Fluency (NWF) measure assesses the alphabetic principle (letter-sound correspondence) and phonological recoding (the ability to blend sounds into whole units). Students are asked to read aloud randomly ordered VC and CVC nonsense words (e.g., “teg,” “kev,” “ot,” etc.) for one minute. Students can produce the most common sound of each letter or read the whole nonsense word. The final score is the total number of letter sounds read correctly in one minute. Correlations between NWF at the end of kindergarten and the SAT-10 reading comprehension subtest at the end of first grade were moderate to large ($r = .56 - .65$; Fien et al., 2008).

English Oral Reading Fluency. DIBELS Oral Reading Fluency (ORF; Good et al., 2002) is also a measure of a student’s skill in reading connected text accurately and fluently. Alternate-form reliability coefficients of different ORF reading passages from the same level of difficulty have ranged from .89 to .94 (Good & Kaminski, 2002). Correlations between DIBELS ORF and the Texas Assessment of Knowledge and Skills in third grade have been large (i.e., .64 in grade 1, .68 in grade 2, and .69 in grade 3; Wanzek et al., 2010). We administered this measure in the middle and end of grade 1, and in the beginning, middle, and end of grade 2.

English Reading Comprehension. The SAT-10 is a group-administered, norm-referenced test of overall reading abilities in English (Harcourt Brace Educational Measurement, 2003). We administered the Reading Comprehension subtest, at the end of grades 1 and 2. Kuder-Richardson reliability coefficients for total reading scores were .97 at grade 1 and .95 at grade 2. The correlations between the SAT-10 Total Reading score and the Otis-Lennon School Ability Test ranged from .61 to .74 (Harcourt, 2003). The normative sample is representative of the U.S. student population. Estimated time of completion was 40 minutes.

Data Collection Procedure

All data collectors received a one-day training on the administration and scoring of all the measures before the first administration, and an additional two-hour training before each administration. Data collectors were fluent native Spanish-speakers or they were native English speakers with advanced proficiency in Spanish. The first author, who is fluent in Spanish, interviewed all data collectors in Spanish. We used a shadow-scoring procedure to determine inter-rater reliability which was above .90 across all time points.

Data Analysis Procedure

We used hierarchical linear modeling (Raudenbush & Bryk, 2002) as the main analytic method to consider the nested nature of our data (i.e., students nested within schools). In addition, we examined four different models to predict outcomes in English and Spanish reading comprehension as we added predictors in a stepwise manner. Model 1 was the initial bilingual proficiency only model. Model 2 was the first-grade predictor model which included English language proficiency at the beginning of first grade, English and Spanish NWF initial scores at the beginning of first grade, and English and Spanish NWF gains during first grade to predict English and Spanish reading comprehension at the end of second grade.

Model 3 included bilingual proficiency gain from the beginning of first grade to the end of second grade in addition to the first-grade predictors of Model 2. Finally, in

Model 4, we added English and Spanish ORF initial scores at the beginning of second grade and ORF gains during second grade in addition to the predictors of Model 3. These stepwise models are useful to separate the unique effects among interdependent variables especially for a longitudinal data collection design as in the present study.

The models assume independent and normally distributed observations. We addressed the first, more important assumption (Van Belle, 2008) by explicitly modeling the multilevel nature of the data. Murray et al. (1996) have shown that the analysis required for this design does not need to include subgroups (e.g., classrooms) to obtain the intended Type I error rate. Regression methods have also been found quite robust to violations of normality and outliers have a limited influence on the results in a variety of multilevel modeling scenarios (Bloom et al., 1999; Donner & Klar, 1996; Fitzmaurice et al., 2004; Maas & Hox, 2004a, 2004b; Murray et al., 2006).

RESULTS

Descriptive Statistics

Table 1 presents the means and standard deviations of first-grade and second-grade reading indices, respectively. As indicated on the table, the average bilingual language proficiency as measured by the BVAT was 89.47 at the beginning of first grade and 89.42 at the end of second grade. Although the difference appears to be minimal, these scores cannot be compared because the BVAT scores have been standardized within each grade (Muñoz-Sandoval et al., 1998). The correlation coefficients between the BVAT scores at the beginning of first grade and the reading comprehension scores at the end of second grade were .39 for English reading comprehension and .33 for Spanish reading comprehension. This correlation was stronger at the end of second grade (.53 for English, and .47 for Spanish).

Student reading comprehension scores at the end of first grade were also highly correlated (.50 or higher) with their end-of-second grade reading comprehension scores within languages (.61 for English; .64 for Spanish) and also across languages (.54 between first-grade English and second-grade Spanish; .52 between first-grade Spanish and second-grade English) suggesting that reading comprehension at the end of first grade was moderately to highly associated with reading comprehension at the end of second grade. ORF was also moderately to highly correlated (.45 or higher) with end-of second-grade reading comprehension scores within languages (.53 ~ .64) and across languages (.45 ~ .48). However, ORF scores in second grade had a small correlation with bilingual proficiency in English (.33) and Spanish (.35). Correlation tables can be provided upon request to the corresponding author.

First-Grade Predictors of Reading Comprehension

Results from the HLM analysis revealed that school-level variances in student English and Spanish reading comprehension scores were statically significant, as seen in the unconditional models in Table 2. The intraclass correlation coefficients indicated that the between-school variances were 7 percent for English reading comprehension and 10 percent for Spanish reading comprehension at the end of second grade. Thus, over 90 percent of the variance in reading comprehension was due to student-level differences, indicating that the schools were similar in terms of their student reading comprehension scores in English and in Spanish.

Student bilingual language proficiency at the beginning of first grade was a significant predictor of their English and Spanish reading comprehension at the end of second grade. A one point increase on the BVAT bilingual proficiency score at the beginning of first grade predicted 1.12 points higher scores for English reading comprehension on the SAT-10 ($B = 1.12$, $t = 7.56$, $p < .001$) and 0.93 points higher scores for Spanish reading comprehension on the Aprenda at the end of second grade ($B = 0.93$, $t = 7.49$, $p < .001$). Student initial bilingual proficiency explained 17 percent of the student-level variance in English reading comprehension and 9 percent of the student-level variance in Spanish reading comprehension.

Student decoding skill, measured by NWF in first grade, explained more of the student-level variance in their end-of-second-grade reading comprehension for both English and Spanish. Table 3 indicates that decoding explained an additional 10 percent of the student-level variance on English reading comprehension and 17 percent of variance on Spanish reading comprehension. English reading comprehension was predicted significantly by student initial scores and gain scores on both English NWF and Spanish NWF ($B = 0.24$, $t = 2.83$, $p < .01$ for English NWF initial; $B = 0.16$, $t = 3.56$, $p < .01$ for Spanish NWF initial; $B = 0.10$, $t = 1.96$, $p < .05$ for English NWF gain; $B = 0.12$, $t = 4.91$, $p < .001$ for Spanish NWF gain). Spanish reading comprehension, however, was only significantly predicted by student initial scores and gain scores in Spanish NWF (i.e., $t = 6.27$, $p < .001$ for initial Spanish NWF; $B = 0.17$, $t = 4.14$, $p < .001$ for Spanish NWF gain), but not by English NWF initial status and gain scores.

Second-Grade Predictors of Reading Comprehension

Next, the second-grade reading indices were explored for their added explanatory power to predict student reading

Table 1. Descriptive Statistics of Student Scores on First- and Second-Grade Assessments (N = 569)

Measure	*Mean*	*SD*	*Minimum*	*Maximum*
Beginning of First Grade				
Bilingual Proficiency	89.47	12.29	35	119
English Nonsense Word Fluency	27.58	22.48	0	136
Spanish Nonsense Word Fluency	46.23	37.33	0	208
End of First Grade				
English Nonsense Word Fluency	74.88	36.99	0	254
Spanish Nonsense Word Fluency	107.49	45.30	17	242
English NWF Gain	47.29	33.90	−105	248
Spanish NWF Gain	61.26	39.03	−109	225
English Reading Comprehension	520.74	42.24	351	667
Spanish Reading Comprehension	547.47	35.33	458	684
Beginning of Second Grade				
English Oral Reading Fluency	39.71	26.33	0	187
Spanish Oral Reading Fluency	38.11	22.66	0	126
End of Second Grade				
Bilingual Proficiency	89.42	11.39	52	129
Bilingual Proficiency Gain	−0.05	10.55	−30	44
English Oral Reading Fluency	79.41	33.62	5	175
Spanish Oral Reading Fluency	58.65	26.35	0	146
English ORF Gain	39.70	20.23	−18	111
Spanish ORF Gain	20.55	14.75	−31	95
English Reading Comprehension	556.72	33.45	486	679
Spanish Reading Comprehension	563.08	35.81	476	703

Note. NWF = Nonsense Word Fluency; ORF = Oral Reading Fluency; Gain scores are differences in the scores between beginning and end of first grade for NWF, between beginning and end of second grade for ORF, and between beginning of first grade and end of second grade for bilingual proficiency.

Table 2. Unconditional Models to Predict English and Spanish Reading Comprehension Scores at the End of Second Grade (Unconditional Model)

	English Reading Comprehension			Spanish Reading Comprehension		
Fixed Effect	*Coefficient*	*SE*	*t*	*Coefficient*	*SE*	*t*
Intercept	557.01	2.07	268.92***	565.05	2.49	227.01***
Random Effect	*Variance*	*df*	χ^2	*Variance*	*df*	χ^2
Level-2	75.12	34	74.45***	131.57	34	100.54***
Level-1	1048.53			1152.53		
Intraclass correlation coefficient (ICC)		0.07			0.10	

*$p < .05$, ** $p < .01$; *** $p < .001$.

Table 3. First-Grade Predictor Models to Predict English and Spanish Reading Comprehension Scores at the End of Second Grade

	English Reading Comprehension			Spanish Reading Comprehension		
Fixed Effect	*Coefficient*	*SE*	*t*	*Coefficient*	*SE*	*t*
Intercept	544.24	2.55	213.48***	552.25	2.87	192.36***
First Grade						
Bilingual Proficiency†	0.88	0.14	6.11***	0.60	0.12	4.91***
English NWF Initial†	0.24	0.08	2.83**	0.07	0.10	0.73
Spanish NWF Initial†	0.16	0.05	3.56**	0.40	0.06	6.27***
English NWF Gain	0.10	0.05	1.96*	0.03	0.05	0.58
Spanish NWF Gain	0.12	0.02	4.91***	0.17	0.04	4.14***
Random Effect	*Variance*	*df*	χ^2	*Variance*	*df*	χ^2
Level-2	81.52	34	93.06***	71.70	34	84.95***
Level-1	765.57			847.99		
Variance Explained at level-1		0.27			0.26	

*$p < .05$, ** $p < .01$; *** $p < .001$.
†Theses predictors were centered around their grand means.
Note. NWF = Nonsense Word Fluency; Gain scores are differences in the scores between beginning and end of first grade.

comprehension. Bilingual proficiency gains from the beginning of first grade to the end of second grade explained an additional seven percent of the student-level variance in English reading comprehension and an additional 6 percent of the student-level variance in Spanish reading comprehension after considering Spanish decoding skills and bilingual language proficiency initial status. In other words, a one point gain on the BVAT from the beginning of first grade to the end of second grade predicted 1.09 point higher scores for English reading comprehension on the SAT-10 ($B = 1.09$, $t = 7.30$, $p < .001$) and 0.99 points higher scores for Spanish reading comprehension on the Aprenda at the end of second grade ($B = 0.99$, $t = 5.35$, $p < .001$).

ORF in second grade significantly predicted end-of-second grade reading comprehension for both English and Spanish, but results varied by the language of the outcome. English reading comprehension was predicted significantly by initial scores ($B = 0.52$, $t = 7.89$, $p < .001$) and gain scores ($B = 0.33$, $t = 9.17$, $p < .001$) on the English ORF in second grade. Spanish ORF gain scores were also a significant predictor of English reading comprehension ($B = 0.11$, $t = 1.96$, $p < .05$), but Spanish ORF initial scores were not ($B = 0.18$, $t = 1.88$, $p =$ n.s.). Spanish reading comprehension was significantly predicted by Spanish ORF initial scores only ($B = 1.02$, $t = 13.62$, $p < .001$).

Table 4 shows that when second grade ORF scores were included in the model, first-grade NWF initial and gain scores were not statistically significant in the prediction of end-of-second-grade English or Spanish reading comprehension. Second grade ORF initial and gain scores in English and Spanish explained an additional 13 percent of the student-level variance in reading comprehension in English. In Spanish, ORF initial status explained 14 percent of the variance in Spanish reading comprehension. Spanish ORF gain scores were not a significant predictor of Spanish reading comprehension.

DISCUSSION

The purpose of this study was to examine the longitudinal prediction of decoding skills, ORF, and bilingual language proficiency on reading comprehension at the end of second grade for Latinx bilingual students learning to read in Spanish and in English. We followed students from the beginning of grade 1 to the end of grade 2. Three main findings were derived from our study. First, bilingual language proficiency initial scores in first grade, and gains from grade 1 to the end of grade 2 are strong significant longitudinal predictors of reading comprehension at the end of second grade. Second, decoding and ORF initial status and gains in English and Spanish vary in their prediction of English and Spanish reading comprehension, questioning the general belief that all literacy skills in one language transfer to literacy skills in a second language. Third, ORF and bilingual language proficiency explained unique variance in reading comprehension in Spanish and in English. We discuss our findings in the context of previous research and our theoretical framework.

Prediction of Reading Comprehension by Bilingual Language Proficiency

Our findings indicated that language proficiency is a strong predictor of reading comprehension even in the lower elementary grades and after controlling for decoding skills. This finding supports the results from several recent studies suggesting that language proficiency is an important contributor to reading comprehension for English-only students and bilingual students within and across languages (see studies by Mancilla-Martínez et al., 2020; Mesa & Yeomans-Maldonado, 2019; Relyea & Amendum, 2020). Our study moves further suggesting that for bilingual students in the United States, *bilingual* language proficiency is a significant contributor to both English reading

Table 4. First- and Second-Grade Predictor Models to Predict English and Spanish Reading Comprehension Scores at the End of Second Grade

	English Reading Comprehension			Spanish Reading Comprehension		
Fixed Effect	*Coefficient*	*SE*	*t*	*Coefficient*	*SE*	*t*
Intercept	544.45	3.05	178.34***	554.32	3.50	158.44***
First Grade						
Bilingual Proficiency†	1.11	0.11	9.76***	0.92	0.14	6.59***
English NWF Initial†	−0.06	0.07	−0.90	−0.11	0.08	−1.34
Spanish NWF Initial†	−0.08	0.0	−1.59	−0.05	0.07	−0.70
English NWF Gain	−0.06	0.04	−1.45	−0.06	0.04	−1.32
Spanish NWF Gain	−0.01	0.03	−0.26	−0.03	0.04	−0.93
Second Grade						
Bilingual Proficiency Gain	0.84	0.11	9.76***	0.83	0.17	4.95***
English ORF Initial†	0.52	0.07	7.89***	−0.08	0.07	−1.17
Spanish ORF Initial†	0.18	0.10	1.88	1.02	0.07	13.62***
English ORF Gain	0.33	0.04	9.17***	0.18	0.11	1.66
Spanish ORF Gain	0.11	0.06	1.96*	0.32	0.19	1.19
Random Effect	*Variance*	*df*	χ^2	*Variance*	*df*	χ^2
Level-2	31.83	34	67.67***	28.53	34	60.14**
Level-1	560.87			619.40		
Variance Explained at level-1		0.47			0.46	

*$p < .05$, ** $p < .01$; *** $p < .001$.
†The predictor has been centered around its grand mean.
Note. NWF = Nonsense Word Fluency; ORF = Oral Reading Fluency; Gain scores are differences in the scores between beginning and end of first grade for NWF, between beginning and end of second grade for ORF, and between beginning of first grade and end of second grade for bilingual proficiency.

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comprehension as well as Spanish reading comprehension. Thus, it appears that bilingual language proficiency combined is necessary for students to understand reading content in both languages.

In this study, we also examined the effect of bilingual language proficiency on reading comprehension measured in each language separately because we are aware that students will be assessed in one language only at the end of the academic year. Thus, by measuring bilingual language proficiency as a predictor of Spanish and English reading comprehension, we are taking student assets in both languages into account (Muñoz-Sandoval et al., 1998) and at the same time recognize that if bilingual students are struggling, they will be assessed and likely supported instructionally in one language at a time.

Prediction of Reading Comprehension by Decoding and Oral Reading Fluency

We also found that Spanish and English reading comprehension outcomes are predicted by decoding as measured by a pseudoword measure. In other words, decoding initial skills and gains in first grade have a longitudinal effect on reading comprehension in Spanish and in English at the end of second grade. Spanish initial status and gains in decoding also had a significant effect on English reading comprehension suggesting cross-linguistic transfer of these skills. However, English initial status and gains in decoding were not a significant predictor of end-of-second-grade Spanish reading comprehension.

This finding suggests that decoding in the students' native language transfers to decoding in their second language, but not the other way around. Spies et al. (2018) also found similar findings, in which reading in Spanish appeared to contribute to reading in English, but not vice versa in a group of Latinx bilingual students. A potential reason for the differences in the prediction of reading comprehension in the native language versus the second language could be that cross-linguistic transfer can only occur from a more dominant language to a less dominant language, or to a language that is equally dominant as the native language. This hypothesis is corroborated by the fact that students in first grade in this study had, on average, significantly higher scores in pseudoword reading in Spanish than in English. Therefore, it makes sense that Spanish literacy skills were significant predictors of English reading comprehension but not the other way around.

Decoding is also necessary to support student ORF, in addition to reading comprehension and vocabulary, in English and in Spanish (Baker et al., 2011; Kim & Pallante, 2012). ORF tends to also be viewed as a bridge between decoding and comprehension (LaBerge & Samuels, 1974, Perfetti, 1999). Thus, we found that once ORF was entered into the model, as illustrated in Table 4, the contribution of decoding to reading comprehension was no longer significant, just as other studies have also demonstrated (e.g., Lindsey et al., 2003). We also found that cross-linguistic transfer of ORF varied across languages. For example, when reading comprehension was in English, English ORF initial status and English and Spanish gains, but not Spanish initial status, were significant predictors of English reading comprehension. In Spanish, neither Spanish ORF gains nor English ORF predicted Spanish reading comprehension. Instead, Spanish reading comprehension was predicted by Spanish ORF initial status only.

These results could be explained, in part, because (1) in second grade, students were receiving more English instruction and therefore their gains in Spanish ORF might have started to recede; or (2) given the nature of the Spanish orthographic system where there are more multisyllabic words than in English, the gains in Spanish in the number of words read might not have been large enough to have a significant effect on reading comprehension (see Baker et al., 2011; Ripoll Salceda et al., 2020). This hypothesis is supported by the gain scores in both languages. Second grade students made almost double the gains on ORF in English than in Spanish (i.e., students read almost 40 more words on English ORF passages from the beginning of second grade to the end of second grade, while they read only 21 more words on Spanish ORF from the beginning to the end of second grade).

Language Proficiency and Decoding Are Separate Constructs That Affect Reading Comprehension

This study indicated that decoding and language proficiency explain unique variance in reading comprehension outcomes in Spanish and in English, supporting the SVR hypothesis for English monolingual speakers, and bilingual speakers (Baker et al., 2011; Hoover & Gough, 1990). Thus, bilingual students need to develop word automaticity in Spanish and in English to become fluent readers in both languages, and also develop their language proficiency to be able to understand what they read. Instruction in decoding and language proficiency should occur in both languages if the goal of bilingual programs is for students to become biliterate and bilingual following the SVR model in both languages.

Limitations

This study has several limitations. First, although we had a large sample size ($n = 600$) and we measured student reading skills and language proficiency longitudinally, our sample was restricted to Spanish-speaking bilingual students in two large regions in the United States. Another limitation is that although all schools provided English and Spanish instruction, the amount of time teachers spent providing instruction in each language was not clear. Finally, in this study, we did not include any schools in which Latinx bilingual students were receiving English-only instruction, so our findings might not fully generalize to the population of Spanish-Speaking bilingual students receiving English-only instruction in the United States.

Implications for Practice

This study has several implications for practice. First, it is important and necessary to acknowledge that bilingual students have assets that need to be considered when assessing their literacy skills. Assessing them in separate languages, or in one language only, might not provide teachers and school psychologists with enough information about how much bilingual students really know in both their languages and how much they can produce in both languages.

Moreover, examining reading comprehension in the two languages bilingual students speak provides a good indication of how much students are using their bilingual language proficiency to support their comprehension. If students do not appear to be using their bilingual assets to support their comprehension, then teachers can provide explicit instruction on how they can use what they know in both languages to understand content (Meadows Center for Preventing Educational Risk, 2021). These additional supports can maximize student assets and encourage them to activate their bilingualism to understand academic content. Training teachers and school psychologists on how to take student bilingualism into account when teaching and assessing students, could lead to higher quality of instruction and higher academic success for bilingual students.

Implications for Research

This study has several implications for research. First, the Latinx bilingual community is very diverse across the U.S. Therefore, conducting studies such as the current one in different contexts and participants can enrich our understanding if bilingualism for Latinx students. Second, Spanish and English language proficiency assessments that are brief, reliable, and valid are needed to better understand and monitor student language development. Third, based on the results of this study, exploring the benefits of bilingualism further by examining how bilingual reading outcomes and bilingual language proficiency support the learning of content (e.g., science, mathematics, social studies) could lead to enhanced instruction and the development of interventions that reduce the achievement gap between monolingual English-speaking students and bilingual students. Finally, developing and testing interventions for struggling bilingual readers that consider their linguistic and cultural assets, and their growth in reading skills in both languages could substantially improve current supports that tend to promote single-language proficiency instead of bilingual proficiency.

The increase in the number of bilingual students in U.S. schools provides us with a unique opportunity to examine closely how bilingualism and biliteracy can support student learning. It is not too early to start examining these issues, particularly considering current advances in neuroscience, and in the use of technology to capture student literacy skills and language proficiency more systematically and efficiently. Technology can provide teachers immediate reports of student performance in both languages. It could also interpret the reports for English monolingual teachers so they can be aware of student bilingual biliteracy skills, particularly when they are transitioning to English only instruction. Extending the findings in this study to address the needs and assets of bilingual students will enhance bilingual education and increase our understanding of bilingualism.

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