Research Article

Internal and External Factors That Support Children's Minority First Language and English

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Purpose: Sequential bilingual children in the United States often speak 2 languages that have different social statuses (minority–majority) and separate contexts for learning (home–school). Thus, distinct factors may support the development of each language. This study examined which child internal and external factors were related to vocabulary skills in a minority language versus English.

Method: Participants included 69 children, aged 5–8 years, who lived in Southern California, spoke Vietnamese as the home language, and received school instruction in English. All participants had at least 1 foreign-born parent, and most mothers reported limited English proficiency. Parents completed a telephone survey, and children completed measures of receptive and expressive vocabulary in each language. Using correlations and stepwise regression, we examined predictors of vocabulary skills in each language that were internal to the child (age, gender, analytical

reasoning, phonological memory) or that pertained to the surrounding environment (cumulative exposure, quantity and quality of input/output).

Results: Vietnamese vocabulary outcomes were related to multiple external factors, of which input and enrichment activities were the best predictors. In contrast, English vocabulary outcomes were related to internal factors, of which age and phonological memory were the best predictors. Parental use of Vietnamese contributed to children's Vietnamese vocabulary outcomes but was not related to children's English vocabulary outcomes.

Conclusions: Vietnamese exposure does not hinder English development. Children from immigrant families are learning English with or without familial support. Rich and frequent exposure and opportunities for practice are essential for the continued development of a minority first language.

Over 20% of children in the United States live in homes in which a language other than English is spoken (U.S. Department of Education, National Center for Education Statistics, Common Core of Data, 2015). In California, 42% of public school students, equivalent to over 2.6 million, speak a language other than English at home (California Department of Education, 2015). This percentage includes children classified either as an English learner (22%) or fluent English proficient (20%). Within this highly diverse bilingual population, the first language (L1) is a minority language and English (L2) is the language of the majority community. There are over 60 minority L1s represented among Californian students,

and the top three are Spanish, Vietnamese, and Chinese (California Department of Education, 2015). Minority L1s and the majority L2 hold different social values, are often used in separate contexts (home vs. school), and are spoken for different communicative purposes (familial vs. academic). Thus, distinct factors may contribute to the development of each language.

This study examines factors that support L1 and L2 learning. Identifying supporting factors that are general to dual-language learning and factors that are specific to each language has important implications for designing interventions for bilingual children and training programs for teachers, speech-language pathologists, and parents. In this study, language outcomes are measured in terms of receptive and expressive vocabulary. Strong vocabulary skills support narrative development (Uccelli & Pérez, 2007) and reading comprehension (Proctor, Carlo, August, & Snow, 2005), which are essential for academic success.

The study is framed within the Social Interactionist Theory (Vygotsky, 1978), which views a child's environment as a source for development. The child and surrounding

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environment are constantly changing, and the richness of the environment is measured in the quantity and quality of interactions (Wong, 2001). Within this theoretical framework, this study examines factors specific to the child (i.e., child-internal factors) and features of the environment (i.e., child-external factors). Of particular interest is the identification of factors that support language development during periods of change in the surrounding environment. For many bilingual children in the United States, school entry marks a time of substantial change due to the transition from primarily L1 exposure at home to academic instruction that is often exclusively in English (L2). Before introducing this study, we review the literature on child-internal and child-external factors related to L1 and L2 outcomes during the early school years.

Child-Internal Factors Related to L1 and L2 Development

The literature on school-age bilingual children has examined a variety of child-internal factors related to L1 and L2 outcomes including chronological age, analytical reasoning, gender, and short-term phonological memory. Chronological age has been used as a gross index of children's overall development or maturation (e.g., Paradis, 2011). Analytical reasoning, as measured by nonverbal intelligence tests, has been related to performance on vocabulary tests for children on the lower end of the cognitive range (e.g., Goldstein, Allen, & Fleming, 1982). The few studies of analytical reasoning in bilingual children have found positive associations between nonverbal intelligence and L2 acquisition (e.g., Paradis, 2011).

Whereas studies with monolinguals have found a gender difference, favoring females to males in early vocabulary acquisition (Fenson et al., 1994), results regarding a gender difference in bilingual children have been mixed. In a longitudinal analysis of Spanish- and English-language samples from bilingual children in kindergarten or first or second grade, Rojas and Iglesias (2013) found a gender difference that was larger and more consistent in Spanish (L1) than in English (L2). Growth curve models showed that girls had a higher initial status and steeper growth rate in the L1 than boys. For English (L2), there was no gender difference in initial status, but girls had a steeper growth rate that was intermittent (i.e., solely during spring semesters). In a separate longitudinal study of Spanish-English bilingual children making the transition from Head Start to kindergarten, Hammer, Davison, Lawrence, and Miccio (2009) measured language outcomes using standardized receptive vocabulary tests and did not find any gender differences in initial status or growth rate in either language. Differences across studies may be related to the use of expressive versus receptive abilities and the different stages of development.

Short-term phonological memory, as measured by nonword repetition (NWR) tasks, has been linked to vocabulary development among monolingual and bilingual children. In a study of monolingual English-speaking

children, aged 4 and 5 years, Gathercole and Baddeley (1989) found strong positive correlations between NWR and vocabulary at each age. Similarly, Paradis (2011) examined bilingual children, aged 4–7 years, from various L1 backgrounds and found that NWR predicted vocabulary skills in English (L2).

Whereas Paradis (2011) and others (e.g., Verhagen, Leseman, & Messer, 2015) have focused on short-term phonological memory in L2 acquisition, few studies have examined phonological memory in bilingual children's L1 and L2. In a comparison between Korean monolingual and Korean-English bilingual preschoolers, Lee, Kim, and Yim (2013) found that the bilingual group performed similarly to the monolingual group on Korean (L1) NWR. However, the bilingual group performed more poorly on Korean vocabulary measures than their monolingual peers. Within the bilingual group, Korean NWR was related to Korean vocabulary but not to English vocabulary. English NWR was not measured. Windsor, Kohnert, Lobitz, and Pham (2010) examined Spanish and English NWR in groups of school-age bilingual children with and without language impairment. Both typical and impaired groups performed higher on Spanish NWR than English NWR. For the typically developing bilingual group ($n = 65$), there were small positive correlations between English NWR and standardized subtests of English-language comprehension and production. In contrast, Spanish NWR was not related to standardized subtests of Spanish-language comprehension or production. Ebert, Pham, and Kohnert (2014) examined relations between NWR and receptive and expressive vocabulary in a separate sample of Spanish-English bilingual children with language impairment. Similar to Windsor et al., group performance on the Spanish NWR task was higher than that on the English NWR task, although performance on vocabulary measures was higher in English than in Spanish. There was a moderate positive association between English NWR and English receptive vocabulary that remained significant even after controlling for the influence of chronological age. Spanish NWR was not related to vocabulary measures in either language. In summary, the handful of studies on NWR and bilingual outcomes show more associations within each language than between languages and relatively more associations in L2 than in L1.

External Factors Related to L1 and L2 Development

Within the Social Interactionist Theory (Vygotsky, 1978), the richness of children's surrounding environment is captured by the quantity and quality of interactions. Language quantity can be measured in terms of present-day levels of exposure or cumulative exposure over a length of time, whereas the quality of interactions can be measured in terms of enrichment activities conducted in each language. Regarding language quantity, Unsworth (2013) examined the effects of cumulative exposure and current levels of input and output on L2 grammatical

development in a sample of English–Dutch bilingual children. Unsworth found that current levels of exposure best predicted performance on L2 grammatical markers. Cumulative exposure accounted for a smaller portion of unique variance on L2 outcomes. Similarly, Bedore and colleagues (2012) examined cumulative exposure and current levels of input and output in a sample of Spanish–English bilingual preschool and kindergarten children and found that current levels of exposure best predicted performance on L1 and L2 morphosyntax and semantics. Cumulative exposure, as indexed by the first year of English exposure, had less predictive value than current levels of exposure.

Several studies have found that language quantity influences outcomes differently in the L1 compared with the L2. Hammer and colleagues (2009) measured mother-to-child language use patterns at three yearly intervals from Head Start to kindergarten. Researchers found a decrease in mothers' Spanish use and an increase in mothers' English use at each yearly interval. Mothers' English use, however, did not affect children's English vocabulary growth, which steadily improved over the 3-year period. In contrast, as mothers' English use increased, children's Spanish receptive vocabulary changed at a slower rate, suggesting a degree of L1 stagnation with increased L2 exposure. Although mothers increased their use of English over time, English language use at home did not predict English growth. Increases in mothers' English use, however, were detrimental to children's Spanish skills (Hammer et al., 2009).

In a related study, language input and output in the home setting have been found to improve children's proficiency in the L1, but not necessarily in the L2. Tsai, Park, Liu, and Lau (2012) used parent surveys and child language measures with a sample of Chinese-American parents and their children, aged 4–7 years, and found that parental use of Chinese was positively related to children's language skills in Chinese production and comprehension. Using pathway models, researchers found that parents who were more orientated toward Chinese culture used the Chinese language more frequently, which in turn positively predicted children's Chinese expressive skills. In contrast, there were no significant associations between parent cultural orientation, cultural maintenance, or language use on children's language outcomes in English. Similarly, using parent surveys and language sampling from Spanish–English bilingual second graders, Gutiérrez-Clellen and Kreiter (2003) found that the amount of Spanish language input at home predicted children's Spanish grammatical skills. However, this relation between input and language outcomes was not evident in English.

Compared with the number of studies that have examined language quantity, fewer studies have examined L1 and L2 outcomes in terms of language quality. Scheele, Leseman, and Mayo (2010) examined the effects of language quality measures on L1 and L2 receptive vocabulary in monolingual Dutch, bilingual Moroccan–Dutch, and bilingual Turkish–Dutch 3-year-olds. The quality of language interactions was measured in terms of the frequency

with which the following occurred in the home: reading, storytelling, conversations, singing, and educational TV. Using pathway modeling, Scheele and colleagues found that reading, storytelling, and conversations predicted receptive vocabulary in the monolingual Dutch group. For the two bilingual groups, however, reading did not predict L1 or L2 vocabulary. Instead, storytelling and conversations in the L1 predicted L1 vocabulary, and storytelling and conversations in the L2 predicted L2 vocabulary.

Finally, Paradis (2011) compared the influence of language quantity and quality measures on L2 outcomes. Language quality was measured as the sum of the frequencies with which children engaged in reading, computer, TV, storytelling, and singing in the L1 and L2. Using a series of regression models, Paradis found that L2 receptive vocabulary was predicted by three child-internal factors (age, phonological memory, and analytical reasoning) and two external factors of language quantity (months of English exposure) and quality (enrichment activities in the L2). Of the two external factors, Paradis found that the quality measure was relatively a better predictor than quantity measure for predicting L2 receptive vocabulary. However, the effect of these two external factors was much smaller than the child-internal factors in the final regression model. Child-internal factors accounted for 33% of the variance in L2 vocabulary, whereas child-external factors accounted for 10% of additional variance. Because Paradis examined the L2 of children from a wide variety of L1 backgrounds, the influence of child-internal and child-external factors on L1 outcomes was not examined.

Study Purpose and Questions

This study examined child-internal and child-external factors related to dual-language development. Within the Social Interactionist Theory (Vygotsky, 1978), change within the child and/or the environment influences the interactions that take place, which in turn can alter the course of development. Accordingly, we focused on the early school years to capture a time frame of substantial change in the surrounding environment when many bilingual children make the transition from primarily L1 at home to L2 at school. Few studies have examined an array of child-internal and child-external factors in L2 acquisition (i.e., Paradis, 2011). Previous studies that have measured L1 and L2 outcomes have related bilingual outcomes to child-internal factors (e.g., Rojas & Iglesias, 2013) or to external factors (e.g., Bedore et al., 2012; Gutiérrez-Clellen & Kreiter, 2003). However, no single study has measured L1 and L2 outcomes and related bilingual outcomes to an array of child-internal and child-external factors. Furthermore, this study focused on children who speak Vietnamese, an understudied language in the area of child development. Whereas there have been a handful of studies on dual-language learning in Vietnamese–English bilinguals (e.g., Pham, 2016; Pham & Ebert, 2016; Pham & Kohnert, 2010, 2014), none has specifically examined internal and external factors in this bilingual population.

This study used parent survey data and direct child measures to examine factors related to L1 and L2 vocabulary skills. Participants were 69 Vietnamese–English bilingual children, aged 5–8 years. Child-internal factors included age, gender, analytical reasoning, and short-term phonological memory. External factors included cumulative exposure, current language exposure, and language-based enrichment activities. There were two research questions:

1. Which internal and external factors relate to outcomes in L2 English?
2. Which internal and external factors relate to outcomes in L1 Vietnamese?

Regarding Research Question 1, we anticipated that a combination of child-internal factors (i.e., age, analytical reasoning, and short-term phonological memory) and child-external factors (quantity and quality of input) would relate to L2 English outcomes (Paradis, 2011). However, the relative influence of external factors on L2 outcomes remained an open question. Bedore and colleagues (2012) found that current levels of input and output predicted outcomes in the L1 and L2. However, several studies have found minimal to no association between current levels of input and output and L2 outcomes (e.g., Gutiérrez-Clellen & Kreiter, 2003) or between L2 outcomes and home language use (e.g., Hammer et al., 2009; Tsai et al., 2012). Overall, we anticipated that child-internal factors would explain a greater amount of variance in L2 outcomes than external factors (Paradis, 2011).

Regarding Research Question 2, we anticipated that L1 vocabulary would be related to multiple external factors including current levels of input and output (e.g., Bedore et al., 2012; Gutiérrez-Clellen & Kreiter, 2003), home language use (e.g., Hammer et al., 2009; Tsai et al., 2012), and the quality of interactions (e.g., Scheele et al., 2010). Of the external factors, we expected cumulative exposure to be less predictive of L1 vocabulary than current levels of exposure (e.g., Bedore et al., 2012). In contrast to the role of external factors, we anticipated that relations between the L1 and child-internal factors would be more tenuous. To illustrate, chronological age has been positively related to outcomes in the L2, but not in the L1 (Ebert et al., 2014; Pham & Kohnert, 2010), suggesting increases in L2 proficiency with age and relative stagnation in the L1. To our knowledge, no studies have examined analytical reasoning as related to L1 outcomes in bilingual children. Relations between short-term phonological memory and the L1 have been mixed. Whereas some studies have found a relation between L1 NWR and L1 vocabulary (Lee et al., 2013), other studies have found NWR–vocabulary relations solely in the L2 (Ebert et al., 2014; Windsor et al., 2010).

Method

Recruitment Procedures

This study was approved by the institutional review boards of the university and the collaborating school

district. Children were recruited from four schools within a large urban school district in Southern California. Schools were selected from a list of schools in which Vietnamese students comprised 15% or more of the student population. Because the district's geographic area spanned over 200 square miles (San Diego Unified, 2017), we selected four schools that were close in proximity to the university to provide graduate and undergraduate student research assistants (RAs) with sufficient time to travel to/from campus and collect data during elementary school hours. We recruited children in kindergarten through second grade to capture the initial years of systematic English exposure, that is, the transition from home exposure primarily in the L1 to school instruction exclusively in the L2.

Recruitment procedures included meetings with principals and staff, written materials, and a telephone message sent to the Vietnamese parents at each school. The telephone message was prerecorded in Vietnamese to briefly introduce the study and notify parents that an information packet with contact information would be sent home via their children. One hundred seventy-three packets were sent to Vietnamese parents across the four schools. Eighty-four parents returned signed consent forms, corresponding to a response rate of 49%. Response rates per school ranged from 30% to 68%.

Parent surveys were conducted via telephone in the parents' preferred language by trained bilingual RAs. Parents were sent a letter in Vietnamese via their children thanking families for their child's participation and reminding parents that they would receive a phone call regarding a survey. At the initial call, parents were provided a brief (re)introduction to the study and were asked their preferred language for completing the survey. They were told that the survey would take about 30 min to complete, and parents were given the option to complete the survey in a single phone call or over multiple calls. The research team attempted to contact the parents of all participants via telephone to complete a survey. Twenty-three parents could not be reached by phone or did not complete the survey. Forty-six respondents completed the survey: 63% were mothers, 30% were fathers, and 7% were other care providers including a grandparent or nanny. Some of the respondents chose not to answer certain questions, resulting in missing data (see Table 1 for sample sizes).

Child and Parent Participants

On the basis of the 84 parents who provided written consent, we used a home language questionnaire form found in children's school records to confirm that Vietnamese was the primary language spoken at home. Seven children were excluded because of exposure to a third language such as Chinese or Cambodian. On the basis of school records, we also excluded four children who were receiving language services in schools, three children who failed school hearing screenings, and one child who had less than 1 year of English school exposure. The remaining 69 children (39 girls and 30 boys) completed the study.

Table 1. Descriptive statistics.

Factors and measures	<i>N</i>	Mean	<i>SD</i>	Min	Max
Internal factors					
Age in months	69	86	11	66	102
PTONI standard score	63	105	17	80	139
Vietnamese NWR	64	82***	8	62	95
English NWR	68	73	11	30	90
External factors					
Cumulative exposure from 0 to 5	43	82	19	50	100
Language input	46	22	10	04	45
Language output	46	16	11	00	41
Vietnamese activities	45	31	18	00	80
English activities	45	80	17	44	100
Language measures					
Vietnamese receptive vocabulary	69	80	18	23	100
English receptive vocabulary	69	98***	6	57	100
Vietnamese expressive vocabulary	69	36	23	0	81
English expressive vocabulary	69	81***	11	16	96

Note. External factors are displayed as percentages. Cumulative exposure = the sum of yearly ratings (100 = Vietnamese only). Language input and output = weekly percentages of Vietnamese heard and spoken by the child, respectively. Language measures are displayed as percent correct. Values with asterisks indicate higher performance when comparing the same task across languages using paired samples *t* tests. PTONI = Primary Test of Nonverbal Intelligence (Ehrler & McGhee, 2008); NWR = nonword repetition in percent phonemes correct.

****p* < .001.

Participants attended kindergarten (*n* = 27), first grade (*n* = 16), or second grade (*n* = 26) and had an average age of 7;0 years;months (*SD* = 11 months, range = 5;6–8;6 years;months).

On the basis of parent surveys, all parents (mothers and fathers) except for one father were born outside the United States, indicating first-generation American status. Mothers, on average, had been living in the United States for 14 years (range = 1–32 years). All mothers reported high Vietnamese proficiency, whereas English proficiency was mixed: 65% of respondents reported no to minimal English, and 35% reported high English proficiency. Language proficiency was also reflected in the language(s) in which surveys were conducted: 94% of the respondents preferred speaking in Vietnamese. Regarding mothers' level of formal education (either in the United States or Vietnam), 71% of the mothers had completed high school or less, whereas 29% completed some college or more. Regarding mothers' occupation, 84% of the respondents worked in manual labor, 9% did not work outside the home, 4% were small business owners, and 2% worked in professional careers.

Training and Assessment Procedures

RAs consisted of graduate and undergraduate students in speech-language pathology or a related field who were fluent in the target language (Vietnamese or English). The first author, who is fluent in Vietnamese and English and has a clinical background in speech-language pathology,

met individually with each RA to verify verbal fluency in the target language. RAs completed over 20 hr of training that included online training in research ethics and the protection of human subjects (Collaborative Institutional Training Initiative Program, 2017), an independent review of task administration protocols, role play activities, and individual meetings with the first author in which each RA practiced all tasks with at least one pilot child before working with study participants.

Child participants completed the study individually with a trained RA in a quiet area of their school during regular school hours. Before beginning the first session, the RA explained the study goals and procedures using child-friendly wording approved by the university's institutional review board. Children were encouraged to ask questions and provided written assent to participate in the study. As part of a larger study, children completed two sessions of 50 min each that targeted one language (Vietnamese or English). Sessions were separated by at least 2 days (average of 6 days), and the order of language administration was counterbalanced. Picture stimuli for all tasks were presented on an iPad 2 (Apple Inc.) using PDF files to reduce the amount of paper materials needed for data collection. Use of the iPad 2 also seemed to maintain the child's level of engagement throughout the session.

Tasks

Parent Surveys

Parent survey items were selected from the Bilingual Input Output Survey (Peña, Gutiérrez-Clellen, Iglesias, Goldstein, & Bedore, 2015) and the Alberta Language Environment Questionnaire (Paradis, 2011). Items were translated and adapted to the Vietnamese language and culture with permission from the original authors. To address linguistic equivalence (Peña, 2007), translation into Vietnamese and back-translation to English were conducted by two independent bilingual reviewers with a graduate or college degree in speech-language pathology. To ensure that items were appropriate for a Vietnamese American audience (i.e., cultural equivalence: Peña, 2007), survey items were reviewed by an expert reviewer who was fluent in both languages and had 5 years of experience working with Vietnamese American parents in special education. Finally, the survey was piloted with two Vietnamese American parents who were not part of the study.

Child Vocabulary Tasks

Children completed picture identification and picture naming tasks in each language to measure receptive and expressive vocabulary skills, respectively. In the picture identification task, children viewed a 2 × 2 picture array, heard a target word, and pointed to the corresponding picture. Each 2 × 2 array consisted of the target item, a phonological foil, a semantic foil, and an unrelated foil. Phonological foils differed for Vietnamese and English, whereas the other foils remained the same. Target items were 40 common objects selected from a picture verification

task used with a separate sample of Vietnamese–English bilingual children (Pham & Kohnert, 2014). In the picture naming task, children were shown pictures and were asked to name 80 items (40 objects and 40 actions). Items were the same as those of the timed picture naming task used in Pham and Kohnert (2014).

Picture stimuli for receptive and expressive vocabulary tasks were black and white line drawings that were freely available from the International Picture Naming Project (Szekely et al., 2004) and from Google image searches. None of the items or picture stimuli overlapped between the picture identification and picture naming tasks. The order of items differed for Vietnamese and English tasks to prevent practice effects across languages. Dependent measures were percent correct in each language.

Child-Internal and Child-External Factors

Internal Factors

Similar to Paradis (2011), the child-internal factors measured in this study were chronological age, gender, analytical reasoning, and phonological memory. Analytical reasoning was measured using the Primary Test of Non-verbal Intelligence (PTONI: Ehrler & McGhee, 2008). In this task, children were shown an array of three to five pictures and were asked to point to the picture that did not belong. Basal and ceiling rules outlined in the manual were followed. As outlined in the test manual, instructions were administered in English. RAs were also prepared to provide the Vietnamese instructions that were included in the test manual for children who were not able to complete the practice items. Practice items were repeated as needed. Within this sample of children, we provided Vietnamese instructions and repeated practice items in two cases to verify that the children understood the task before starting the test. Standard scores were used as the dependent measure to reduce the confound with chronological age.

Phonological memory was measured using NWR tasks in Vietnamese (Pham, Ebert, Dinh, & Dam, in press) and in English (Dollaghan & Campbell, 1998). The English NWR task (Dollaghan & Campbell, 1998) consisted of 16 items that followed the phonotactic rules of English and increased in length from one to four syllables (four items/length). The Vietnamese task (Pham et al., in press) consisted of 20 items that followed the phonotactic rules of Vietnamese and increased in length from one to four syllables (five items/length). Stimuli from both tasks excluded late-developing consonants and consonant clusters, and both tasks had a fixed syllable structure within each stimulus length. For English, one-syllable items consisted of consonant–vowel–consonant (CVC) structure, two-syllable items consisted of CVCVC structure, three-syllable items consisted of CVCVCVC structure, and four-syllable items consisted of CVCVCVCVC structure (Dollaghan & Campbell, 1998). For Vietnamese, one-syllable items consisted of CVC structure, two-syllable items consisted of CVCCV structure, three-syllable items consisted of CVCCVCCV structure,

and four-syllable items consisted of CVCCVCCVCCV structure (Pham et al., in press).

Consistent with procedures outlined in Dollaghan and Campbell (1998), items in the NWR tasks were presented in order of increasing difficulty. Stimuli were prerecorded by native speakers of each language. Children listened to the stimuli via headphones and were asked to repeat each item immediately after hearing it. Responses were audio-recorded for later transcription. Scoring followed Dollaghan and Campbell in that each phoneme was scored for accuracy (1 = *correct*, 0 = *incorrect*); substitutions and omissions were considered errors, whereas additions or slight distortions were not considered errors. Dependent measures were percent of phonemes correct (consonants and vowels) for each language. Two second raters (one for English and one for Vietnamese) with prior training in phonetic transcription randomly selected 15% of the sample and transcribed and scored the NWR data. Point-by-point interrater agreement was calculated to be 94.2% in English (range = 92%–97%) and 93.7% in Vietnamese (range = 91%–97%).

External Factors

External factors included cumulative exposure, current estimates of language input and output, and current estimates of language quality (e.g., language enrichment activities). For cumulative exposure, parents reported the language(s) spoken in the home (2 = *Vietnamese*, 1 = *both*, and 0 = *English*) for each year of the first 5 years of the child's life. The maximum score was 10 (i.e., Vietnamese-only for 5 years). The dependent measure was the proportion of Vietnamese spoken in the home in which 1.00 would indicate 100% Vietnamese and 0.00 would indicate 0% Vietnamese (equivalent to 100% English) in the home during the first 5 years of the child's life.

Language input and output were calculated as the proportion of Vietnamese heard or spoken by the child, respectively, within a typical week. Consistent with the Bilingual Input Output Survey (Peña et al., 2015), parents reported on the language(s) the child heard (input) and spoke (output) on an hourly basis (2 = *Vietnamese*, 1 = *both*, and 0 = *English*) for a typical weekday and a typical Saturday. Weekday and weekend estimates were multiplied by 5 and 2 days, respectively, and divided by the total number of waking hours. A proportion of 1.00 would indicate 100% Vietnamese, and 0.00 would indicate 0% Vietnamese (equivalent to 100% English).

Consistent with the Alberta Language Environment Questionnaire (Paradis, 2011), language-based enrichment activities (e.g., books, media) were tallied by language and frequency (e.g., 2 = *every day*, 1 = *one to two times/week*, and 0 = *never*). For Vietnamese, the maximum score was 10, which includes books (2 points = *every day*), iPad (2 points = *every day*), TV/movies (2 points = *every day*), storytelling (2 points = *every day*), weekend Vietnamese class (1 point = *once a week*), and attending a Vietnamese church or temple (1 point = *once a week*). For English, the maximum score was 8, which includes books

(2 points = *every day*), iPad (2 points = *every day*), TV/movies (2 points = *every day*), and storytelling (2 points = *every day*). Vietnamese and English activities were calculated separately: The sum of points by an individual child in a given language was divided by the total number of possible points for that language.

Data Analysis

Statistical analyses were conducted using SPSS software, Version 23.0 (IBM Corporation, 2014). We calculated bivariate Pearson correlations between internal/external factors and vocabulary outcomes in each language and controlled for multiple comparisons using the Benjamini and Hochberg (1995) method. In accordance with Cohen (1988), we considered significant correlations greater than .50 as large, between .50 and .30 as moderate, and less than .30 as small. After the correlation analysis, we conducted separate stepwise regressions for each outcome measure: Vietnamese receptive vocabulary, Vietnamese expressive vocabulary, English receptive vocabulary, and English expressive vocabulary. Because stepwise regressions use statistical algorithms to identify which predictors to include and which to exclude from final models (George & Mallery, 2016), we entered all 10 internal and external factors into each model to identify the most important predictors for each vocabulary outcome measure. Because not all participants completed all tasks, we selected pairwise deletion (instead of listwise deletion) for all correlation and regression analyses.

Results

Table 1 displays the descriptive statistics for child-internal factors, child-external factors, and vocabulary measures. As noted in the table, six children did not complete the PTONI (Ehrler & McGhee, 2008) because of time conflicts with school-related activities. For these children, teachers and/or parents verified that there was no history of special education or any concern regarding non-verbal intelligence. Five children did not complete Vietnamese NWR, and one child did not complete English NWR. For NWR tasks, if children refused to repeat the two practice items even after multiple opportunities, RAs would stop task administration and would not continue to the test items.

Regarding internal factors, children scored within the average range on the PTONI with a mean standard score of 105 and a range of 80–139. For NWR tasks, average group performance was higher in Vietnamese (82% percent of phonemes correct) than in English (73%) when compared using a paired samples *t* test, $t(63) = 6.19, p < .001, d = 0.94$. In addition, there was a wider distribution of scores for English (30%–90% accuracy) than for Vietnamese (62%–95% accuracy), indicating more variability in NWR performance for English than Vietnamese.

External factors were gathered from parent survey data. Average cumulative exposure from 0 to 5 years was

82%, indicating that the primary language spoken at home was Vietnamese before school entry. In contrast, current language input and output primarily consisted of English: Children, on average, heard 22% Vietnamese and spoke 16% Vietnamese within a typical week. The proportion of weekly language-based enrichment activities (e.g., books, media) was greater for English (80%) than Vietnamese (31%). The greater proportion of English activities may have been in large part because English activities could have been conducted during and outside school, whereas Vietnamese activities were limited to outside school hours. Descriptively, we noted the wide range of percentages for Vietnamese activities (0%–80%). Language input and output percentages also varied (0%–43%); however, this range was smaller than that of Vietnamese activities. Together, these findings suggested that L1 exposure may have been more consistent in terms of quantity but more variable in terms of the quality of L1 interactions across families.

As shown in Table 1, average performance on Vietnamese receptive vocabulary (80%) was much higher than Vietnamese expressive vocabulary (36%), resulting in a gap between receptive and expressive skills in Vietnamese. In addition, the wide distribution of scores for receptive and expressive vocabulary (see Table 1) indicated high variability in Vietnamese vocabulary skills within the group. In contrast, average performance on English receptive vocabulary was very high (98%). Near-ceiling-level performance on this measure suggested that identifying commonly found objects was too easy of a task, at least in English. Average performance on English expressive vocabulary was also high (81%). Paired samples *t* tests showed higher performance in English than in Vietnamese for receptive vocabulary, $t(68) = -8.04, p < .001, d = 1.34$, and expressive vocabulary, $t(68) = -14.83, p < .001, d = 2.50$.

Factors Related to Vocabulary Outcomes in Each Language

Table 2 displays correlations between internal/external factors and vocabulary outcomes in each language. English receptive vocabulary was moderately related to one internal factor, English NWR ($r = .346, p = .004$) and was not related to any external factors. As shown in Table 3, stepwise regression confirmed that the best fitting model for English receptive vocabulary included English NWR as the sole predictor, which accounted for 12% of the variance on this task.

English expressive vocabulary was positively related to three internal factors of chronological age ($r = .450, p < .001$), Vietnamese NWR ($r = .294, p = .018$), and English NWR ($r = .529, p < .001$). The magnitude of these correlations ranged from small to moderate. Similar to English receptive vocabulary, English expressive vocabulary was not related to any external factors. As shown in Table 3, the best fitting model for English expressive vocabulary included English NWR and age, which together accounted for 37% of the variance on this task. Vietnamese NWR was no longer a significant predictor of English

Table 2. Correlations between internal/external factors and language outcomes.

Factors	Vietnamese		English	
	Rec vocab	Exp vocab	Rec vocab	Exp vocab
Internal factors				
Age	.281	.141	.191	.450
Female	.195	.104	.189	.232
PTONI	–.020	–.122	.116	.247
NWRV	.366	.206	.266	.294
NWRE	.108	.014	.346	.529
External factors				
Cumulative exposure	.356	.343	.075	–.016
Language input	.250	.353	–.085	–.019
Language output	.169	.320	–.220	–.196
Vietnamese activities	.367	.312	–.110	–.008
English activities	.007	–.131	–.070	–.169

Note. Boldfaced correlations are significant after controlling for multiple comparisons (Benjamini & Hochberg, 1995). Rec vocab = receptive vocabulary; Exp vocab = expressive vocabulary; PTONI = Primary Test of Nonverbal Intelligence (Ehrler & McGhee, 2008); NWRV = Vietnamese nonword repetition; NWRE = English nonword repetition.

expressive vocabulary in the final regression model after taking into account age and English NWR.

For Vietnamese (see Table 2), receptive vocabulary was related to a combination of internal and external factors. There were small to moderate positive correlations between Vietnamese receptive vocabulary and two internal factors of chronological age ($r = .281, p = .019$) and Vietnamese NWR ($r = .366, p = .003$) and two external factors of cumulative exposure ($r = .356, p = .019$) and Vietnamese activities ($r = .367, p = .013$). As shown in Table 4, the best fitting model for Vietnamese receptive vocabulary included one internal factor, Vietnamese NWR, and one external factor, Vietnamese activities, which together accounted for 35% of the variance on this task. Age and cumulative exposure were no longer significant predictors of Vietnamese receptive vocabulary in the final stepwise regression model.

Table 3. Best fitting regression models for English receptive and expressive vocabulary.

Factor	Receptive vocabulary			Expressive vocabulary		
	B	SE B	β	B	SE B	β
English NWR	.19	.06	.35**	.49	.12	.43***
Age				.34	.11	.32**
R^2		.12			.37	
F for change in R^2		8.97**			19.09***	

Note. Best fitting models were selected using stepwise regressions with all 10 internal and external factors entered as potential variables. NWR = nonword repetition.

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

Vietnamese expressive vocabulary was not related to any internal factors but was related to several external factors. There were moderate positive correlations between Vietnamese expressive vocabulary and cumulative exposure ($r = .343, p = .024$), language input ($r = .353, p = .016$), language output ($r = .320, p = .030$), and Vietnamese activities ($r = .312, p = .037$). As shown in Table 4, the best fitting model for Vietnamese expressive vocabulary included a single external factor, language input, which accounted for 12% of the variance on this task.

Discussion

This study focused on bilingual children in the early school years who spoke Vietnamese (L1) and English (L2). Using parent surveys and direct child measures, we identified factors related to vocabulary outcomes in each language. Consistent with the Social Interactionist Theory (Vygotsky, 1978), we examined an array of factors related to the child (i.e., child-internal factors) and the surrounding environment (i.e., external factors). Child-internal factors included age, gender, analytical reasoning, and short-term phonological memory, as measured by NWR tasks in each language. External factors captured the quantity of exposure in each language (i.e., cumulative exposure, current levels of input and output) as well as the quality of language interactions (i.e., enrichment activities in each language).

Before discussing the main research questions, we remark on the developmental patterns found within this bilingual sample. Consistent with previous studies of minority L1 speakers (e.g., Jia, Chen, Kim, Chan, & Jeung, 2014; Pham & Kohnert, 2014), bilingual children in this study showed shifts toward English within the early school years. Average performance on the receptive and expressive vocabulary tasks was higher in English than in Vietnamese. There was a strong positive correlation between chronological age and English expressive vocabulary. The lack of an association between age and English receptive vocabulary may have been because children performed at ceiling levels on this task. For Vietnamese, age was related to receptive vocabulary but not expressive vocabulary. Findings indicate improvement in English with age and potential L1 stagnation, at least in the expressive modality. Shifts toward English reflect school and community level support for the majority language; relatively weaker performance in Vietnamese reflects limited social support and fewer opportunities to use the L1 outside the home (Pearson, 2007).

In contrast to the shifts toward English dominance in vocabulary skills, performance on NWR tasks was higher in Vietnamese than in English (see Table 1). There are at least two potential reasons for this result. One potential reason for cross-linguistic differences in NWR performance might be related to the tasks themselves. Vietnamese and English NWR stimuli were comparable on many features including length (one to four syllables) and syllable structure (i.e., fixed syllable pattern within each length). Both tasks were administered in the same way (i.e., in increasing difficulty) and scored using guidelines from Dollaghan and

Table 4. Best fitting regression models for Vietnamese receptive and expressive vocabulary.

Factor	Receptive vocabulary			Expressive vocabulary		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Vietnamese activities	45.98	12.67	.48**			
Vietnamese NWR	1.09	0.30	.48**			
Language input				78.70	31.47	.35*
R^2		.35			.12	
<i>F</i> for change in R^2		10.69***			6.26*	

Note. Best fitting models were selected using stepwise regressions with all 10 internal and external factors entered as potential variables. NWR = nonword repetition.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Campbell (1998). Nonetheless, there may have been differences in the phonological properties of the stimuli that could have influenced the results; indeed, it is highly difficult to perfectly equate NWR tasks across languages (Ebert et al., 2014).

Another potential reason for higher NWR performance in Vietnamese might be related to a relative strength in the L1 in the area of phonological memory. The pattern of higher NWR performance in the L1 and higher L2 performance in other language areas has been found in previous studies with bilingual children. In a sample of school-age Spanish–English bilinguals with language impairment, Ebert and colleagues (2014) found higher NWR performance in the L1 (Spanish) although performance on expressive and receptive vocabulary measures was higher in English. Similarly, Lee et al. (2013) found that Korean–English bilingual children performed just as well as monolingual Korean children on a Korean NWR task, despite having poorer performance than monolinguals on Korean vocabulary tests. Relatively higher performance on certain tasks in the L1 and other tasks in the L2 is a hallmark of childhood bilingualism in which language dominance can fluctuate over time and language domain (Bedore et al., 2012; for a review, see Kohnert, 2012). The collective findings from previous studies suggest that phonological memory in bilingual children's L1 can remain relatively comparable with that in monolingual children (Lee et al., 2013) and therefore might be more resistant to attrition than other language skills.

Factors Related to L2 Vocabulary

Study findings indicate that different factors support vocabulary skills in each language. Regarding Research Question 1, we had anticipated that child-internal factors of age, analytical reasoning, and short-term phonological memory would be related to L2 vocabulary outcomes and that, overall, child-internal factors would explain a greater amount of variance in L2 outcomes than external factors (cf. Paradis, 2011). These hypotheses were supported in our results. As shown in Table 2, English expressive vocabulary was moderately related to age and strongly related to phonological memory, and the correlation between L2 expressive vocabulary and analytical reasoning,

indexed by PTONI, approached significance ($p = .051$). On the basis of stepwise regression models (Table 3), English NWR best predicted English receptive vocabulary, and age and English NWR best predicted English expressive vocabulary. Although there was a small correlation between Vietnamese NWR and English expressive vocabulary, Vietnamese NWR was no longer a significant predictor in the final regression model. Increases in L2 vocabulary with age reflect shifts toward relative strength in English that were previously discussed. Findings also highlight the relation between short-term phonological memory and vocabulary that has been consistently found in monolingual children (e.g., Gathercole & Baddeley, 1989) and in the L2 acquisition of bilingual children (e.g., Paradis, 2011; Verhagen et al., 2015).

Regarding external factors, Paradis (2011) found that two external factors of language quantity (months of English exposure) and quality (enrichment activities in the L2) predicted L2 vocabulary but that these external factors accounted for less variance in the final regression models than the child-internal factors. Unlike Paradis, we did not find any correlation between L2 vocabulary and external factors (see Table 2). This finding initially seemed counter-intuitive as children in this study were currently exposed to a much greater amount of English than Vietnamese (see inverse values of input and output in Table 1) and were engaging in English activities with high frequency. However, we noted that children, on average, were already performing high on the L2 vocabulary measures (see Table 1). Greater quantity and quality of English exposure might not be needed to improve L2 vocabulary, at least the type of vocabulary measured here, which included high-frequency objects and actions. One implication is that it may not be necessary to duplicate L2 acquisition efforts across home and school contexts. L2 use at home, particularly among immigrant parents who are limited in English proficiency, does not seem to contribute to children's initial L2 vocabulary skills (Hammer et al., 2009; Paradis, 2011).

The role of external factors, however, can change over time. Paradis and Jia (2017) followed a subgroup of children from the study of Paradis (2011) at the age of 8–10 years and found that external factors became more important at this older age. Discrepancies between the two

Paradis studies may reflect a developmental shift in which initial L2 acquisition is more reliant on child-internal factors of language learning aptitude, whereas continued L2 acquisition relies on environmental factors such as the quality of language input (Paradis & Jia, 2017). The surrounding environment continues to be a source for development (Vygotsky, 1978), and for minority L1 speakers, the environment more pertinent to L2 vocabulary development could be children's school rather than the home setting. The role of school instruction in providing high-quality L2 input may become a strong predictor of bilingual children's long-term L2 acquisition, particularly for building advanced vocabulary and academic language (Procter et al., 2005).

Factors Related to L1 Vocabulary

Regarding Research Question 2, we expected fewer relations between child-internal factors and L1 vocabulary because of the mixed findings in the literature on associations between L1 outcomes and age (e.g., Pham & Kohnert, 2010) and short-term phonological memory (e.g., Windsor et al., 2010). In contrast to internal factors, we anticipated that L1 vocabulary would be related to multiple external factors of language quantity (e.g., Gutiérrez-Clellen & Kreiter, 2003) and language quality (e.g., Scheele et al., 2010). Of the external factors, we expected cumulative exposure to be less predictive of L1 vocabulary than current levels of exposure (e.g., Bedore et al., 2012).

In line with our hypotheses, we found fewer associations between L1 vocabulary outcomes and child-internal factors. As shown in Table 2, there was a small correlation between age and Vietnamese receptive vocabulary and a moderate correlation between Vietnamese NWR and Vietnamese receptive vocabulary. Age, however, was not a significant predictor in the stepwise regression model for Vietnamese receptive vocabulary (Table 4), suggesting that increases with age can be inconsistent. Similar to Vietnamese expressive vocabulary, receptive vocabulary skills may be vulnerable to L1 attrition or stagnation.

Similar to previous studies of NWR in bilingual children (e.g., Lee et al., 2013; Windsor et al., 2010), we found more associations between NWR and language outcomes within each language than between languages. In contrast to previous studies that found associations between NWR and language outcomes in the L2 but not in the L1 (Ebert et al., 2014; Windsor et al., 2010), we found NWR related to vocabulary outcomes in each language. Differences in results could be related to the type of language outcome measured. This study measured vocabulary skills in terms of high-frequency words, whereas previous studies measured academic language skills using standardized tests. In summary, short-term phonological memory seems to underlie vocabulary development in general; however, the relation between phonological memory and vocabulary is language specific.

As expected, Vietnamese vocabulary outcomes were moderately related to multiple external factors: cumulative

exposure, language input and output, and Vietnamese activities (Table 2). Best fitting regression models (Table 4) revealed that Vietnamese NWR and Vietnamese activities best predicted Vietnamese receptive vocabulary and language input best predicted Vietnamese expressive vocabulary. The regression models show that current levels of input and output accounted for more variance in vocabulary than cumulative exposure (e.g., Bedore et al., 2012).

Consistent with the Social Interactionist Theory (Vygotsky, 1978), the richness of the surrounding environment, at least for the minority L1, was measured in terms of the quantity and quality of interactions. Minority L1s have less social value than the majority language and are used in more limited contexts with a fewer number of partners (Pearson, 2007). Particularly for minority L1s, frequent and rich exposure is vital for continued development (Kohnert, Yim, Nett, Kan, & Duran, 2005; Pearson, 2007). In contrast to the majority L2 that can be found in school and the larger community, the home environment is the main context and source for development (Vygotsky, 1978) for the L1.

Study Limitations

There were at least three limitations to this study. First, many parents did not complete the entire survey, resulting in missing data. On the basis of anecdotal feedback, most parents worked 10 hr or more each day, 6 days of the week, and found it difficult to complete a survey of 30 min even if divided into multiple phone calls. Future studies that embark on collecting parent surveys, particularly with immigrant families, may need to reduce the time burden for parents and offer various ways to complete the survey in written, verbal, and in-person formats (e.g., Gutiérrez-Clellen & Kreiter, 2003). The second limitation was the correlational nature of the data. Correlations can identify potential relations between variables, and stepwise regression analysis can help to identify which factors have the best predictive values. However, cross-sectional data gathered at one time point cannot speak to causality. Future intervention studies that focus on the factors identified here (e.g., increasing L1 exposure) can provide more information on underlying mechanisms for supporting dual-language learning. Finally, although this study included multiple internal and external factors, we obviously could not include all potential factors. We recognize the importance of variables that were not included here such as factors related to the school context (e.g., quality of instruction, teachers' attitudes) and additional factors relevant to family life (e.g., cultural perspectives, child nutrition, frequent moves).

Clinical Implications

Several clinical implications can be gathered from the findings in this study. First, exposure to a minority L1 does not hinder English gains in sequential bilingual children. None of the external factors measured in this study

were associated with English performance. Findings suggest that children are learning English with or without familial support. Many immigrant parents (and even some educators) hold the misconception that the L1 can impede English acquisition. Mounting empirical evidence in this area shows that this is simply not the case in typical development (for a review, see Bialystok, 2001) as well as among children with disorders (for a review, see Kohnert, 2012). Consistent with previous studies (e.g., Hammer et al., 2009), we found that parental use of the L1 was unrelated to children's English (L2) vocabulary outcomes. Clarifying misconceptions is an excellent starting place on which to build home-school connections needed for children's academic success (Kohnert et al., 2005).

Although not directly measured here, this study highlights the potential for communication breakdown, particularly when parents prefer and have a higher proficiency in the L1, whereas children are shifting toward English. As children shift toward more English use, mothers have been shown to also shift toward English in parent-child interactions (Hammer et al., 2009). Increases in mothers' use of English have been linked to decreases in children's L1 proficiency (Hammer et al., 2009); it may also prove difficult for parents with limited English skills to communicate fully and accurately with their children. Miscommunication or limited communication in the home can strain family ties well into adolescence (Tseng & Fuligni, 2000). Supporting children's L1 is one way to address the intergenerational communication gap. For Vietnamese American youth from immigrant families, high Vietnamese language proficiency has been related to stronger family cohesion (Ho & Birman, 2010). Indeed, continued L1 development is important for children's overall psychosocial and emotional well-being (e.g., Tsai et al., 2012).

Finally, findings from this study suggest that the key to promoting L1 development is through rich and frequent exposure to the L1 and opportunities for L1 use (Kohnert, 2012; Pearson, 2007). Parents play an important role in promoting L1 skills in their children, particularly given the shortage of formal schooling opportunities in the United States that support bilingualism and biliteracy. Tangible methods in which immigrant parents have promoted the L1 include weekend heritage language classes and visits to the country of origin. However, Jia and colleagues (2014) caution parents that weekend L1 classes may not be engaging due to older materials, antiquated teaching methods, and heavy reliance on untrained volunteers; researchers also propose that visits to the home country need thoughtful planning to provide rich and varied language experiences. Resources are needed for parents to make the daily commitment to promote children's L1 speaking and reading skills (Law, 2015).

In collaboration with parents, there are a variety of ways educators can support children's L1. First, teachers and speech-language pathologists interact with parents regularly and can help to clarify misconceptions about bilingualism (e.g., Kohnert, 2012; Kohnert et al., 2005). Second, speech-language pathologists can provide parent training

on how to support language development (e.g., Tysbina & Eriks-Brophy, 2010). Finally, incorporating the L1 into the classroom (e.g., Cummins, 2005) and into treatment planning (e.g., Cordero & Kohnert, 2006), even when educators do not speak children's L1, conveys the message that the L1 has value and creates meaningful and varied opportunities to develop L1 skills.

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