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Examining the role of vocabulary depth, cross-linguistic transfer, and types of reading measures on the reading comprehension of Latino bilinguals in elementary school

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Abstract Given the increase of bilingual students in the K-12 public school system, understanding reading comprehension performance, especially among this population, has been a major focal point in the research literature. This study explores the nature of reading comprehension among a sample of 123 Spanish–English bilingual elementary students. We add to the existing knowledge base regarding reading comprehension in two significant ways: (1) augmenting the Simple View of Reading by testing the role of both vocabulary depth contribution and dual-linguistic ability in English reading comprehension; and (2) questioning the manner through which reading comprehension is understood through measurement and conceptualization. Specifically, we build a comprehensive model of reading comprehension that tests the effects for vocabulary depth, Spanish oral language, and biliteracy. In line with previous research that suggests different reading measures tap different abilities, we test our model for three different measures of reading comprehension: a cloze exercise, a passage and multiple choice based test, and a timed silent sentence reading judgment

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task. Our findings converge with previous research on the role of vocabulary depth in reading comprehension and also challenge prior work which has compared different reading measures. Implications for theoretical and empirical approaches to understanding reading comprehension, specifically among Spanish–English bilingual students, are discussed.

Keywords Vocabulary · Depth · Cross-linguistic transfer · Reading comprehension · Reading measures · Spanish

Introduction

Previous research has demonstrated that English Language Learners (ELLs) can perform proficiently on word reading tasks, but in regards to reading comprehension this population tends to perform below average (Lesaux, Koda, Siegel, & Shanahan, 2006; National Center for Education Statistics, 2011). Thus, understanding reading comprehension performance, especially among bilinguals, has been a major focal point in the research literature on reading (RAND Reading Study Group, 2002). However, the complex nature of reading comprehension, specifically when considering dual language students, is enigmatic.

At one level, reading comprehension involves the ability to decode, or simply convert graphic information to linguistic form. This word recognition skill, however, is not the single fundamental component of reading comprehension. According to the simple view of reading, reading comprehension is the interaction of decoding and oral language ability (Hoover & Gough, 1990). Simply stated, strong word reading skills coupled with verbal language ability is positively associated with reading comprehension. Verbal, or oral, language has often been indexed through measures of vocabulary breadth, that is the number of words a student knows. This view of vocabulary breadth as an indicator for oral language ability is limiting, as it does not fully account for the realm of vocabulary knowledge. Thus, while there is strong evidence that vocabulary is related to reading comprehension (Anderson & Freebody, 1983; Cunningham & Stanovich, 1997; Proctor, Carlo, August, & Snow, 2005), the precise role of vocabulary has been less investigated. Arguably, vocabulary knowledge can be divided into two distinct categories: vocabulary breadth and vocabulary depth (Proctor, Uccelli, Dalton, & Snow, 2009). It is established that vocabulary breadth is associated with reading comprehension (Pearson, Hiebert, & Kamil, 2007), but the role of vocabulary depth, or how well a student knows a word, warrants more study.

This ability to fully unpack the nature of reading comprehension is not only contingent on the understanding of significant predictors, but also the manner in which reading comprehension is assessed. Cutting and Scarborough (2006) have suggested that different reading comprehension measures tap different cognitive skills. In other words, predictors (e.g., decoding ability) may vary depending on the outcome measure. This is an especially important consideration when working with bilingual learners, as variation in language ability across languages may affect

student performance differently depending on how reading comprehension is measured.

An important component in understanding reading comprehension among bilingual students is the need to be more sensitive of the uniqueness within the bilingual population. Research in the domain of bilingualism has traditionally debated the "cognitive advantages of bilingualism", specifically examining differences between bilingual and monolingual children (e.g. Bialystok, 1986, 1997). Current work investigating reading comprehension follows in a similar manner documenting the language, literacy, and academic ability of monolingual and bilingual children and attempting to explain variation between the two populations (e.g., Lesaux & Siegel, 2003; Proctor et al., 2009) While this line of research takes into account between-group variation, it does not account for the deep within-group variation of bilingual students. Bilingual students vary by a host of factors including, but not limited to, language ability related to native language proficiency (Páez, 2008) and second language proficiency (Suárez-Orozco, Suárez-Orozco, & Todorova, 2008). Research is needed with a focus on within-group diversity among bilingual learners to better understand the varying degrees of bilingualism and biliteracy that exist within this population (Bialystok, 1988) and to also pave the way for applied research on bilingual learners, particularly in the area of reading comprehension.

The research study presented in this article address this need by examining reading comprehension within a diverse group of bilingual students. Specifically, we untangle these varying degrees of bilingualism by looking closely at the relationship between English and Spanish oral language ability and three different measures of literacy performance (i.e., reading comprehension) among a bilingual sample of Latino students. First, we examine this notion of degrees of bilingualism (Bialystok, 1988) by examining language performance as a function of biliteracy (i.e., the ability to speak *and* read in more than one language). We then build upon the existing literature on reading comprehension by testing a model of reading comprehension that accounts for English vocabulary depth (i.e., semantics, syntax, morphology), native language status (i.e., Spanish oral proficiency), and biliterate ability (i.e., ability to speak and read in English and Spanish); we test this model against three different reading tests. The research literature base from which our model is derived is constrained to studies of reading comprehension that include either predictors of linguistic depth or native language ability among bilingual elementary school Latino students; given the dearth of literature specifically focused on bilinguals, some relevant findings of monolingual studies are presented to provide further empirical evidence for the model we developed in this research work. Our study converges previous work on vocabulary depth, cross linguistic transfer, and types of reading comprehension assessments.

Vocabulary depth

It has been suggested that vocabulary depth can be broken down into the following three domains: morphology, semantics, and syntax (Proctor, Silverman, Harring, &

Montecillo, 2012). Morphological awareness refers to understanding of the structure of words as combinations of meaningful units (e.g., book + shelf = bookshelf). Semantic awareness is the understanding of how words relate to each other conceptually (e.g., *school and teacher*). Finally, syntax refers to knowledge of language structure and grammar. Given that the research already suggests that ELLs can achieve proficiently on word reading tasks (Lesaux, 2006) and that vocabulary breadth is associated with reading comprehension (Pearson et al., 2007; Proctor et al., 2005) the following work reviewed is that which examines the role of vocabulary depth (i.e., morphology, syntax, semantics) as predictors to English reading comprehension.

Kieffer and Lesaux (2008) looked specifically at the role of derivational morphology, that is the ability to extract base words from a derived word (e.g., *elect* from *election*), by following a group of 87 Spanish–English fourth grade ELLs into their fifth grade year. Results showed that even after controlling for word reading skills, vocabulary breadth, and phonological awareness, morphology was a significant predictor for two different reading measures: the Woodcock-Muñoz Language Survey-Revised Passage Comprehension (Woodcock, Munoz-Sandoval, Reuf, & Alvarado, 2005) and Gates MacGinitie Reading Comprehension (MacGinitie, MacGinitie, Maria & Dreyer, 2002), significantly increasing the predictive power of the model by 7.8 and 6.1 %, respectively. These findings suggest that for Spanish-speaking ELLs there is a statistically significant relationship between morphology and English reading comprehension in the later elementary grades. Similar research with monolinguals has yielded parallel results further suggesting the contribution of morphology to English reading comprehension (e.g., Deacon & Kirby, 2004; Nagy, Berninger, & Abbott, 2006; Kuo & Anderson, 2006).

It has been suggested that words can be related in a number of ways (Vermeer, 2001) and this relationship, semantic awareness, may be another component of vocabulary depth that contributes to reading comprehension. Previous work with monolinguals has suggested semantic depth as a predictor for reading comprehension (Nation & Snowling, 2004; Tannenbaum, Torgeson, & Wagner, 2006), but its contribution above and beyond that of vocabulary breadth has not been fully understood. Proctor et al. (2009), examined semantic awareness and its relationship to reading comprehension among a group of 35 monolingual and bilingual fifth graders. Using a baseline model that included both decoding and oral language skills, semantics was not only a significant predictor, but also increased the overall variation an additional 3 % explaining a total 80 % of the variation in reading comprehension. Further, Proctor et al. (2009) also found a significant interaction between semantic depth and oral language illustrating that students with at least average command of oral language proficiency showed a stronger relationship between semantics and reading comprehension, This second finding illustrates the importance of English oral language proficiency in semantic depth and reading comprehension.

The final component of vocabulary depth is that of syntactic awareness. To our knowledge there is no study that looks explicitly at the role of syntax on reading comprehension for Spanish–English bilinguals. Low and Siegel (2005) examined 284 sixth graders in Canada with limited English proficiency and found that syntax

was a significant predictor for reading comprehension. Additional research with monolinguals has not yielded consistent results (e.g., Cain, 2007; Mokhtari & Thompson, 2006). The work of Proctor et al. (2012) has built upon this work by exploring a reading model that included the 3 aforementioned measures of vocabulary depth: morphology, semantics, and syntax. They examined the reading comprehension of 295 Spanish–English bilingual and English monolingual elementary students over the course of an academic year. After controlling for word identification, vocabulary breadth, language status (i.e., monolingual or bilingual), and grade level it was found that both semantics and syntactic awareness were significant predictors of initial status, but not change for reading comprehension. Morphology, however, had no significant effect on status or change. Further, it was found that for bilingual students semantic awareness was the strongest predictor of English reading comprehension. Finally, it is worth mentioning that upon adding Spanish language measures into the model there were no significant native language predictors. While models of reading comprehension that include measures of linguistic depth have shown that morphology, semantics, and syntax can play a significant role in English reading comprehension for bilingual students there is still further research needed to provide stronger evidence for the role of vocabulary depth in reading comprehension ability among Spanish–English bilinguals.

Cross linguistic-transfer

English language ability in bilingual students plays a role in English reading comprehension, however it has been argued that bilingual students may also employ metalinguistic and cross-linguistic skills that access both English and Spanish language knowledge (Bialystok, Luk, & Kwan, 2005a; Cummins, 1979; Proctor, August, Snow, & Barr, 2010). While this notion of biliteracy, that is literate competencies in two languages, has been examined among young learners (see: Bialystok, 1997; Bialystok, McBride-Chang & Luk, 2005b; Moll, Saez, & Dworin, 2001; Reyes & Azuara, 2008), it has been less examined in middle childhood or middle to late elementary school grades.

Proctor, August, Carlo, and Snow (2006) examined the role of Spanish vocabulary as a contributor to English reading among 135 Latino fourth graders. They found a significant main effect of Spanish vocabulary knowledge on English reading comprehension. An interaction was also found between Spanish vocabulary and English fluency illustrating that Spanish vocabulary was more beneficial for the more fluent English readers. Swanson, Rosston, Gerber, and Solari (2008) examined the effects of both English and Spanish oral and phonological skills on English reading comprehension among a sample of 68 bilingual third graders and found no effect of Spanish on English reading comprehension when both English *and* Spanish predictors were included in the model. Swanson et al. (2008) did find, however, that with the exclusion of English predictors in the model, Spanish syntax was found to be a positive predictor for English reading. Nakamoto, Lindsey, and Manis (2008) also examined the potential for cross-linguistic transfer of Spanish skills to English reading comprehension among 282 sixth grade Latino ELLs and found no main

effect of Spanish language on English reading; however there was a significant moderating effect of Spanish vocabulary breadth which was consistent with the work of Proctor et al. (2006) further suggesting that varying degrees of proficiency manifest differently (Bialystok, 1988). Similarly, Lesaux, Crosson, Kieffer, and Pierce (2010) studied the relationship between oral language and English reading comprehension among 87 Spanish dominant fifth grade bilinguals and found that while English oral language measures correlated highly with English reading comprehension, the same measures in Spanish were only weakly correlated suggesting that English oral language plays a stronger role in English reading comprehension than Spanish language.

Among the few studies that have examined the role of both English and Spanish language ability as predictors for English reading comprehension findings suggest that English language ability plays a more dominant role in English reading comprehension than Spanish oral language ability. However, these lines of research have been limited to the simple view of reading. Further the significant interactions (Proctor et al., 2006; Nakamoto et al., 2008) suggest that the role of Spanish language varies depending on students' English language proficiency providing further evidence that researchers must be cognizant of within group variation of bilinguals. The present study seeks to add to the literature by testing a model of cross-linguistic transfer that uses a more complex model of reading comprehension.

Operationalizing reading comprehension

When looking across studies of reading comprehension there is no one universal measure of reading comprehension. The most commonly used measures include the Passage Comprehension subtest from the different editions of the Woodcock Language Proficiency Battery (e.g., WLPB-R, Woodcock, 1991; WMLS-R Woodcock, et al., 2005) and the Reading Comprehension subtest of Gates-MacGinities Reading Tests (GATES; MacGinitie et al., 2002). The Woodcock Passage Comprehension is a cloze exercise where students are asked to silently read a short sentence or passage with a blank and give an appropriate missing word for the corresponding blank. The GATES asks students to read brief passages and then answer subsequent multiple-choice questions. These two reading tests are different in composition and it has been suggested that different reading comprehension measures tap different cognitive abilities (Cutting & Scarborough, 2006). In other words, predictors may vary depending on the outcome measure. For instance, it could be argued that a cloze exercise used to measure reading comprehension may depend strongly on vocabulary breadth, as students need to access their own vocabulary repertoire to generate an answer.

Francis, Snow, August, Carlson, Miller, and Iglesias (2006) illustrated this idea through the examination of the Woodcock Johnson Language Proficiency Battery—Revised Passage Comprehension subtest (WJLPB-R PC; Woodcock, 1991) and an experimental test, the Diagnostic Assessment of Reading Comprehension (DARC; August, Francis, Hsu, & Snow, 2006). The DARC was specifically designed to minimize the influence of word reading accuracy and vocabulary on reading

comprehension. Francis et al. (2006) hypothesized that the WJLPB-R PC is heavily affected by print related skills and tested whether the DARC and WJLB-R PC are two distinct measures of reading comprehension. Among a sample of 192 Latino ELLs it was found that the WJLB-R PC was more strongly related to print skills (i.e., decoding and fluency) than the DARC, where oral language skills carried more weight.

Keenan, Betjemann, Olson (2008) extend on this work through the comparison of the Gray Oral Reading Test (GORT; Wiederholt & Bryan, 1992), Qualitative Reading Inventory—3 (QRI; Leslie & Caldwell, 2001), the Passage Comprehension subtest from the Woodcock-Johnson Tests of Achievement-III (WJPC; Woodcock, McGrew, & Mather, 2001), and the reading comprehension subtest from the Peabody Individual Achievement Test (PIAT; Dunn & Markwardt, 1970). The GORT consists of oral reading, medium passages, and multiple choice; the QRI also contained oral reading, but long passages and short answer and retell; both the PIAT and WJPC were silent with single sentences, but the PIAT relied on picture selection while the WJPC used cloze exercises. It was found that these reading comprehension tests correlated only moderately with each other. It was further found that PIAT and WJPC were strongly predicted by decoding ability, but not the GORT and QRI measures. These findings confirm the work of Francis et al. and previous work (Francis, Fletcher, Catts, & Tomblin, 2005) that variance in reading comprehension when measured via a cloze exercise (e.g., WJLB-R PC, WJPC) is strongly associated with decoding ability. The PIAT, however, is not a cloze exercise and thus this finding also suggests that multiple-choice selection of pictures to represent sentence meaning is strongly related to word level skills.

Table 1 summarizes the research on reading comprehension of Spanish–English bilinguals that focuses on either vocabulary depth or native language as predictors. This table includes the measures used to examine reading comprehension, the final manner in which reading comprehension was conceptualized as an outcome, and its respective predictors. The only consistent measure of reading comprehension across all respective studies is a variation of the Woodcock Passage Comprehension subtest cloze exercise (WMLS-PC; Woodcock, 1991; Woodcock et al., 2001, 2005). Three of these studies used WMLS-PC as the sole indicator for English reading comprehension. However, some of these empirical investigations included another test of reading comprehension in addition to the WMLS-PC. Other tests included measures that required students to read passages and answer corresponding multiple-choice questions (e.g., GATES).

Previous work that has drawn upon multiple measures of reading comprehension, whether to create a latent variable or to examine the constructs independently have typically included two variations: a cloze exercise and short passages followed by multiple choice. A more recent test of reading comprehension, the Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner, Torgesen, Rashotte, & Pearson, 2010) requires students to read a series of sentences and determine whether the statement is true or false (e.g., *A snail can eat a thousand snakes*). The TOSREC serves as a test of silent reading fluency (Wagner et al., 2010) which relies on students ability to decode and comprehend. Recent research with the TOSREC has tested its criterion validity (Johnson, Pool, & Carter, 2011) and also examined its utility in predicting reading comprehension (Kim, Wagner, & Foster, 2011). To our

Table 1 Reading comprehension assessments, outcome variable, and language constructs included in model for studies that examine linguistic depth or Spanish language ability among Spanish–English bilinguals

	Reading comprehension assessment(s)	Latent construct created for outcome variable	Model includes depth measures	Model includes Spanish
Francis et al. (2006)	WJLB-R PC			
	DARC			
Keenan et al. (2008)	GORT			
	QRI			
	WJPC			
	PIAT			
Proctor et al. (2006)	WMLS-R PC			x
Nakamoto et al. (2008)	WMLS-R PC	x		x
	Gray silent reading test			
Swanson et al. (2008)	WMLS-R PC			x
Lesaux et al. (2010)	WMLS-R PC			x
	GATES			
Proctor et al. (2009)	WMLS-R PC	x	x	
	MCAS-ELA			
Kieffer and Lesaux (2008)	WMLS-R PC		x	
	GATES			
Proctor et al. (2012)	WMLS-R PC	x	x	x
	GATES			
	TOSREC			

knowledge there has not been a study that used the TOSREC as a sole outcome variable for reading comprehension. One study, Proctor et al. (2012), has used the TOSREC as an outcome by modeling reading comprehension using a latent variable that included the TOSREC in addition to the WMLS-R PC and that GATES.

The research on reading comprehension has not been consistent in its measurement or operationalization of the construct. Further, it is suggested that different tests of reading demand specific linguistic skills. This idea has been recently illustrated through the work Kieffer and Lesaux (2008) which examines two different tests of reading comprehension in fifth grade. This is further confirmed through the comparison of findings from the literature that examine vocabulary depth and its contribution to reading performance. Thus, the current study further investigates the relationship between variation in linguistic skills and constructs of reading comprehension by testing the same model of reading for three different tests of reading comprehension.

The present study

The present study seeks to contribute to both the research literature on Latino students' English reading comprehension and also the research on the intriguing nature of how

reading comprehension is measured and operationalized. We do this by examining a model of English reading comprehension that accounts for both English and Spanish language skills. While previous research on Latino students has looked at both English and Spanish ability, it has failed to consider biliterate ability, or lack there of, as a function of performance. The finding in Proctor et al. (2006) that the effect of Spanish vocabulary on reading comprehension diminished with less fluent readers illustrates the importance of taking into account language ability variation *within* the bilingual population. Thus, the present study extends this research by exploring bilingual students language performance as a function of biliteracy, that is the ability to not only speak, but also read in both languages. Further, consistent findings have illustrated that English oral language ability plays a significant role in Latino students' English reading ability, but few studies have investigated measures of linguistic depth knowledge as significant contributors to English reading ability. Finally, Cutting & Scarborough, (2006) have suggested that different reading comprehension measures tap different cognitive skills. In other words, predictors may vary depending on the outcome measure. This is illustrated through the work of Kieffer and Lesaux (2008) who found morphology, a measure of vocabulary depth, to be a significant predictor for two different tests of reading comprehension. Subsequent research has confirmed that vocabulary depth plays a significant role in reading comprehension for Spanish–English bilinguals (e.g., Kieffer & Lesaux, 2008; Proctor et al., 2009, 2012), but the exact construct of vocabulary depth has varied depending on the way reading comprehension is measured.

Thus, the current study builds upon previous literature by first examining English and Spanish oral language and English literacy ability (i.e., reading comprehension) as a function of biliteracy. We then examine the relationship between these linguistic constructs by testing a model of reading comprehension that looks at multiple components of linguistic ability in both English and Spanish as predictors for three different measures of reading comprehension. Our study is guided by the following research questions:

1. Is there an effect of biliteracy on the English and Spanish oral language and the English literacy performance of bilingual Latino students?
2. What is the relationship between English and Spanish oral language and the English literacy performance of bilingual students?
3. Does the relationship between English language ability (i.e., decoding, vocabulary breadth, and vocabulary depth), Spanish oral language (i.e., vocabulary breadth, syntactic ability, and biliterate ability), and English reading comprehension vary as a function of the reading comprehension measure?

The first question examines oral language and literacy performance as a function of biliteracy. The purpose of this question is to further examine if performance varies by degree of language ability. For the purpose of this study we define biliteracy as ability to speak *and* read in both English and Spanish. Thus, students who are henceforth referred to as biliterate are students who demonstrated this ability in our Spanish language battery assessment (to be discussed further in the next section). Our second research question attempts to bridge previous work that has examined vocabulary

depth knowledge and dual language ability as predictors for reading comprehension. Our third question complexifies this process by working through the model building process for three different reading comprehension measures.

Method

Participants

Participants were part of a larger, two-year study examining comprehension, language acquisition, and vocabulary development among English monolinguals and Spanish–English bilinguals (see Proctor et al., 2012). Data reported for the current research are from the second year of the project and include the Spanish–Englihs bilingual participants in grades 3–5. English and Spanish permission forms were sent to participating schools located in the northeast and mid-Atlantic region of the United States. All bilingual students whose parents gave consent were included in the study. Thus our sample includes 123 bilingual Latino elementary students from two semi-urban school districts in the United States. Students were from grades 3, 4, and 5, with 44, 45, and 34 students in each grade, respectively. Of the sample, 72 students (58.5 %) were identified by their school as English Language Learners and 105 (85.4 %) of the students received free or reduced meals. Although the majority of students were designated as ELL, all students received instruction exclusively in English. Based on findings from language and literacy assessments (discussed in more detail below), it is worth noting that while all students were identified as bilingual, only 56 of the students were also considered biliterate. Table 2 summarizes basic demographics aggregated by grade.

Measures

English reading comprehension

We used three measures to assess English reading comprehension: Woodcock-Munuz Language Survey-Revised Passage Comprehension (WMLS-R PC; Woodcock et al., 2005) subtest, the Gates-MacGinities Reading Test, Fourth Ediction (GATES;

Table 2 Participant demographics aggregated by grade

	Grade 3	Grade 4	Grade 5	Total
ELL	29	26	17	72
Non-ELL	15	19	17	51
Biliterate	17	18	21	56
Monoliterate	27	27	13	67
FARM	38	37	30	105
Non-FARM	6	8	4	18
IEP	4	7	3	14
Non-IEP	40	38	31	109

MacGinitie et al., 2002), and the Test of Sentence Reading Efficiency and Comprehension (TOSREC; Wagner et al., 2010). The WMLS-R PC (Form B) is an individual assessment where students were presented with a cloze passage; students were asked to read the passage silently and then give the missing word. Passages increased in difficulty as the student progressed and the assessment was discontinued when the student gave 5 consecutive incorrect responses. The internal reliability for the WMLS-R PC for 7–12 years old is .80–.94 (Woodcock et al., 2005).

The GATES (Form T) was group administered by grade. Students were given thirty-five minutes to read a series of grade-leveled passages and answer corresponding multiple choice questions. Test–retest reliability coefficients of the GMRT are .89–.93 for 3rd–5th grade (MacGinitie et al., 2002). The final measure of reading comprehension was the TOSREC (Form C). TOSREC is a three-minute group task. Students were presented with a grade appropriate series of sentences and were asked to rate as many sentences possible in the time period as *true* or *false*; *true* sentences were those that were grammatically and semantically correct (e.g., *A cow has a tail.*) while *false* sentences were grammatically correct, but lacked semantic truth (e.g., *Popcorn is cooked in a pool.*). The TOSREC manual reports .89–.93 alternate-form reliability for grades 2–5.

English and Spanish letter word recognition

The English and Spanish version of the WMLS-R Letter-Word Identification (LWID) subtest was used to measure students' word recognition ability. For this assessment, students were presented a series of words to read aloud, with the words increasing in difficulty as students progressed. The test was discontinued after a student incorrectly read six consecutive items. The internal reliability of this subtest is .96–.98 for 7–12 year-olds (Woodcock et al., 2005).

English and Spanish vocabulary breadth

The English and Spanish version of the WMLS-R Picture Vocabulary (PV) subtest were used to measure vocabulary breadth. Using the respective language of the assessment, students were asked to identify pictured objects. Similar to the LWID task, pictures progressed in difficulty and testing was discontinued after six consecutive errors. The internal reliability for children between 7 and 12 years old is .88–.92 (Woodcock et al., 2005).

English morphology

English morphological awareness was evaluated through the Extract the Base test (ETB; August, Kenyon, Malabonga, Louguit, & Caglarcan, 2001). For this test students are first given a word (e.g., *publicity*) and then asked to derive the base of the word to logically complete a sentence (e.g., *The ____ was happy with the show.*). Students were read the target word and sentence aloud and then asked to write their responses in the blank space provided. Students were presented with 28 items, for a total possible raw score of 28. Students received a score of 1 if the word

was either a correctly spelled response or misspelled but phonologically plausible (e.g., *empti* instead of *empty*); a score of 0 indicated an incorrect response. The local sample alpha is .843.

English semantics

Semantics was assessed solely in English. The CELF Word Class 2 subtest (WC) was used to evaluate students' semantic awareness. For this task, students were read a set of four words, two of which were semantically related (e.g. *teacher*, *school, street, cake*). Students were asked to repeat the two words that were related from the set. Testing was discontinued after five consecutive misidentifications. For children ages 7–12, the reported stability ranges from .72 to .84, and the internal consistency ranges from .72 to .82.

English and Spanish syntax

English and Spanish syntactical awareness was assessed with the Formulated Sentences (FS) subtest from the Clinical Evaluation of Language Fundamentals, Fourth Edition (CELF; Semel, Wiig, & Secord, 2003). Students were given a picture and target word, then asked to generate a complete sentence about the picture using the target word. Sentences were scored on a scale of 0, 1 or 2. A score of zero indicated that the student produced an incomplete sentence, complete sentence with two or more syntactical or semantic errors, a complete sentence that was not meaningful, failed to use the target word, or reference the stimulus picture. A score of 1 was given if a student produced a complete sentence with no more than two semantic or syntactical errors; a score of 2 was awarded to complete sentence that was first semantically and syntactically correct and second, correctly used the target word and referenced the stimulus picture. Target words became more difficult as the test progressed and administration discontinued if a student produced five consecutive scores of 0. Stability coefficients for this measure are .74–.62 and internal consistency is .82–.76 for children ages 7.0–12.11 (Semel et al., 2003).

Procedure

A team of trained research assistants administered the assessments in a quiet room. All assessments were individually administered, except for the TOSREC and GATES, which were group administered. Bilingual research assistants administered the Spanish battery during the months of January and February. Given that there is no good measure for assessing bilingual students dual language abilities (Proctor & Silverman, 2011) we compiled our batteries from the aforementioned measures.

English and Spanish battery

The English battery was administered in the months of April and May of the same academic year. Since the TORSEC and GATES were group administered, they were administered in one session on a separate testing day. The remainder of the English

assessments were compiled into an individual battery that took students 30–50 min to complete. The assessment order was as follows: formulated sentences, word classes, picture vocabulary, passage comprehension, letter-word identification, and extract-the-base. The Spanish battery was administered February of the same academic year and included the following tasks in respective order: formulated sentences, picture vocabulary, letter word identification, and passage comprehension. All assessments were first scored by the respective administrator, and then double scored by a second research assistant. With the exception of the reading comprehension tests, raw scores were used for all analyses.

Biliteracy indicator

The first two tests in the Spanish battery were strictly oral in nature (i.e., syntax and vocabulary breadth). The first task that assessed literacy ability was letter word identification; for this task students were first presented with the six basal words; students who could correctly read the six words proceeded with the test and also continued on to complete the passage comprehension test. Of the 123 students, 115 successfully passed the six basal word threshold and went on to complete the letter word identification task; however of these 115 students only 56 also demonstrated the ability to complete the passage comprehension task. Thus, while the majority of the students demonstrated the ability to successfully complete a decoding assessment, less than half of these bilingual students were also able to accurately complete a comprehension task. These students who successfully completed the letter word identification task *and* the passage comprehension task were considered biliterate.

Results

One-way analysis of variance (ANOVA) was used to address the first research question. Results revealed that for the three reading comprehension measures there were no significant differences between the monoliterate and biliterate groups. For the English predictors there was a significant positive effect of biliteracy for English word recognition, $F(1, 121) = 4.04$, $p < .05$. In other words, biliterate students significantly outperformed their monoliterate peers on the construct of English word recognition. In contrast, the monoliterate students significantly outperformed their biliterate peers on English vocabulary breadth., $F(1, 121) = 5.99$, $p < .05$. As expected, the biliterate students also significantly outperformed their monoliterate peers on all Spanish language constructs: letter word recognition, $F(1, 113) = 165.98$, vocabulary breadth, $F(1, 113) = 25.97$, and syntax, $F(1, 112) = 14.65$, all $p < .001$. Table 3 summarizes the mean performance, percentile ranks, and standard deviations for all language variables of the sample.

Bivariate correlation statistics were first used to address the relationship between English and Spanish oral language, English literacy, and biliterate ability. Table 4 summarizes these findings. In general, a significant moderate-to-strong relationship was found between all English measures ($p < .01$). There was also a significant

Table 3 Language variables for entire sample disaggregated by language status

	Total Sample (n = 123)		Monoliterate (n = 67)		Biliterate (n = 56)	
	Raw score	Percentile rank	Raw score	Percentile rank	Raw score	Percentile rank
English reading						
WMLS	18.35 (3.38)	32.02 (19.73)	18.42 (2.80)	32.28 (18.23)	18.27 (3.98)	31.65 (21.61)
GATES	23.28 (9.61)	30.95 (23.70)	23.39 (8.98)	30.70 (21.69)	23.15 (10.38)	31.24 (26.03)
TOSREC	23.06 (9.87)	33.32 (25.65)	23.22 (9.12)	31.56 (25.58)	22.86 (10.79)	35.51 (25.80)
English predictors						
Word recognition	45.56 (8.32)	43.31 (25.51)	44.34 (7.45)	39.34 (21.88)	47.34 (9.10)[a]	48.06 (28.76)
Breadth	29.98 (6.16)	37.86 (30.68)	31.34 (4.71)[b]	42.08 (24.96)	28.66 (7.34)	32.86 (35.88)
Morphology	20.35 (4.33)	n/a	19.86 (3.81)	n/a	21.12 (4.59)	n/a
Semantics	9.37 (3.35)	n/a	9.45 (2.59)	n/a	9.27 (4.08)	n/a
Syntax	34.69	n/a	35.48 (8.66)	n/a	33.77 (12.53)	n/a
Spanish predictors						
Word recognition	32.76 (11.95)	35.77 (37.20)	23.81 (5.41)	12.97 (18.87)	42.18 (9.44)[a]	59.80 (36.70)
Breadth	24.42 (7.99)	16.72 (19.93)	21.07 (7.67)	9.46 (15.90)	27.95 (6.75)[a]	24.51 (20.99)
Syntax	22.51 (9.20)	n/a	19.45 (8.59)	n/a	25.68 (8.79)[a]	n/a

[a] Biliterate students significantly outperform monoliterate students

[b] Monoliterate students significantly outperform biliterate students

Table 4 Correlation of English and Spanish language constructs

	1	2	3	4	5	6	7	8	9	10	11
1. English reading—WMLS	1										
2. English reading—TOSREC	.646**	1									
3. English reading—GATES	.440**	.540**	1								
4. English word recognition	.575**	.552**	.585**	1							
5. English breadth	.687**	.498**	.522**	.639**	1						
6. English morphology	.625**	.651**	.576**	.820**	.713*	1					
7. English semantics	.505**	.472**	.565**	.545**	.701**	.643**	1				
8. English syntax	.655**	.520**	.512**	.538**	.780**	.683**	.644**	1			
9. Spanish breadth	−.269**	−.267**	.075	−.112	−.266**	−.092	−.062	−.167	1		
10. Spanish syntax	−.002	−.108	.115	−.001	.075	.156	.140	.182	.712*	1	
11. Spanish word recognition	−.201*	−.015	.143	.207*	−.253**	.131	−.042	−.215*	.527**	.380**	1
12. Biliteracy	.143	.159	.216*	.378**	−.004	.248**	.070	.019	.217*	.189	.660**

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

positive relationship between Spanish oral language measures (i.e. breadth and syntax; $r = .712$, $p < .05$). Further, a significant moderate relationship was found between all reading comprehension measures (WMLS & TOSREC, $r = .646$; WMLS & GATES, $r = .440$; GATES & TOSREC, $r = .540$; all $p < .001$); English measures of depth also correlated significantly and moderately (morphology & semantics, $r = .643$; morphology & syntax, $r = .683$; semantics & syntax, $r = .644$; all $p < .01$). English breadth held a weak, but significant negative correlation to Spanish word recognition ($r = -.253$, $p < .01$) and Spanish vocabulary breadth ($r = -.266$, $p < .01$) Spanish and English word recognition also had a weak, but significantly positive correlation ($r = .207$, $p < .01$).

To address the third research question multiple regression was used to fit the data to three different reading comprehension outcomes: WMLS-R PC, GATES, and TOSREC. Reading comprehension was operationalized by each of the different measures according to their respective construct. Thus, for WMLS-R PC operationalizes reading comprehension as the ability to complete a cloze exercise; TOSREC operationalizes reading comprehension as the ability to read short sentences and determine their validity in a given period of time; finally, the GATES operationalizes reading comprehension as the ability to read short passages and answer corresponding multiple choice questions. Each reading comprehension measure is displayed in its own table and will be discussed separately below.

Reading comprehension as a cloze exercise

Given that our sample was exclusively bilingual students, the use of normed standard scores, which are normed to a monolingual population, were not appropriate for our sample. Thus, for the purpose of our analyses our outcome variables were converted to z-scores, which indicate the relative distance of each student's raw score performance from the sample mean, indicated as a proportion of the standard deviation of the sample mean. While the use of z-scores instead of the standard scores constrains us to generalizations within our sample, we believe that the interpretations help us better understand the nature of language and reading comprehension within this particular bilingual population. Table 5 summarizes the model-building process for developing a model for reading comprehension that accounts for L1 and L2 language ability. Model 1 displays our baseline model, age and English word reading ability. Our baseline model accounted for 38 % of the variation. Model 2 added English language ability, specifically a measure of vocabulary breadth and 3 measures of vocabulary depth: syntax, semantics, and morphology. Model 3 added Spanish oral language into the model. The final model tested the role of biliteracy. Biliteracy was determined by student ability to complete the Spanish reading task; as discussed in the method section students who completed the Spanish reading task were considered biliterate. In summary, Model 3 proved to be the best fitting model tested, which accounted for 63 % of the explained variation ($F = 23.99$, $p < .001$). On control for the other variables in the model, for each one-point change in vocabulary breadth, morphology, and syntax there was an associated .047, .042 and .028 respective change on the z-score performance for the WMLS-R.

Table 5 Regression models investigating the role of English language, Spanish language, and biliteracy on English reading comprehension (WMLS-PC z-score) controlling for age and word recognition ability

Variable	Model 1		Model 2		Model 3		Model 4	
	Est. (SE)	Standard est.	Est. (SE)	Standard est.	Est. (SE)	Standard est.	Est. (SE)	Standard est.
Intercept	−3.25 (.769)***		−4.08 (.634)***		−4.08 (.644)***		−3.99 (.659)***	
Age	.008 (.069)	–	.023 (.054)	–	.026 (.058)	–	.002 (.059)	–
English word recognition	.070 (.009)***	.616	.014 (.010)	–	.012 (.011)	–	.009 (.011)	–
English vocabulary								
Breadth			.047 (.017)**	.287	.047 (.018)*	.287	.050 (.019)*	.310
Morphology			.038 (020)	–	.042 (.021)*	.197	.041 (.021)	–
Semantics			.012 (.024)	–	.012 (.024)	–	.012 (.024)	–
Syntax			.027 (.009)**	.296	.028 (.009)**	.312	.028 (.009)*	.311
Spanish oral language								
Breadth					.005 (.012)	–	.004 (.012)	–
Syntax					−.008 (.010)	–	−.009 (.010)	–
Biliteracy								
Dichotomous view							.092 (.139)	–
R^2	.381		.651		.630		.655	
ΔR^2	.381***		.269***		.002		.002	
df	108		104		102		101	

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

Table 6 Regression models investigating the role of English language, Spanish language, and biliteracy English reading comprehension (GATES) z scores controlling for age and word recognition ability

Parameter	Model 1		Model 2		Model 3		Model 4	
	Est. (SE)	Standard est.	Est. (SE)	Standard est.	Est. (SE)	Standard est.	Est. (SE)	Standard est.
Intercept	.267 (.874)		.548 (.879)		.414 (.887)		.478 (.912)	
Age	−.302 (.079)***	−.312	−.327 (.076)***	−.337	−.355 (.081)***	−.366	−.358 (.082)***	−.369
English word recognition	.061 (.010)***	.509	.031 (.014)*	.257	.028 (.015)	–	.026 (.016)	–
English vocabulary								
Breadth			−.017 (.024)	–	−.008 (.025)	−.048	−.006 (.026)	–
Morphology			.021 (.028)	–	.023 (.029)	–	.023 (.029)	–
Semantics			.084 (.033)*	.280	.079 (.033)*	.263	.079 (.033)*	.263
Syntax			.19 (.012)	–	.021 (.012)	–	.021 (.012)	–
Spanish oral language								
Breadth					.022 (.016)	–	.022 (.017)	–
Syntax					−.015 (.014)	–	−.016 (.014)	–
Biliteracy								
Dichotomous view							.066 (.195)	–
R^2	.313		.423		.434		.434	
ΔR^2	.313***		.110**		.011		.001	
df	105		101		99		98	

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

Reading comprehension as passages with corresponding multiple choice

Table 6 summarizes the model-fit process with GATES as the dependent variable. The baseline model only accounted for 30 percent of the variation. The best fitting model was Model 3 ($F = 9.47$, $p < .001$) which explained 43 % of the overall variation. On control for other variables, a one-point change in English semantics was associated with a .079 z-score change in performance on the GATES.

Reading comprehension as a timed silent reading sentence judgment task

Table 7 summarizes the model-fitting process using TOSREC as the outcome measure. In this iteration the baseline model accounted for almost 41 % ($p < .001$) of the explained variation. The addition of Spanish oral language in Model 3 did not significantly change the overall variation ($\Delta R^2 = .024$, $p > .05$), however age became non-significant and English morphology ($B = .061$, $p < .05$) and English syntax ($B = .025$, $p < .05$) became significant predictors. Interestingly, Spanish syntax is also a significant predictor ($B = -.024$, $p < .05$) however it is a negative effect. This suggests for this particular measure Spanish language may be interfering with performance. Model 3 ($F = 15.35$, $p < .001$) was our more robust model.

Discussion

Despite the fact that the number of bilingual students is rapidly increasing, research examining the within-group performance of bilingual students' language ability is limited. This study adds to the previous knowledge base regarding reading comprehension in two significant ways: (1) challenging the Simple View of Reading (Hoover & Gough, 1990) by testing the role of both vocabulary depth contribution and dual-linguistic ability in English reading comprehension; and (2) examining the manner through which reading comprehension is understood through measurement and conceptualization.

Reading comprehension among bilingual students: a not so simple view

In dividing our bilingual sample into biliterate and monoliterate groups we are able to examine differences within this population. It was found that biliterate students significantly outperformed their monoliterate peers on English word recognition $F(1, 121) = 4.04$, $p < .05$. In contrast, monoliterate students significantly outperformed their biliterate peers on the construct of English vocabulary breadth, $F(1, 121) = 5.99$, $p < .05$. This is not surprising, as we would expect that monoliterate students come from homes with a higher frequency of English language use compared to their biliterate peers. However, the finding that biliterate students outperform their monoliterate peers on English word recognition, suggests potential for cross-linguistic transfer. This finding aligns with Bialystok's (1988) idea that the more bilingualism one possesses, the higher linguistic awareness. Biliterate students, who arguably possess more bilingual skills performed in the 59th

Table 7 Regression models investigating the role of English language, Spanish language, and biliteracy English reading comprehension (TOSREC) z score controlling for age and word recognition ability

Parameter	Model 1		Model 2		Model 3		Model 4	
	Est. (SE)	Standard est.	Est. (SE)	Standard est.	Est. (SE)	Standard est.	Est. (SE)	Standard est.
Intercept	−2.13 (.801)**		−2.25 (.794)**		−2.21 (.789)**		−2.24 (.809)**	
Age	−.143 (.072)*	.072	−.148 (.068)*	−.152	−.127 (.071)	–	−.125 (.072)	–
English word recognition	.078 (.009)***	.647	.040 (.013)**	.333	.033 (.013)**	.275	.034 (.014)*	.283
English vocabulary								
Breadth			−.005 (.021)	–	−.008 (.022)	–	−.009 (.023)	–
Morphology			.049 (.026)	–	.061 (.026)*	.269	.062 (.026)*	.270
Semantics			.039 (.030)	–	.041 (.030)	–	.041 (.030)	–
Syntax			.020 (.011)	–	.025 (.011)*	.242	.025 (.011)*	.253
Spanish oral language								
Breadth					.010 (.014)	–	.011 (.014)	–
Syntax					−.024 (.012)*	−.217	−.023 (.012)*	−.213
Biliteracy								
Dichotomous view							−.034 (.171)	–
R^2	.416		.523		.546		.547	
ΔR^2	.416***		.106***		.024		.000	
df	108		104		102		101	

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

percentile in Spanish word recognition and in the 48th on English word recognition, perhaps suggesting that these students are transferring their Spanish word reading skills. Finally, as would be expected, biliterate students significantly outperformed their monoliterate peers on all Spanish measures, as their ability to read in Spanish would positively correlate to vocabulary and word recognition ability. Thus, since biliterate students outperform their monoliterate peers on Spanish indicators, and English decoding, and both groups perform comparably on English measures it would seem that promotion of Spanish development should be favorable, especially if there is potential for cross-linguistic transfer.

Consistent with previous research (Lesaux et al., 2010; Nakamoto et al., 2008) the baseline model for all three reading measures found English word recognition to be a significant predictor of reading comprehension. However for the WMLS-R, upon the addition of English language variables the significant effect of English word recognition was no longer present. This is curious given that previous research has suggested that decoding is more strongly associated with performance on a cloze exercise (Francis et al., 2006; Keenan et al., 2008). However, this finding further suggests the role of oral language and vocabulary knowledge (Proctor et al., 2012) in English reading comprehension above and beyond that of decoding ability. It is also curious to note that upon the addition of Spanish language variables into our model English morphology becomes a significant predictor. This finding further suggests potential for cross-linguistic transfer, as students may be leveraging their Spanish language ability in English reading comprehension.

For the GATES, with the addition of English language variables, English word recognition remains a significant predictor. However, it is curious to note that upon the addition of Spanish language variables the significant effect for English word recognition is no longer present. This is congruent with previous research that Spanish language may play role in English reading comprehension (Proctor et al., 2006), further suggesting potential for cross-linguistic transfer.

Our final measure of reading comprehension, the TOSREC, was curiously the only reading construct where English word recognition remained a significant predictor across all models. Previous work which has compared different reading comprehension measures as outcomes has been primarily limited to monolinguals and it is worth noting that varying language ability may rely on different skills. For instance the work of Kim et al. (2011) found that in using a latent variable comprised of cloze exercises (i.e., Passage Comprehension subtest, Woodcock et al., 2001; Woodcock Reading Mastery Test-Revised, WRMT-R, Woodcock, 1987) and passages with corresponding open ended questions (experimental passages; Kim et al., 2011) decoding predicted reading comprehension better for average first grade readers that their more skilled peers. In other words the more advanced readers did not rely as heavily on decoding. Given the underwhelming English literacy performance demonstrated by this sample, perhaps, at least in the case of the TOSREC, limited proficiency constrains this sample to rely more heavily on decoding.

Finally, in testing the contribution of biliterate ability in language performance and reading comprehension our findings were null. This is not too surprising given variability in the sample; within the biliterate sample only one student was able to read at age level in Spanish. It is worth mentioning that when considering the norm

standard scores in English, the sample average performed at the 50th percentile in word recognition, but for reading comprehension on average our sample fell in the 30th percentile. This alone suggests that even if there is a biliterate advantage, in an English-only learning environment bilingual students still do not receive the necessary support to achieve proficiently. Further investigation of dual language interaction and native language support is needed to better understand how we can support bilingual students in the classroom.

Differentiation in constructs

The second main finding in this study was the association of different predictors depending on the reading measure outcomes. English vocabulary breadth was a significant predictor for the WMLS-R, this finding is curious as the WMLS-R was the only construct where English vocabulary breadth was significant. The WMLS-R is a cloze-exercise, thus this finding seems logical since performance depends on students' ability to draw from their own vocabulary bank to correctly complete the task.

Interestingly, English syntactic awareness and morphology were significant predictors for both the TOSREC and the WMLS-R. In regards to syntactic awareness, this is notable as only a few studies have also found this association (Low & Siegel, 2005; Mokhtari & Thompson, 2006; Proctor et al., 2012). Syntactic awareness requires higher order thinking, as it is contingent not only on the ability to combine words, but to do so grammatically and in the appropriate context. This is particularly challenging for bilingual students, as they must be able to navigate between two languages that do not share common grammatical rules. This finding also complements the work of Kieffer and Lesaux (2008) that for Spanish–English bilinguals morphology is a significant predictor to the WMLS-R; interestingly Kieffer and Lesaux (2008) also found morphology to be a significant predictor for the GATES, although that is not consistent with the present study. Of curious nature is the finding that semantics, the vocabulary depth construct that was not significant in the TOSREC or the WMLS-R, was the single significant English language predictor for the GATES. The variation of significant predictors across constructs supports previous research that different reading constructs may be associated with varying linguistic and cognitive abilities (Cutting and Scarborough, 2006).

It is also interesting to note that the TOSREC was the single measure where English word reading ability remained significant *and* Spanish language, albeit negative, had a significant effect. According to the automaticity view of reading (LaBerge & Samuels, 1974) fluency affects comprehension, as the less effort a student needs to expel on decoding the more cognitive processing they have available for constructing meaning and making inferences. The TOSREC is a cognitively demanding test as it requires readers to read a sentence then determine if it is grammatically correct and meaningfully accurate. The finding that English word reading ability is a significant predictor while also maintaining a negative effect of Spanish syntax suggest that Spanish language may be interfering with the fluency demands required to successfully complete the TOSREC.

Our model of reading comprehension challenges the Simple View of Reading (Hoover & Gough, 1990) by testing the role of vocabulary depth in reading for three

different reading comprehension assessments. As discussed earlier it is curious that English word recognition remained a significant predictor for TOSREC, but not for WMLS-R or GATES; however as discussed in the previous paragraph, the cognitive demands of the TOSREC may constrain this particular sample to rely heavily on decoding ability (Kim et al., 2011; LaBerge & Samuels, 1974) Also of interest and congruent with previous research (Tannenbaum et al., 2006; Proctor et al., 2009) is that vocabulary breadth is a significant predictor for the WMLS-R measure, but not the GATES or TOSREC. Given the nature of a cloze exercise, readers must draw upon their own vocabulary bank in order to complete the passages, thus the finding that breadth is a significant predictor is logical. Congruent with previous work on semantic awareness (Proctor et al., 2009, 2012) we found this construct to be a significant predictor for the GATES. This relationship to the GATES is plausible as this test requires students to be able to make meaningful connections between the questions asked and the corresponding passages they read.

Our model for reading comprehension explained 63 % of the variation for the WMLS-R Passage Comprehension subtest ($F = 23.99$, $p < .001$) with English syntax (.312, $p < .01$) as the strongest coefficient estimate. The finding that syntax was a stronger coefficient than breadth illustrates the importance of vocabulary depth beyond that of vocabulary breadth; in other words merely knowing words is not enough, but *how well* you know a word plays a role in English reading comprehension. In contrast only 43 % of the variation in reading comprehension ability was explained for the GATES ($F = 9.47$, $p < .001$). Finally, when testing the model with TOSREC ($F = 15.35$, $p < .001$) as the outcome variable, 55 % of the variation in reading comprehension was accounted for with English decoding (275, $p < .01$) as the strongest coefficient estimate. When synthesized together our two findings suggest that regardless of the reading measure vocabulary depth has a significant relationship with Latino bilinguals' English reading comprehension ability, however the exact role varies depending on the construct.

Thus, while our work confirms previous work on the relationship between vocabulary depth and reading comprehension (Deacon & Kirby, 2004; Kieffer & Lesaux, 2008; Nation & Snowling, 2004; Proctor et al., 2012), some commonalities and differences are curious. Kieffer & Lesaux (2008) found morphology to be a significant predictor to English reading comprehension on both the WMLS-R and Gates, when in this replication it was significant for the WMLS-R and the TOSREC, but not the GATES. Thus, we echo the finding that morphology significantly predicts reading comprehension, but there is variation across constructs. Proctor et al. (2012) found syntactic awareness and semantic as significant predictors in their latent construct of reading. These findings were illustrated in WMLS-R (syntax), TOSREC (syntax) and GATES (semantics).

Conclusion

The nature of reading comprehension, particularly among bilingual students, is a construct that is neither easily measured nor easily operationalized. The current study raises some theoretical and empirical questions for future work. First,

theoretically, we must move beyond the idea that reading comprehension can be simply understood through the examination of bilingual students' ability on word reading tasks. The overall variation explained increased for all three measures of reading comprehension upon the addition of English vocabulary knowledge measures. This challenges future work to test models of reading comprehension that push the limits of the Simple View of Reading (Hoover & Gough, 1990). Another important implication in our work is the negative finding of Spanish language playing a role in English reading comprehension for the TOSREC reading test. While it has been suggested that bilingual students have the potential for cross-linguistic transfer (Cummins, 1979; Proctor et al., 2010) it is difficult to illustrate this idea empirically. Spanish language was only influential in the same measure where word level skills not only remained significant, but was also the strongest coefficient. Previous work has demonstrated the effect of Spanish being stronger for fluent bilingual readers (Proctor et al., 2006), this idea coupled with the notion that less proficient readers may rely more on decoding (Kim et al., 2011) further suggests that bilingual students vary in proficiency in their native and second languages resulting in degrees of bilingualism (Bialystok, 1988) that manifest differently in language ability and, consequently, literacy performance. It is important to note that our sample of students demonstrated low proficiency in both English and Spanish and, although Spanish was spoken in the home, students did not receive any academic instruction in Spanish. Further, of the Spanish students who were biliterate, only one student was able to read at grade level. This raises the question of whether there is a certain threshold of native and second language ability that must exist in order for cross-linguistic transfer to be manifested in reading comprehension ability. Further, existing assessments for measuring reading comprehension do not account for bilingual or biliterate ability.

Limitations and implications for future research

Our study is constrained to a Spanish–English sample which helps us further understand reading comprehension for bilingual students. We do not, however, account for varying language proficiency within our reading models. We ask if there is an effect of biliteracy on language and literacy performance, but not we do not test our reading model for the two different populations. Future work should be more cognizant of varying degrees of bilingualism and investigate if predictors of reading ability are the same within the bilingual population (i.e., biliterate vs. monoliterate). Also, for the purpose of our study we drew upon a number of standardized assessments to create a robust English battery with a Spanish equivalent. A limitation in our field is the dearth of assessments that are appropriate for capturing *bilingual* ability (Proctor & Silverman, 2011), rather we use assessments of English and their Spanish equivalents to try and understand the nature of language and literacy for Spanish–English bilinguals. Bilinguals are not the sum of two monolinguals (Grosjean & Grosjean, 2010) and in order for our field to move forward it is imperative that we develop measures that are appropriate for bilingual individuals. We constrain our model to linguistic ability and do not

account for other variables notable in the role of reading comprehension, such as background knowledge, home environment, or schooling. Subsequent work would benefit from the addition of contextual variables, as there are additional notable factors that play a role in reading comprehension. Finally, the present study tested a model of reading comprehension against three different reading comprehension assessments. Concurrent with previous work we demonstrated that different measures demand different linguistic skills. Given our own and previous findings, future researchers must be cognizant of measures selected for measuring reading comprehension and how the ultimate outcome of reading comprehension is conceptualized, particularly when working with bilingual students.

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