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Phonological Awareness Trajectories: Young Spanish–English and Cantonese–English Bilinguals

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Abstract

This study focused on the phonological awareness skills of 72 Spanish–English and 86 Cantonese–English bilinguals, all enrolled in bilingual and mainstream classrooms in the same schools. Bilinguals were assessed on phonological awareness, decoding, vocabulary, and knowledge of book reading each year from kindergarten until second grade. Individual growth modeling analysis revealed no difference in growth trajectories of English phonological awareness between (a) Spanish–English and Cantonese–English bilinguals and (b) children enrolled in bilingual and mainstream programs. Within-language decoding, vocabulary, and knowledge of book reading were associated with the estimated average initial levels of phonological awareness skills, while only knowledge of book reading had significant effects on the estimated growth trajectory of phonological awareness skills. These findings suggest that young bilinguals with different home languages may have similar growth trajectories in English phonological awareness skills during early elementary school years. The findings have implications for early educational practices.

Keywords

phonological awareness; longitudinal; bilingual; language development; children

Introduction

The concept of phonological awareness relates to a child's ability to recognize and identify sounds used in speech. For both alphabetic and non-alphabetic reading, phonological awareness has been shown to play a critical role in literacy development (e.g., Li, Shu, McBride-Chang, Liu, & Peng, 2012; Nithart et al., 2011; Shu, Anderson, & Wu, 2000; Soltani & Roslan, 2013; Wagner, Torgesen, & Rashotte, 1994; Yeung & Ganotice, 2014). Moreover, studies have shown that a child's phonological awareness is a predictor of later reading achievement for both monolinguals (e.g., Anthony, Williams, McDonald, & Francis, 2007) and bilinguals (e.g., Chiappe, Siegel, & Gottardo, 2002; Lesaux, Rupp, & Siegel, 2007; Yeung & Chan, 2013). However, most studies in this area have examined bilinguals without specifying their home language or have focused on Spanish–English bilinguals and not on other bilingual groups, such as Chinese–English bilinguals. While English and

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Spanish are alphabetic languages, the Chinese writing system is morphosyllabic (Shu & Anderson, 1997). In the Chinese writing system, the characters contain phonetic radicals linked to the sound of the character and semantic radicals connected to meaning (Ho & Bryant, 1997). Additionaly, individual Chinese characters signify one syllable and contain consonant–vowel or consonant–vowel–consonant constructions. Furthermore, unlike English and Spanish, Chinese characters do not have consonant clusters. As such, Spanish–English bilinguals and Chinese–English bilinguals may differ in the growth of phonological awareness skills. This study therefore aimed to analyze individual differences in both bilingual children's initial level and their growth trajectory of phonological awareness skills and to investigate whether variation in phonological awareness skills at the beginning of kindergarten and change in their growth are related to any factors such as children's home (first) language (L1) and their home literacy practices. Findings will help fill a gap in the understanding of the acquisition and development of literacy skills in bilingual children from diverse cultural backgrounds where the home language differs (Hammer, Hoff, Uchikoshi, Gillanders, Castro, & Sandilos, 2014; Hammer, Jia, & Uchikoshi, 2011).

Background Literature

Phonological Awareness Skills in Bilinguals

Past studies that have compared bilinguals with different language combinations have shown that bilinguals perform differently in phonological awareness skills based on how similar or different their two languages are. Furthermore, prior research has been cross-sectional, comparing different groups of bilinguals at one point in time. There is a need for longitudinal studies that analyze developmental patterns in phonological awareness development among bilingual children with different home languages.

Bialystok and colleagues studied the phonological awareness skills relating to monolingual English speakers and two different groups of bilinguals in first and second grades whose L1 was Chinese (consisting of both Cantonese and Mandarin speakers) or Spanish (Bialystok, Majumder, & Martin, 2003). They found that all three groups differed, with the Spanish–English bilinguals having the highest mean scores on a phoneme segmentation task given in English. In their study, the next highest performing group was the monolinguals. The Chinese–English bilinguals had the lowest scores in that study. The authors suggested that the similarities in the phonological and orthographic structures of Spanish and English and the transparent letter–sound correspondences of Spanish may have helped the Spanish–English bilinguals score higher on the English phonological awareness tasks than the children who were Chinese–English bilinguals. The Chinese–English bilinguals did not have this facilitating effect, because the phonological and orthographic structures of Chinese and English are different. Although all groups were selected from community language programs as well as schools in the same diverse urban neighborhoods, no further details were given about the schools, the phonological awareness instruction, or the participants' socioeconomic status.

In a follow-up study, Bialystok and colleagues analyzed data regarding the decoding and phonological awareness skills of English monolingual first graders and three groups of bilingual first graders whose other languages were either Cantonese, Hebrew, or Spanish

(Bialystok, Luk, & Kwan, 2005). Again, on an English phonological segmentation task and an English decoding task, on average, both the Hebrew–English bilingual children and the Spanish–English bilingual children scored higher than both the English monolinguals and the Cantonese–English bilinguals, providing further evidence suggesting that if a child's two languages are both alphabetical, the child receives phonological awareness benefits from being bilingual. In this study, not all of the different bilingual groups attended the same schools, even though all of the children in the study lived in the same urban neighborhoods. For example, the Hebrew–English bilinguals were enrolled in a private day school, while the Spanish–English bilinguals appeared to attend different schools. Only the monolingual and the Cantonese–English bilinguals attended the same public schools. No further details were given about the schools, the phonological awareness instruction, or the participants' socioeconomic status.

Many previous studies have overlooked the role of classroom instruction in promoting the development and growth of phonological awareness skills. Although much is known about the role of instruction with monolingual English students, there is significantly less literature targeting the impact of instruction on the growth and development of phonological awareness in bilinguals (Francis, Lesaux, & August, 2006). In fact, in their meta-analysis of bilinguals' phonological awareness skills in both languages, Branum-Martin, Tao, Garnaat, Bunta, and Francis (2012) found that phonological awareness instruction was not adequately described in most studies. They noted that although instruction likely influences bilingual relationships, there was not enough representation of the various instructional models (e.g., dual immersion or transitional bilingual models). Their meta-analysis involved cross-language associations between phonological awareness in the bilinguals' two languages, and their results revealed high cross-language correlations when the two languages were alphabetic languages, but the same correlations varied widely when the languages were not, such as Cantonese and English.

In a recent study with monolinguals from six European home languages, Duncan and colleagues (2013) examined the role of instruction in the development of phonological awareness in several different languages including Portuguese, English, Spanish, French, Icelandic, and Greek. The children received instruction in phonics and decoding in each language. The results showed that instruction in decoding and phonics had a more significant effect than differences in the literacy structures of native languages on 5- and 6-year-olds' abilities to manipulate phonemes.

Past research has not examined different bilingual groups who receive the same type of second language (English) literacy instruction, most likely because of the difficulty in finding such participants and schools. However, prior research has shown that awareness of phonemes is fostered by instruction in reading of alphabetic characters (e.g., Duncan et al., 2013). Therefore, more research needs to examine groups of bilinguals who are receiving similar instruction and to target children both in mainstream classrooms in which all instruction is in English and in bilingual classrooms in which English instruction is supplemented with instruction in the home language. In a recent study, we compared bilingual children with different language dominance enrolled in the same classrooms and receiving the same literacy instruction (Kuo, Uchikoshi, Kim, & Yang, 2016). In this cross-

sectional study, we found that both Japanese–English and English–Japanese bilingual children in dual language first- and second-grade classrooms performed similarly and scored higher than their English monolingual classmates on questions that included, for example, syllables with onsets shared between Japanese and English. Classroom instruction and exposure to the two languages, rather than language dominance, appeared sufficient for the Japanese–English and English–Japanese students to perform similarly on an English phonological awareness task. Thus, if given similar English phonological awareness instruction, bilingual children enrolled in bilingual and mainstream classrooms may perform comparably.

Factors in the Development of Phonological Awareness

Apart from reading instruction, past research suggests that decoding skills, vocabulary, and shared book reading also influence the growth in phonological awareness skills. For instance, decoding skills help both monolingual and bilingual children develop phonological awareness skills (e.g., McGuinness, McGuinness, & Donohue, 1995; Perfetti, Beck, Bell, & Hughes, 1987). Experience decoding a written language also allows the child to understand phoneme-level information, boosting their phonemic awareness. Decoding and awareness of phonemes have a bidirectional relationship with each other (e.g., National Reading Panel, 2000; Perfetti et al., 1987), although the ultimate value of developing phonological awareness is in learning to decode.

There is also evidence that vocabulary development is related to development of phonological awareness. The lexical restructuring model suggests that vocabulary growth helps children's phonological systems to develop and become increasingly better at distinguishing phonemes (Metsala & Walley, 1998). By this theory, children's phonological representations undergo a series of changes in which they become more segmental over time (Goswami, 2000; Metsala & Walley, 1998). At first, children's phonological representations are thought to be whole words. When children's vocabulary increases, children start to understand that each word is represented by syllables and then, finally, by distinct phonemes. High-frequency words from dense neighborhoods drive segmental restructuring. Consistent with this model, Chiappe and colleagues reported that, for English monolinguals, vocabulary knowledge was associated with phonological awareness skills for first through third graders (Chiappe, Chiappe, & Gottardo, 2004), with correlations between (a) children's receptive and expressive vocabulary and (b) children's ability to perform phoneme deletion and blending exercises.

Shared book reading at home may be another predictor in the development of children's phonological awareness skills. A meta-analysis found that, during a child's preschool years, the amount of book reading with an adult explained some of the variance in early literacy proficiencies, including the awareness of phonemes (Bus, van Ijzendoorn, & Pellegrini, 1995). Similarly, in low- and middle-income families, Raz and Bryant (1990) found children's phonological awareness to be linked to the amount of shared book reading at home and the frequency of library visits.

The Present Study

As noted previously, past studies have often compared bilinguals without controlling for classroom instruction or for how much literacy instruction in the L1 the bilinguals have received. As instruction influences the growth of phonological awareness, differences in exposure and instruction may distort general effects (Comeau, Cormier, Grandmaison, & Lacroix, 1999; Duncan et al., 2013; National Reading Panel, 2000). In English, reading reinforces phonological awareness development in a reciprocal manner (McGuinness, McGuinness, & Donohue, 1995; Perfetti et al., 1987), perhaps compounding the effects of instruction. Although much is known about the influence of instruction on monolingual students learning English, less is known about effective instruction for bilinguals (Francis et al., 2006), and very little is known about differences between instruction for phonological awareness in bilingual classrooms versus mainstream classrooms. In bilingual classrooms, children receive reading instruction in both the L1 and school (English) languages, whereas in mainstream classrooms, children receive instruction only in the school language. Whether learning to read in the L1 impacts the growth in phonological awareness of bilinguals remains to be examined. Therefore, one goal of this study was to examine the development of phonological awareness skills in bilinguals enrolled in both bilingual and mainstream classrooms.

Furthermore, to understand the developmental trajectories of bilinguals, students from two different bilingual groups were sampled from the same schools, receiving similar literacy instruction. The bilinguals' L1 was either Cantonese, a language that is different from English in phonological and orthographic structures, or Spanish, a language that is similar to English and shares an alphabetic writing system. By examining the phonological awareness development in these two groups receiving similar classroom literacy instruction over a three-year period, we could compare the growth trajectories in English phonological awareness skills between bilinguals with different language combinations.

This study focused on Cantonese bilinguals rather than Mandarin bilinguals because Cantonese instruction does not utilize a romanization system, such as pinyin, to teach Cantonese. Mandarin, on the other hand, is frequently taught using pinyin. Consequently, by including one set of bilinguals who are exposed to alphabetic reading only in English (Cantonese–English bilinguals) and another set of bilinguals who are exposed to alphabetic reading in two languages (Spanish–English bilinguals), it was possible to clarify the development in phonological awareness of bilinguals. The following questions were addressed in this study:

1. Do initial levels and growth trajectories of phonological awareness skills differ between Spanish–English and Cantonese–English bilinguals?
2. Do growth trajectories of phonological awareness skills differ based on whether the children are in bilingual classrooms or in mainstream classrooms as they learn to read in English?
3. How do decoding, vocabulary, and shared book reading at home affect the initial levels and growth trajectories of phonological awareness skills?

To answer these questions, longitudinal data were collected and analyzed through individual growth modeling (Singer & Willett, 2003; Willett, 1994).

Method

Participants

Data were collected from a total of 158 students, including 86 Cantonese–English bilingual children and 72 Spanish–English bilingual children, at three time points: fall of kindergarten, spring of first grade, and spring of second grade. When data were collected in kindergarten, the age of the children was, on average, about 5 years and 3 months. The full range of ages of the kindergarten participants extended from 4 years and 8 months to 6 years and 8 months. Children were recruited for the study from six schools in two diverse urban school districts in California which enrolled high percentages of Cantonese–English and Spanish–English children. Children's L1s were all verified through parent surveys. Survey results also confirmed that the home language was either exclusively Spanish or Cantonese or a mostly Spanish or Cantonese with some English. All children were typically developing and had not been identified for learning difficulties or for an individualized education program through the school district. Although consent form return rate differed by classroom, it averaged 73%.

According to demographic data published by the district, school enrollment data, and parental questionnaires, 75% or more of the students in this study received free or reduced lunch through a federally assisted meal program for children from low income homes in the United States. Background data were collected through parental questionnaires (see below). A total of 137 (87%) of the parents responded to the questionnaire; the majority (115) indicated that their child was American-born. The majority of the Cantonese-speaking parents responded that they were from Guangzhou, China (46), with the rest reporting Vietnam (8) and Hong Kong (5) as the countries of birth. The majority of Spanish-speaking parents responded that they were from Mexico (33), and the remainder reported Guatemala and El Salvador (6 each) as the country of birth. Many of the parents had not graduated high school, had low English proficiency, and lacked the time to help their children with homework or to read to their children in English.

Three of the six schools enrolled all bilingual children in the mainstream classroom. The remaining three schools had separate early-exit transitional bilingual programs for native Spanish-speaking children and native Cantonese-speaking children, as well as regular mainstream classrooms. Parents, with guidance from the school district, were able to request enrollment of their children in either a mainstream or bilingual program. In this study, to explore differences in programs, children were recruited from bilingual and mainstream programs so that there would be varied L1 and English proficiency levels. A total of 81 (34 Spanish) in kindergarten, 79 (44 Spanish) in first grade, and 73 (39 Spanish) in second grade were enrolled in bilingual classrooms.

At kindergarten entry, all children took the state-mandated California English Language Development Test (CELDT). Based on this test, all participating children were identified as English learners and were receiving second language English instructional support when

they joined the study. At the end of kindergarten, 15 children were reclassified on the CELDT and moved from the bilingual program to mainstream first grade classrooms. At the end of first grade, one child was reclassified on the CELDT and was placed in a mainstream second grade classroom. To be reclassified, a student must meet the following requirements: (a) an overall CELDT score of 4 (defined as early advanced) or 5 (defined as advanced), with (b) no subscore on the CELDT below 3 (defined as intermediate), and with (c) teacher approval.

In the early-exit transitional bilingual programs, instruction was in Cantonese or Spanish approximately 90% of the time and in English for the remaining 10% during the kindergarten year. By second grade, the ratio varied by classroom and was determined by the classroom teacher depending on the topic or the background knowledge of the children in the class, but only 10–40% of the instruction was conducted in Cantonese or Spanish, with the remaining time in English. For children in the Spanish–English and Cantonese–English bilingual classrooms, the two groups of bilinguals were in different classrooms. Bilinguals in the mainstream classrooms were placed in classrooms with monolingual English speakers as well as children who spoke other languages at home. The teachers in both mainstream and bilingual classrooms taught from the same state-adopted textbooks and had weekly grade-level team meetings to plan their weekly lessons, ensuring that they all covered similar topics and that the lessons aligned with state standards. During interviews, the teachers addressed the importance of these weekly grade-level meetings to ensure that all classrooms received the same curriculum and met the same goals. Literacy instruction followed a balanced literacy approach with a combination of phonics and whole language instruction. Classroom observation data using the Early Language and Literacy Classroom Observation (ELLCO) Toolkit (Smith, Dickinson, Sangeorge, & Anastasopoulos, 2002) found that all classrooms surpassed the ELLCO standard for teaching practices. The classroom environment in each classroom was organized, and classrooms were managed in a supportive and positive atmosphere with a focus on diversity in classroom activities. A detailed analysis of the classroom environment and literacy instruction is reported elsewhere (Uchikoshi & Maniates, 2010). Additionally, Cantonese literacy instruction did not include instruction in pinyin.

For all of the 158 students, data were collected at three time points for 108 (44 Spanish) children and at two time points for 50 (31 Spanish) children. In kindergarten, 129 (51 Spanish) children participated in the study, while in first grade, the number increased to 150 (70 Spanish) children, ending in second grade at 145 (62 Spanish) children. Children who left the school or who were added in first grade did not differ in their achievement scores from the children with complete data.

Materials

All children were assessed individually in both English and their L1 by trained assessors. Each of the assessors was a native speaker in the language being tested and was trained to only speak the language of testing. Testing was conducted over two 30-minute sessions, one for each language.

English Phonological Awareness—Children were tested on the blending, elision, and segmentation word subtests of the Comprehensive Test of Phonological Processing (Wagner, Torgesen, & Rashotte, 1999). There was a total of 20 items in each of the subtests conducted. In the blending subtest, children were asked to form real words by putting together sounds or syllables. In contrast, the elision subtest asked children to listen to a word and then repeat the word with a portion (e.g., a syllable) missing. Finally, the segmenting subtest asked children to say a word and then repeat "one sound at a time," thereby stating each phoneme in the word. The internal consistency from the norms for 7-year-olds is .91 for elision, .86 for blending, and .90 for segmenting (Wagner et al., 1999). As blending and elision subtasks were assessed at all time points, the raw scores of both subtests were used to form a combined phonological awareness variable and were used for the growth modeling analysis. Segmenting was assessed only in second grade, because this skill is acquired later than blending and elision (Wagner et al., 1999).

Decoding Skills—The ability to decode words in English was assessed using the letter–word identification subtest in the Woodcock Language Proficiency Battery–Revised (WLPB–R; Woodcock, 1991). In this subtest, the first five questions test a child's ability to match a rebus with a picture. The questions that follow examine a child's ability to identify alphabetic letters and read a list of high-frequency words. The items eventually increase in difficulty to include multisyllabic or low-frequency words, which measures the children's skill in decoding real English words. The split-half reliability from the norms for 6-year-olds is .96 (Woodcock, 1991).

English Vocabulary—Receptive English vocabulary was assessed using the Peabody Picture Vocabulary Test (PPVT–III; Dunn & Dunn, 1997), which contains 204 items. In this assessment, the child selected the one picture from a group of four that best corresponds to the words that s/he heard. The split-half reliability from the norms for six-year-olds is .92 (Dunn & Dunn, 1997).

Home Language (L1) Vocabulary—Spanish and Cantonese receptive vocabulary was tested using the Spanish (Test de Vocabulario Imágenes–Peabody; Dunn, Padilla, Lugo, & Dunn, 1986) and the Chinese (Lu & Liu, 1998) versions of the PPVT. Each of these tests contained 125 items. Reliability was calculated for each home language group by year. For the participants in this study, the Cronbach alpha ranged from .94 to .97, averaging .94 for the Spanish version and .96 for the Cantonese.

Knowledge of English Book Reading—In this study, a print concepts and book understanding test was used as a measure of shared book reading. This measure was given only in the fall of kindergarten, as many children tend to reach the ceiling by second grade. By the time children start kindergarten, it is expected that they will have some knowledge of print concepts (Clay, 1972). Using a task that measures concepts about print and book understanding as a measure of shared book reading, this study analyzed the effect of shared book reading on the growth trajectories of children's phonological awareness. In past studies, data on book reading have been collected from parent questionnaires. Parents were

usually asked how often they read with their children or the number of children's books they have in the home. However, parental questionnaires are based on parents' self-reports.

The English book reading task includes 16 questions that an assessor can ask when reading a book with a child to examine his or her understanding of the book and knowledge of print concepts (Book Task Test; Tabors & Páez, 2002). All questions were given in English. The total possible score was 19 points. For this task, the English version of *The Carrot Seed* (Krauss, 1945/2004) was used. The child was expected to respond verbally in English or to point at words or pictures in the book. Questions included: "Where's the front of the book?" and "What does the boy have in his wheelbarrow?" For this sample group, Cronbach's alpha was estimated to be .73.

Background Variables—In order to gain an understanding of children's language environment and background, further information was gathered from the parents using a written four-page survey that was provided to them by the children's homeroom teacher. The questionnaire was given in Spanish, Chinese, or English and included questions regarding several factors that are known to have an effect on academic achievement (Uchikoshi, 2005, 2006a, 2006b). The questionnaire included both multiple-choice and short answer questions. Some of the questions asked were related to family demographics, such as the family's income level, the number of people in the household, the duration of the family's time in the United States, and the family's generation status. Other questions related to the child's background data, including, for example, birthplace and history of exposure to English.

Data Analysis

As an initial matter, a descriptive analysis was performed on all assessments and questionnaire responses. The descriptive data are presented in standard scores, which are norm-referenced scores based on the participant's age at the time of testing. Despite the fact that these assessments were normed based on populations of English-speaking monolinguals, such comparisons are useful because these bilingual children are in the education system in the United States (which is predominantly monolingual). This type of assessment allows us to understand how bilinguals perform compared to their monolingual English-speaking peers (McCardle, Mele-McCarthy, & Leos, 2005).

The relationship between the variables was analyzed using correlation analyses. Then, individual growth modelling was utilized to answer the three research questions, specifically for the purpose of analyzing the differences in both the initial level and rate of change in phonological awareness among individual children and the effects of decoding, vocabulary, and knowledge of book reading on phonological awareness. To analyze differences in the initial level and rate of change in the combined phonological awareness measure (blending and elision subtests) among individuals, individual growth modelling was run. Individual growth modelling is a statistical method that examines data longitudinally, and it is useful in analyzing datasets wherein there is variation in the number of and in the time between time points in the data collected (Littell, Milliken, Stroup, & Wolfinger, 1996; Singer, 1998; Singer & Willett, 2003). Individual growth modelling includes all of the participants in the calculated estimation, even those with missing data. In this study, as data were collected over

a three-year period, there were missing data, and time between data collected varied between 12 months and 16 months. As such, time was measured in months instead of number of time points, and raw scores were entered into the analysis. Because each child was assessed two or three times, a linear model was used (Singer & Willett, 2003; Willett, Singer, & Martin, 1998).

A series of theoretically motivated models for phonological awareness were analyzed. Model 1 included no predictors. Model 2 showed within-person change. Because there was variation in growth across children, predictors were added to investigate between-person variation and whether the predictors affected individual changes in phonological awareness. First, native language (L1: a dummy variable where Spanish was coded as 1 and Cantonese was coded as 0) was added as a predictor to learn whether individual changes in phonological awareness were associated with L1 status, as shown in the model below:

$$\text{Phonological Awareness}_{ti} = [ß_{00} + ß_{01}\, L1_{ti} + ß_{10}\, TIME_{ti} + ß_{11}\, L1_{ti}\, TIME_{ti}] + [u_{0i} + u_{1i}\, TIME_{ti} + r_{ti}]$$

Since the models that differ in fixed effects were compared, full maximum likelihood estimates were used (see Singer, 1998).

Although L1 was not significant, it remained part of the model, because the central research question was whether differences in phonological awareness were related to the child's L1. Then, program (a dummy variable where bilingual was coded 1 and mainstream was coded as 0) and school (six schools) were added. Program and school also remained in the model even when they were not significant because the program was part of one of the research questions and because it was important to control for program and differences in school. Further analysis examined whether L1 and English vocabulary, English decoding, and knowledge of English book reading were significant predictors. Both vocabulary and decoding were time-changing predictors, where their values varied depending on the year (kindergarten, first grade, or second grade). The book reading measure was collected only at the beginning of kindergarten. Additional predictors, including the age when the child started kindergarten, highest education level of parents, and age when the child was first exposed to English were then included to see if they were significant. All predictors and interactions between predictors and time were added into the models, but were removed if they were not statistically significant.

Results

Descriptive Findings

Table 1 provides an overview and summary of the parental responses to the questionnaire. According to the data, the average age Cantonese-speaking children heard English for the first time was at approximately two and a half years old, while exposure to English for Spanish-speaking children occurred after their third birthday. On average, both groups began kindergarten when they were 5.23 years old; and the maternal education level for both groups was the completion of some high school. Overall, the Cantonese–English and

Spanish–English bilinguals, in both bilingual and mainstream programs, had similar backgrounds regarding their mother's education and their age of kindergarten entry.

Table 2 shows the mean and standard deviation results for all phonological awareness outcomes. Results are shown for the total number of participants first, then separately by home language (Cantonese or Spanish) and classroom program (mainstream or bilingual). Subtest scaled scores are reported, compared to the published monolingual English sample mean of 10 with a standard deviation of 3. On average, the participants scored below average in kindergarten but reached approximately average by second grade on both blending and elisions tasks when compared to the published monolingual norms. It appears that children obtained a higher score on the blending assessment as compared to the elision assessment. The data also suggest some group differences, with more variation among groups in kindergarten than among those in later years.

Only the segmenting standard score will be discussed in detail in this section because the combined phonological awareness scores, composed of the blending and elision scores, will be examined longitudinally with individual growth modeling analysis. The average segmenting standard score that was collected in second grade was 9.49 points, compared to the published monolingual English sample mean of 10. A two-way ANOVA for language and program comparing the segmenting scores in second grade revealed no significant main effect of language, $F(1, 142) = 0.53$, $p = .466$, $\eta_p^2 = .004$, and no significant main effect of program, $F(1, 142) = 0.03$, $p = .863$, $\eta_p^2 = .0001$. The interaction between language and program was also not significant, $F(1, 141) = 1.05$, $p = .606$, $\eta_p^2 = .0019$. There were no significant differences in performance on the segmenting task among the four groups.

The means and standard deviations of the standard scores for vocabulary and decoding are shown in Table 3. For receptive English vocabulary, the participants scored an average of one standard deviation below age-level monolingual norms for all three years. On average, the participants also scored lower than norms for Spanish/Chinese monolinguals on receptive L1 vocabulary. While there is large variation in the receptive vocabulary in L1, it appears that the participants in bilingual classrooms scored higher than those in mainstream classrooms. For English decoding, on average, the participants scored about the age-level average in kindergarten, and their scores increased to one standard deviation above age-level norms for monolingual English speakers by the end of second grade. Correlations between the literacy scores are shown in Table 4. The correlations between the phonological awareness variable and other variables such as decoding, knowledge of book reading, and English vocabulary were relatively small when compared to other studies in applied linguistics (Plonsky & Oswald, 2014).

Individual Growth Modeling

Model 1 in Table 5 shows that there was variance in phonological awareness skills, and that the phonological awareness of an average child changed over time. The intraclass correlation coefficient in Model 1 indicated that 14% of the variation in phonological awareness was associated with differences among children. The difference in variance components between Models 1 and 2 show that 78.6% of the within-person variance in phonological awareness was attributable to time. Additionally, the results from Model 2 show that there was

variability at the beginning of kindergarten as well as in the growth in phonological awareness over the three years. More predictors were added to Model 2. Model 9 became the final model after examining the Q-Q plots for normality assumptions. The parameters for the final models are summarized in Table 6.

Effect of Native Language—The estimated average initial phonological awareness level and growth was not associated with whether the child was a Cantonese–English bilingual or a Spanish–English bilingual. This remained true even after controlling for the other predictors in the model.

Effect of Program—The child's program (i.e., mainstream or bilingual program) had no effect on the estimated average initial level and growth of phonological awareness. This remained true even after controlling for the other predictors in the model.

Effect of School—After English vocabulary was entered into the model, it appears that one of the schools (School 3) scored higher on the combined phonological awareness measure than the other schools at the beginning of the study in kindergarten. This school continued to have a higher score for three years.

Effect of Decoding—English decoding was associated with the estimated average initial phonological awareness, but not with the rate of growth in phonological awareness. This finding indicated that bilinguals who began kindergarten with more developed English decoding skills also began with more developed phonological awareness skills at the start of kindergarten (see Figure 1). Since the standard deviation for phonological awareness across all three years was 9.71 points, the coefficient of .13 for English decoding relates to an effect size of slightly over half of a standard deviation for the three-year period.

Effect of English Vocabulary—The estimated coefficient for English vocabulary was associated with the estimated average initial phonological awareness level, but not with the rate of growth in phonological awareness. This finding indicates that bilinguals who began school with more extensive English vocabulary had more developed phonological awareness skills at the beginning of kindergarten (see Figure 1). The coefficient of .06 corresponds to a little under one-quarter of a standard deviation for the three-year period. Moreover, L1 receptive vocabulary was not associated with the estimated average initial level or growth in phonological awareness.

Effect of Knowledge of English Book Reading—The estimated coefficient for knowledge of English book reading was associated with the estimated average level of phonological awareness in kindergarten. The coefficient of .72 corresponds to over 2.5 standard deviations for the three-year period. Moreover, after controlling for other variables, the estimated coefficient for the interaction between knowledge of English book reading and time was significant and negative. These findings suggested that bilinguals who began kindergarten with lower English book reading scores also had less developed phonological awareness skills, but the development was faster than that of those who started kindergarten with higher book reading scores (see Figure 2). In fact, those who began kindergarten with low book reading scores caught up on phonological awareness to those who began

kindergarten with high book reading scores after three years when controlling for decoding and vocabulary.

Discussion

This longitudinal study adds to the literature through a rare opportunity to observe growth in phonological awareness skills in bilinguals with different language combinations who attended the same schools and received similar literacy instruction. In answer to the first research question, which asked whether the two bilingual groups developed differently, this study found no significant differences between Spanish–English and Cantonese–English bilinguals on the estimated average initial phonological awareness level or on the rate of growth in phonological awareness after controlling for school, decoding, vocabulary, program, and knowledge of book reading. That is, the Cantonese–English and Spanish–English bilingual students showed no differences in phonological awareness skills when they began kindergarten. Furthermore, there were no differences in the trajectories of phonological awareness skills. Unlike the findings in previous research by Bialystok and colleagues (2003, 2005), the Spanish–English and Cantonese–English bilinguals did not differ on the segmenting task assessed in second grade (see Table 2). This may be because the two groups of bilinguals in this study attended the same schools and received similar literacy instruction throughout the three years, unlike past studies that recruited bilingual children from different schools and, therefore, did not consider classroom phonological awareness instruction. This finding suggests that instruction may have a more sustained impact on phonological awareness than the influence of L1.

To answer the second research question concerning differences between programs, this study found that the bilinguals in the bilingual and mainstream programs did not differ on the estimated average initial levels of phonological awareness or on the rate of growth in phonological awareness, even after controlling for school, decoding, vocabulary, native language, and book reading. The bilinguals in mainstream programs, whether they were bilingual in Spanish and English or Cantonese and English, were placed with the same teacher in the same classrooms. For those in the bilingual programs, although the two bilingual groups were in separate Spanish–English or Cantonese–English bilingual classrooms with their respective bilingual teachers, teachers met weekly with the mainstream classroom teachers to ensure that they covered the same curriculum. Differences due to classroom instruction and curriculum were not found between the language groups or between the instruction groups, supporting previous research that shows the effectiveness of instruction and training in phonological awareness (Duncan et al., 2013; National Reading Panel, 2000).

With regard to the third research question concerning the effects of vocabulary, decoding, and shared book reading at home, similar to past research with monolingual children, English vocabulary (Chiappe et al., 2004), English decoding (e.g., Anthony, Lonigan, Driscoll, Phillips, & Burgess, 2003; Wagner et al., 1997; Wise, Sevcik, Morris, Lovett, & Wolf, 2007), and knowledge of English book reading (Bus et al., 1995) had significant effects on the estimated average initial level of phonological awareness. Children who came to kindergarten with higher levels of English decoding skills, English vocabulary, and

English book reading also began kindergarten with higher levels of phonological awareness. The relationship was within-language, where the neighborhood density of English vocabulary helped children's English phonological awareness, in agreement with the lexical restructuring model (Metsala & Walley, 1998). L1 vocabulary knowledge in Spanish or Cantonese was not associated with the estimated average initial level or rate of growth in English phonological awareness.

For decoding, bilinguals in this study were tested with a letter–word identification task. The first 14 items measured children's letter identification ability with regard to uppercase and lowercase letters. The average bilingual kindergartener knew 13 items on this task, indicating knowledge of most of the letters or sounds of letters on the assessment when school started in the fall term. Bilinguals that began kindergarten with greater English decoding skills had more developed phonological awareness skills.

Unlike Wise et al. (2007), we found an effect of English vocabulary knowledge on phonological awareness skills at the beginning of kindergarten. Bilinguals who started kindergarten with a larger English vocabulary also had high phonological awareness skills. This may be because the participants in Wise et al.'s study were monolingual English-speaking children. The present research sampled bilingual children who, on average, have poorer English vocabulary than their monolingual peers (Cobo-Lewis, Pearson, Eilers, & Umbel, 2002; Hammer, Lawrence, & Miccio, 2008; Oller & Eilers, 2002; Páez, Tabors, & Lopez, 2007; Uchikoshi, 2006b). For some children in this study, kindergarten was the first exposure to English. As such, many children began kindergarten with a limited English vocabulary. The mean English vocabulary score of this group of bilinguals was one standard deviation below age-matched monolingual norms.

Additionally, there was an effect of book reading on the initial levels of phonological awareness. Children who started kindergarten with lower book reading scores demonstrated faster growth in phonological awareness skills than children who began kindergarten with more advanced book reading knowledge. By second grade, those who began with lower book reading scores caught up on phonological awareness skills to those who began with higher book reading scores, after controlling for decoding and vocabulary, which may be because book reading concepts are taught extensively in kindergarten and lower elementary grades. It should be noted that literacy practices in the home were not observed in this study, and the conceptualization of a book reading task as a measure of home literacy should be further examined.

In summary, this study found that bilinguals from typologically different home languages did not differ in their English phonological awareness trajectories from kindergarten through second grade. Additionally, there were no differences in the growth trajectories in English phonological awareness between bilinguals placed in mainstream classrooms and those in bilingual classrooms, as teachers met weekly to ensure that classroom phonological awareness instruction was similar across classrooms. The longitudinal nature of this study extends the scope of existing research, demonstrates the importance of controlling for classroom instruction targeting phonological awareness, and may provide further support to the longstanding evidence that alphabetic reading instruction fosters phonological

awareness. These findings are essential for educators, particularly those who have bilingual students from various language backgrounds in their classrooms. It appears that balanced literacy instruction does not need to be differentiated by the child's home language.

Implications stemming from these findings are that educators need to focus on enriching the vocabulary and decoding skills of all bilinguals, regardless of their home language. For those bilinguals acquiring English as the majority language, early experiences with English nursery rhymes, English alphabetic songs, and English picture books may help bilingual children acquire English vocabulary, become familiar with letters and sounds, and help them to notice and think about the phonological structure of words (Harper, 2011; Kozminsky & Asher-Sadon, 2013; Uchikoshi, 2006a).

Limitations and Future Directions

Several limitations warrant future research. First, English phonological awareness skills were examined using only real English words. Future research might consider using nonwords, which may show between-group differences. In addition, we did not collect information about children's L1 reading experience and instruction outside of the bilingual programs. In fact, the mainstream Cantonese group had lower L1 proficiency than their second language proficiency, suggesting that their English skills were stronger than their Cantonese skills, despite the fact that they were identified as English learners and were receiving second language services. We obtained information about children's enrollment in weekend Spanish/Cantonese schools. The majority of children in mainstream classrooms did not attend weekend or afterschool language schools. Future research might consider collecting more information about L1 literacy acquisition practices in the home. Moreover, the null results do not guarantee that the two groups develop phonological skills similarly. We can state only that we did not find evidence of a difference in the development of phonological awareness skills between the Cantonese–English and Spanish–English groups tested in this study. Furthermore, although vocabulary and decoding are treated as time-varying covariates, future analysis could examine parallel process or multivariate growth models. Additionally, although no participating children were identified for learning difficulties during the study, and all were assumed to be typically developing, bilinguals may sometimes be identified for learning difficulties later in the elementary years. We also did not model classroom differences. Finally, because we had only three data points, we could not test for nonlinear growth.

Conclusion

Understanding the similarities in English phonological growth for bilingual children with different language combinations and the factors that contribute to the development of English phonological awareness can aid in developing a curriculum and teaching methodologies that can result in balanced bilingualism and academic success. The absence of differences in growth trajectories between Spanish–English and Cantonese–English bilinguals suggests that bilinguals, regardless of L1, can benefit from letter knowledge and vocabulary exposure and instruction in the language of instruction and the majority language of the society at large (English, in this case) before kindergarten entry. The bilingual school-

age population is continuing to rise, and in California, more than 50 percent of students enrolled in the state's K–12 schools in 2015–2016 were Latinos (California Department of Education, 2017). In order to create successful interventions for these students, it is necessary to understand the acquisition and development of phonological awareness, especially because there is longstanding research to show that it predicts later academic success. Additional qualitative studies on classroom reading instruction, home literacy environments, and children's L1 phonological awareness will provide further knowledge. More longitudinal studies investigating bilinguals' growth in literacy skills are crucial to create appropriate curricula, interventions, and assessments for all bilinguals.

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Appendix: Accessible Summary (also publicly available at https://oasis-database.org)

Uchikoshi, Y. (2019). Phonological awareness trajectories: Young Spanish–English and Cantonese–English bilinguals. *Language Learning*.

Do phonological awareness skills develop differently for Spanish–English and Cantonese–English bilinguals?

What this research was about and why it is important

Phonological awareness relates to the ability to recognize and identify sounds used in speech. Phonological awareness has been known to play an important role in young children's reading achievement. Yet it is not well known how phonological awareness develops in bilingual children. For example, bilingual children might learn phonological awareness skills differently depending on whether they know two languages that share a writing system (such as Spanish and English) or know two languages that do not share a writing system (such as English and Cantonese). In this study, the researchers addressed this issue by examining whether the development of phonological awareness skills in English differed between bilinguals with two languages that are structurally similar (English and Spanish) and bilinguals with two languages that are different (English and Cantonese). Both types of bilinguals were recruited from the same schools and thus were likely to have received similar reading instruction. The researchers showed that young bilingual children with different home languages who are receiving similar reading instruction in school did not differ in their development in English phonological awareness skills during the early elementary years (from kindergarten to second grade, aged 4 years and 8 months to 8 years and 11 months).

What the researchers did

- The researchers tested 86 Cantonese–English bilingual children and 72 Spanish–English bilingual children. The children were followed over three years—from kindergarten to second grade.
- Approximately half of the children were in mainstream classrooms, where English was the only language of instruction, and half were in bilingual classrooms, where some instruction was delivered in the children's home language (Spanish or Cantonese) as a way of transitioning these children to English-only instruction.
- The researchers assessed language and literacy in kindergarten, first grade, and second grade, by testing children's:
  - phonological awareness skills in English (e.g., forming a word by putting together sounds or syllables, or listening to a word and repeating it with a syllable or a sound missing);
  - word reading skills in English;
  - vocabulary in English and their home language (Spanish or Cantonese);
  - comprehension of age-appropriate English books.

What the researchers found

- Spanish–English and Cantonese–English bilinguals did not differ in the development of their phonological awareness skills in English over the three years of the study.
- There was also no difference in growth in English phonological awareness skills between bilinguals enrolled in mainstream and bilingual classrooms.
- Children with more developed English vocabulary and English word reading skills had more developed phonological awareness in English at the beginning of kindergarten.
- Children who began kindergarten with weaker comprehension of English books caught up by the end of second grade in their phonological awareness compared to their peers who had begun kindergarten with better comprehension of books.

Things to consider

- Young bilingual children's vocabulary in the main language of instruction (English in this case) seemed to be related to their phonological awareness.
- Although the two bilingual groups performed similarly in tests of phonological awareness in this study, it is still possible that other bilingual children (e.g., children who speak different pairs of languages or children in different education systems) might develop phonological awareness at different rates and to different degrees of success.

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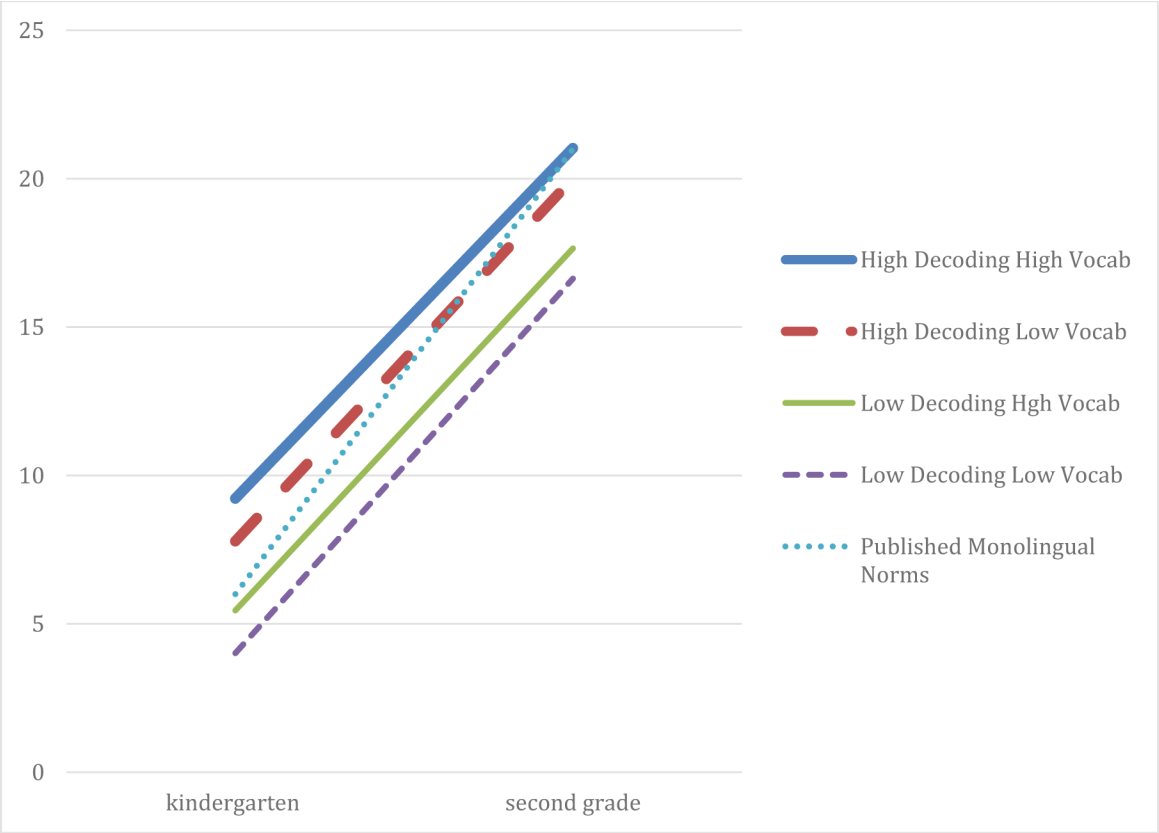

Figure 1.

Average fitted trajectories describing the effect of time-varying English decoding and time-varying English vocabulary on the change in English phonological awareness for Spanish–English and Cantonese–English bilinguals. High is defined as scoring at the 75th percentile, while low is defined as scoring at the 25th percentile (N = 158).

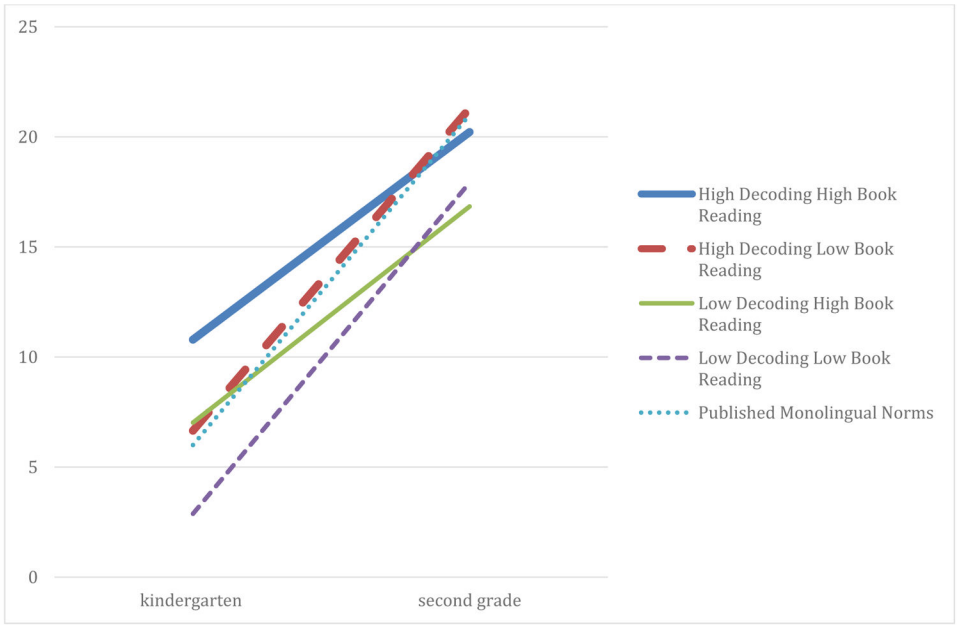

Figure 2.

Average fitted trajectories describing the effect of time-varying English decoding and English book reading scores on the change in English phonological awareness for Spanish–English and Cantonese–English bilinguals. High is defined as scoring at the 75th percentile, while low is defined as scoring at the 25th percentile (N = 158).

Table 1

Means (standard deviations in parentheses) for background variables

	All bilinguals		Spanish		Cantonese	
Variable	**Total**	**Range**	**Bilingual**	**Mainstream**	**Bilingual**	**Mainstream**
n	137		43	19	49	26
Age of first English exposure (years)	2.86 (1.40)	0–6	3.25 (1.66)	3.21 (1.69)	2.36 (1.11)	2.76 (1.25)
Kindergarten start age (years)	5.23 (0.35)	4.67–6.67	5.21 (0.30)	5.29 (0.39)	5.20 (0.32)	5.21 (0.34)
Mother's education[a]	3.68 (1.76)	0–9	3.76 (2.06)	3.42 (2.27)	3.76 (1.13)	3.65 (1.72)

Notes.

[a]Mother's education ranged from 0 to 9: none = 0, some primary education = 1, completed primary education = 2, some high school = 3, graduated from high school = 4, some college/trade school = 5, received associate's degree or trade certification = 6, received bachelor's degree = 7, some graduate study = 8, received graduate degree = 9.

Table 2

Means (standard deviations in parentheses) for phonological awareness data ($N = 158$)

	All bilinguals		Spanish		Cantonese	
Variable	**Total**	**Range**	**Bilingual**	**Mainstream**	**Bilingual**	**Mainstream**
English elision scaled score						
n	129		34	17	47	31
Kindergarten	7.67 (2.43)	4–18	7.38 (2.67)	6.82 (1.94)	7.85 (2.14)	8.16 (2.76)
n	150		44	26	35	45
First grade	9.28 (2.99)	2–17	8.57 (3.65)	9.35 (2.42)	9.39 (2.92)	10.10 (2.27)
n	145		39	23	34	49
Second grade	10.14 (15.81)	2–17	9.67 (3.25)	9.41 (2.86)	10.52 (2.70)	10.61 (2.71)
English blending scaled score						
n	129		34	17	47	31
Kindergarten	9.44 (2.94)	4–18	8.94 (2.99)	8.65 (3.42)	9.43 (2.47)	10.45 (3.08)
n	150		44	26	35	45
First grade	11.87 (2.91)	3–18	11.18 (3.68)	12.27 (2.92)	11.71 (2.13)	12.83 (2.59)
n	145		39	23	34	49
Second grade	11.66 (2.64)	5–18	11.31 (2.95)	11.87 (2.07)	11.12 (2.48)	12.73 (2.60)
English segmenting scaled score						
n	145		39	23	34	49
Second grade	9.49 (1.97)	5–14	9.58 (2.37)	9.72 (1.67)	9.50 (1.86)	9.29 (1.87)
English combined phonological awareness raw scores						
n	129		34	17	47	31
Kindergarten	9.05 (9.17)	0–32	7.70 (9.24)	8.53 (10.32)	8.27 (7.79)	10.93 (9.54)
n	150		44	26	35	45
First grade	17.51 (7.14)	0–34	15.74 (9.21)	17.81 (6.25)	17.14 (5.94)	19.61 (5.99)
n	145		39	23	34	49
Second grade	23.87 (6.85)	8–38	23.18 (7.66)	24.50 (6.34)	23.73 (6.76)	24.19 (6.64)

Table 3

Means (standard deviations in parentheses) for achievement data ($N = 158$)

	All bilinguals		Spanish		Cantonese	
Variable	**Total**	**Range**	**Bilingual**	**Mainstream**	**Bilingual**	**Mainstream**
English book reading						
n	129		34	17	47	31
Kindergarten	11.89 (4.52)	0–19	9.97 (4.87)	13.11 (3.02)	12.13 (4.66)	12.83 (4.18)
English receptive vocabulary standard score						
n	129		34	17	47	31
Kindergarten	79.83 (16.72)	40–109	70.50 (17.72)	82.21 (12.34)	81.74 (14.18)	85.45 (18.43)
n	150		44	26	35	45
First grade	84.11 (14.44)	40–120	76.23 (15.87)	84.67 (14.68)	83.89 (12.22)	91.67 (10.07)
n	145		39	23	34	49
Second grade	86.16 (14.41)	50–135	79.53 (18.51)	87.83 (15.39)	87.03 (11.02)	89.88 (10.53)
L1 receptive vocabulary standard score						
n	129		34	17	47	31
Kindergarten	89.48 (17.64)	55–128	97.75 (13.20)	87.38 (18.64)	93.85 (16.86)	74.93 (13.62)
n	150		44	26	35	45
First grade	90.15 (16.80)	55–131	100.48 (13.93)	89.12 (15.55)	89.21 (13.38)	80.95 (17.25)
n	145		39	23	34	49
Second grade	83.45 (18.51)	55–133	98.86 (10.64)	84.83 (20.57)	84.97 (14.44)	69.88 (14.69)
English decoding standard score						
n	129		34	17	47	31
Kindergarten	102.81 (16.01)	55–157	88.13 (17.99)	101.58 (13.38)	108.57 (8.81)	110.23 (13.89)
n	150		44	26	35	45
First grade	116.07 (17.40)	53–152	107.14 (24.87)	111.67 (9.98)	122.31 (11.18)	122.58 (10.29)
n	145		39	23	34	49
Second grade	118.78 (14.89)	85–153	116.39 (17.67)	111.56 (12.73)	123.50 (13.32)	120.73 (13.23)

Table 4

Correlations matrix for literacy variables (N = 158)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1 PA (K)	—												
2 PA (1st grade)	.32**	—											
3 PA (2nd grade)	.22*	.62***	—										
4 E vocabulary (K)	.27*	.28*	.20*	—									
5 E vocabulary (1st grade)	.19*	.27**	.24*	.73***	—								
6 E vocabulary (2nd grade)	.30**	.30**	.15	.58***	.72***	—							
7 L1 vocabulary (K)	–.11	–.12	–.08	–.10	–.07	.01	—						
8 L1 vocabulary (1st grade)	–.20	–.18*	–.12	–.21*	–.10	.00	.50***	—					
9 L1 vocabulary (2nd grade)	–.12	–.10	–.10	–.30*	–.26*	–.01	.64***	.68***	—				
10 E decoding (K)	.23*	.23*	.18	.45***	.49***	.40***	–.16	–.20*	–.25	—			
11 E decoding (1st grade)	.10	.26***	.25*	.48***	.53***	.53***	–.05	.00	–.07	.72***	—		
12 E decoding (2nd grade)	.07	.37***	.26*	.42***	.42***	.56***	.10	–.01	.02	.42***	.72***	—	
13 E book reading	.26*	.23*	.16	.62***	.47***	.41***	–.04	–.04	–.19*	.32**	.30**	.23*	—

Note. PA = phonological awareness; K = kindergarten; E = English; L1 = first language.

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Table 5

Fixed effects parameter (*SE*) estimates from a series of fitted individual growth models in which English decoding, English receptive vocabulary, and English book reading predict the average English phonological awareness skill at the start of kindergarten and rate of change in English phonological awareness skill, after controlling for school, native language (L1), and language of instruction during the period between kindergarten and second grade for all children ($N = 158$)

Parameter	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]	Model 5[e]	Model 6[f]	Model 7[g]	Model 8[h]	Model 9[i]
Intercept	17.31*** (0.53)	6.49*** (0.84)	7.09** (0.95)	5.23*** (1.33)	5.89** (1.73)	–56.63*** (5.69)	–55.08*** (5.81)	–52.66*** (6.26)	–57.06*** (6.30)
Time (months)		0.59** (0.03)	0.59*** (0.03)	0.59*** (0.03)	0.59*** (0.03)	0.10 (0.05)	0.01 (0.06)	0.09 (0.07)	0.43** (0.11)
L1			–1.33 (1.03)	–0.37 (1. 07)	–0.29 (1.08)	1.11 (0.82)	1.10 (0.81)	1.02 (0.92)	0.85 (0.92)
School 1				–2.06 (1.83)	–2.11 (1.83)	2.61 (1.45)	3.48* (1.44)	1.78 (1.70)	1.03 (1.70)
School 2				2.34 (1.33)	2.17 (1.37)	1.80 (1.02)	1.06 (1.04)	1.76 (1.27)	1.54 (1.27)
School 3				2.84 (2.12)	2.22 (2.36)	3.49 (1.77)	4.37* (1.77)	5.10* (2.14)	4.64* (2.13)
School 4				1.83 (1.66)	1.19 (1.98)	1.40 (1.55)	1.76 (1.54)	2.16 (1.90)	1.61 (1.89)
School 5				4.28* (2.02)	3.69 (2.29)	3.90* (1.74)	4.20* (1.76)	4.81* (2.17)	4.06 (2.16)
Program					–0.70 (1.19)	–0.40 (0.99)	0.83 (1.02)	1.54 (1.31)	1.24 (1.29)
English decoding						0.16*** (0.01)	0.14*** (0.01)	0.13*** (0.02)	0.13*** (0.02)
English vocabulary							0.11*** (0.02)	0.07* (0.03)	0.06* (0.03)
English book reading								0.18† (0.10)	0.72** (0.18)
English book reading × Time									–0.03** (0.01)

Note. Final model = Model 9. English phonological awareness measure is a combination of the blending and elision subtests.

[a]Unconditional model.

[b]Time.

[c]L1: 1 = Spanish; 0 = Cantonese.

[d]Schools.

[e]Program: 1 = bilingualism; 0 = mainstream.

[f]English decoding.

[g] English vocabulary test.

[h] English book reading.

[i] English book reading × Time.

† $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Table 6

Random effects parameter (*SE*) estimates from fitted individual growth models in which English decoding, English receptive vocabulary, and English book reading predict the average English phonological awareness skill at the start of kindergarten and rate of change in English phonological awareness skill, after controlling for school, native language (L1), and language of instruction during the period between kindergarten and second grade for all children ($N = 158$).

Parameter	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]	Model 5[e]	Model 6[f]	Model 7[g]	Model 8[h]	Model 9[i]
Intercept	12.64* (5.81)	72.98*** (12.99)	71.72*** (12.87)	67.16*** (12.96)	66.65*** (12.88)	47.37*** (11.22)	37.71*** (11.47)	35.70* (11.53)	28.28* (10.37)
Slope		0.07*** (0.02)	0.07*** (0.02)	0.07** (0.02)	0.07*** (0.02)	0.06* (0.02)	0.05* (0.02)	0.05* (0.02)	0.03† (0.02)
Residual	80.66** (7.22)	17.24*** (2.26)	17.21*** (2.25)	17.37*** (2.28)	17.25*** (2.28)	19.67*** (2.85)	17.16*** (2.76)	17.08*** (2.93)	17.65*** (3.00)
Proportional reduction in variance from Model 2									
Intercept				8.0%	8.7%	35.1%	48.3%	51.1%	61.2%
Slope						14.3%	28.6%	28.6%	57.1%
AIC	3037.8	2737.2	2737.5	2736.4	2738.1	2461.1	2143.0	1805.6	1795.6

Note. Final model = Model 9. English phonological awareness measure is a combination of the blending and elision subtests. AIC = Akaike's information criterion.

[a] Unconditional model.

[b] Time.

[c] L1: 1 = Spanish; 0 = Cantonese.

[d] Schools.

[e] Program: 1 = bilingualism; 0 = mainstream.

[f] English decoding.

[g] English vocabulary test.

[h] English book reading.

[i] English book reading × Time.

$^{\dagger}p < .10$,

$^{*}p < .05$,

$^{**}p < .01$,

*** $p < .001$.