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Reading-related skills of kindergartners from diverse linguistic backgrounds

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ABSTRACT
This study examined whether measures used to identify children at risk for reading failure are appropriate for children from different language backgrounds. Tasks assessing literacy and phonological and language processing at the beginning and end of kindergarten were administered to 540 native English speakers (NS), 59 bilingual children (BL), and 60 children whose initial exposure to English was when they began school (ESL). Although the BL and ESL children performed more poorly than the NS children on most measures of phonological and linguistic processing, the acquisition of basic literacy skills for children with different language backgrounds developed in a similar manner. Furthermore, planned contrasts between the language groups did not explain the variance in the children's literacy performance in May. Instead, alphabetic knowledge and phonological processing were important contributors to early reading skill. Therefore, children learning English may acquire literacy skills in English in a similar manner to NS children, although their alphabetic knowledge may precede and facilitate the acquisition of phonological awareness in English.

The consequences for untreated reading disabilities extend far beyond the academic domain. When learning disabilities are inadequately remediated, children and adolescents are at a higher risk for developing secondary behavioral problems and psychiatric disorders (Barwick & Siegel, 1996; McBride & Siegel, 1997; Silver, 1989, 1993). The success or failure of treatment for learning disabilities is dependent on the time at which intervention began. In fact, the proportion of children whose reading disabilities are successfully remediated decreases dramatically when intervention is delayed until third grade or later (Foorman, Francis, Shaywitz, Shaywitz, & Fletcher, 1997; Lyon, 1995). Therefore, early

intervention is a critical component in the prevention and treatment of learning disabilities and their consequences.

Screening for the cognitive and linguistic skills that are considered prerequisite to reading acquisition is a first step toward intervention. There is considerable evidence indicating that it is possible to identify children who are at risk for reading failure in their native language before formal instruction has even begun (e.g., Blachman, 1984; Scanlon & Vellutino, 1997; Share, Jorm, Maclean, & Matthews, 1984). According to Siegel (1993), there are five basic cognitive processes involved in reading. These processes include phonological processing, syntactic awareness, working memory, semantic processing, and orthographic processing. Many screening batteries used to identify at-risk children typically assess some or all of these processes (e.g., Majsterek & Ellenwood, 1990; Scanlon & Vellutino, 1997; Share et al., 1984). Although these measures have proven to be robust predictors of subsequent reading ability within one's native language, it is less clear whether these measures are also appropriate for children from linguistically diverse backgrounds. Thus, in this study we examined the nature and development of phonological processing, orthographic awareness, and naming speed in both native English-speaking prereaders and children from diverse linguistic backgrounds.

One skill that has proven to be an excellent predictor for subsequent reading development is phonological awareness for native speakers of English (e.g., Adams, 1990; Bradley & Bryant, 1983; Juel, Griffith, & Gough, 1986; Perfetti, 1984; Stanovich & Siegel, 1994; Wagner & Torgesen, 1987) and for native speakers of other languages (Ben-Dror, Bentin, & Frost, 1995; Casalis & Louis-Alexandre, 2000; Høien, Lundberg, Stanovich, & Bjaalid, 1995; So & Siegel, 1997; Sprenger-Charolles, 1991). In fact, phonological awareness has proven to be a more powerful predictor of the speed and efficiency of reading acquisition than intelligence test scores (Share et al., 1984; Stanovich, 1994; Stanovich, Cunningham, & Cramer, 1984). Due to its strong predictive validity, a number of screening measures that assess phonological awareness in kindergarten have been developed to identify children at risk for future reading failure (e.g., Majsterek & Ellenwood, 1990; Muter, Hulme, & Snowling, 1997; Torgesen & Bryant, 1994).

In addition to measures of phonological awareness, children's knowledge of letter names, or alphabet knowledge, is critical for successful reading acquisition (Foorman et al., 1997; Siegel, 1993). Letter name knowledge has been a consistent predictor of early reading skills for native speakers of English and other languages (e.g., Adams, 1990; Bruck, Genessee, & Caravolas, 1997; Chall, 1967; Majsterek & Ellenwood, 1995; Vellutino & Scanlon, 1987). However, the relation between phonological awareness and letter knowledge is a matter of considerable debate. Some assume that alphabet knowledge is independent of phonological awareness (Adams, 1990). Others have argued that alphabet knowledge is critical for the development of phonological awareness (e.g., Stahl & Murray, 1994, 1998; Wagner, Torgessen, & Rashotte, 1994). In fact, Stahl and Murray (1994) found using scatterplot analysis that children who could not identify at least 45 of 54 letter forms showed little evidence of phono-

logical awareness. Therefore, alphabet knowledge may be more effective as an early predictor of early literacy skill.

In addition to the well-established deficits in phonological and alphabetic knowledge, there is evidence for the involvement of naming speed deficits in reading disability (e.g., Badian, 1993; Badian, McAnulty, Duffy, & Als, 1990; Bowers, 1995; Bowers & Swanson, 1991; Felton & Brown, 1990; Korhonen, 1995; McBride-Chang & Manis, 1996; Wolf, 1991a; Wolf, Bally, & Morris, 1986; Wolf & Obregon, 1992). In fact, naming speed, as measured in rapid automatized naming tasks (RAN, Denckla & Rudel, 1976), was shown to be a significant predictor of later reading skill (Ackerman & Dykman, 1993; Badian et al., 1990; Denckla & Rudel, 1976; Share et al., 1984; Wolf, 1991b). Potential underlying causes for impaired naming speed include phonological deficits (Wagner, Torgesen, Laughon, Simmons, & Roshette, 1993), deficits in orthographic processing (Bowers, 1995), and deficits in word retrieval (Fawcett & Nicolson, 1994). Each of these deficits can account for the relationship between naming speed and reading skill.

Finally, more general cognitive skills that are considered important for reading acquisition are syntactic awareness and verbal working memory. Syntactic awareness refers to the ability to understand the basic grammatical structure of the language in question. This skill appears critical for the fluent and efficient reading of text, which requires making predictions of words that come next in the sequence. Deficits in syntactic awareness in poor readers were reported for native speakers of English (e.g., Siegel & Ryan, 1988; Tunmer & Hoover, 1992; Tunmer, Nesdale, & Wright, 1987) and native speakers of other languages (e.g., Bentin, Deutsch, & Liberman, 1990; Da Fontoura & Siegel, 1995; So & Siegel, 1997). The second skill, verbal working memory, refers to the cognitive processes involved in the temporary storage of information while simultaneously processing incoming information or retrieving information from long-term storage (Baddeley, 1983). For beginning readers, decoding places heavy demands on verbal working memory. Beginning readers must retrieve the appropriate grapheme–phoneme correspondences from long-term memory, hold those in memory in the appropriate sequence, and blend them to produce the appropriate pronunciation of the target word. There is considerable evidence that individuals with reading disabilities experience significant difficulties with working memory (Chiappe, Hasher, & Siegel, 2000; Gottardo, Stanovich, & Siegel, 1996; Siegel, 1994; Siegel & Ryan, 1988; Swanson, 1993, 1994). Similar difficulties in working memory were reported for disabled readers in Chinese (So & Siegel, 1997), Hebrew (Geva & Siegel, 2000) and Portuguese (Da Fontoura & Siegel, 1995).

However, it is less clear whether the factors that are important for the acquisition of early literacy skills in one's native language are the same for children who are learning to read in a second language. A growing body of research suggests that phonological awareness is a skill that appears to transfer from one's first to one's second language and is not restricted to the language of experience (Chiappe & Siegel, 1999; Cisero & Royer, 1995; Durgonoglu, Nagy, & Hancin-Bhatt, 1993; Verhoeven, 1994). However, it is less clear whether there is the same cross-lan-

guage transfer of more complex cognitive skills, such as syntactic awareness and verbal working memory. For example, Chiappe and Siegel found that Punjabi-speaking children in the first grade had decoding and phonological skills in English comparable to those of their native speaking peers. However, their syntactic skills lagged behind the native English speakers. Similarly, Da Fontoura and Siegel (1995) found that the verbal working memory and the syntactic skills of Portuguese–English bilingual children who had been born in Canada still lagged behind the skills of English monolingual children in middle school.

Despite the convergence of studies showing cross-language transfer for phonological awareness but not for syntactic processing or working memory (Durgunoglu et al., 1993; Verhoeven, 1994), there is evidence suggesting that young children who are learning English as a second language may show poorer performance on phonological measures than native English speakers (Wade-Woolley, Chiappe, & Siegel, 1998). In fact, Wade-Woolley et al. found that children for whom English is a second language (ESL) performed more poorly than native English speakers on measures of phonological awareness in kindergarten, but not in the following year in grade 1. Therefore, the amount of exposure to English experienced by ESL children may influence whether their performance on phonological awareness and other linguistic measures shows impairments relative to native English speakers. The purpose of the present study was to test if those variables that are considered important for reading acquisition among native speakers of English play the same role in the reading acquisition of children from different linguistic backgrounds. Three types of language backgrounds were considered in the current study: native English speakers who spoke English exclusively at home, bilingual children who spoke English and at least one other language at home, and ESL children who did not speak English until they began school in kindergarten. Thus, the literacy, phonological, and language skills of children with different linguistic backgrounds were examined.

METHOD

Participants and design

The development of language and beginning literacy skills were examined for 659 kindergarten children enrolled in 32 schools in the North Vancouver school district; it was assessed in November and the following May. All participants' hearing and vision were in the normal range. The children and their teachers were questioned about the languages the children spoke at home with their families. There were 540 children who were native English speakers (NS). These children spoke English at home with their parents. There were 59 children who reported that they spoke English and at least one other language at home. These children were classified as bilingual (BL). Languages in addition to English spoken by bilingual children included Farsi (11 children), Japanese (7 children), Spanish (7 children), Tagalog (5 children), Chinese (5 children), French (4 children), Slovakian (3 children), and Canadian First Nations languages such as Squamish (3 children). Additional non-English languages that were spoken by one or two bilingual children included Arabic, German, Greek, Hindi, Indone-

sian, Korean, Kurdish, Polish, Portuguese, and Punjabi. There were 60 children who exclusively spoke a language other than English at home. These children were classified as ESL. The main languages spoken by ESL children included Chinese (both Mandarin and Cantonese by 21 children), Farsi (12 children), and Korean (6 children). Additional languages spoken by one or two ESL children included Arabic, Armenian, Bulgarian, Finnish, Hindi, Italian, Kurdish, Norwegian, Pujabi, Russian, Spanish, and Swedish. The children from all three language groups demonstrated sufficient skill in English to complete all the tasks. In addition, the children from the three language groups lived in the same neighborhoods and attended the same schools. In November the mean age of the total sample was 64.2 months, and there was a standard deviation of 3.5 months.

Instructional program. The literacy programs within this district are guided by the philosophy that every child can become a reader through a balanced approach to literacy instruction. In practice, the instructional programs included phonological awareness training for all children in kindergarten. Additional phonological awareness training was provided to children identified as being at risk for reading problems in small groups and on an individual basis. The phonological awareness training in these schools was based on the prototype of the program, *Launch into Reading Success* (Bennett & Ottley, 2000). Most classes taught the letter–sound relationships using songs such as the alphabet jive. In addition to phonics and phonological awareness training, teachers used a variety of activities, such as journal writing, read alouds, the use of big books, lively discussions, alphabet songs, and cloze activities to foster growth in literacy and oral language skills.

Although intervention for potential reading difficulties is provided to children in this district when they are in kindergarten, language intervention is not available for ESL and bilingual children until they are in the first grade. Thus, the ESL and bilingual children in this study were in the same kindergarten classrooms and received the same instructions as NS children.

Measures

Literacy measures. In both sessions, beginning literacy skills were assessed using the reading subtest of the Wide Range Achievement Test–3 (WRAT-3; Wilkinson, 1995). The WRAT-3 reading test requires children to identify 15 upper-case letters and a set of words presented in order of increasing difficulty. This task is discontinued when a child makes 10 consecutive errors. Both raw and percentile scores were calculated for this measure.

Children were also given a letter identification task in which they were asked to name lower-case letters presented in random order. The letters were presented in 18-point Arial typeface. The total number of letters identified by the children was used as the dependent measure, with a maximum score of 26.

The third literacy measure was a simple spelling task in which the children were asked to print their names and five high frequency, simple words. These words were *no, mom, dad, cat,* and *I*. Children were awarded 1 point for correctly spelling their names and each of the simple words.

Children's experience with everyday print was assessed using an environmental print task, in which they attempted to name 18 stimuli. The stimuli were names of objects, signs, popular movies, and local sports teams that were common in the environment. Stimuli included 7up, Batman and Robin, Blockbuster, Dairy Queen, KFC, McDonald's, Nike, Pizza Hut, Pepsi, Reebok, Roots (a popular clothing chain in Canada), Sesame Street, Shell, Starbucks Coffee, Stop, Taco Bell, *The Lost World*, and Vancouver Grizzlies. Six of the stimuli were presented in the logo condition with their stylized print accompanied by their familiar logos. For example, Taco Bell was presented with the ringing bell above its name. Six of the stimuli were presented in the stylized print condition, in which the items were presented with their familiar typeface but without the logo. For example, McDonald's appeared in its stylized print without the well-known golden arches. The final six stimuli were presented in typeface condition using a 20-point Century Gothic font. The stimuli were counterbalanced so that every stimulus appeared in each condition an equal number of times. The number of stimuli recognized in each condition (logo, stylized print, and typeface) was recorded. The maximum value for each of the three scores obtained from this task was 6.

Measures of phonological processing. All children were administered five measures of phonological processing. These tasks were administered in both sessions, unless indicated otherwise.

SOUND MIMICRY. First, children's skill at recognizing and reproducing sounds in oral language was assessed using the Sound Mimicry Subtest of the GFW Sound Symbol Test (Goldman, Fristoe, & Woodcock, 1974). In this task, children repeated pseudowords of increasing difficulty that had been read to them by the experimenter. Pseudowords ranged in difficulty from vowel–consonant (VC) syllables (e.g., *ab* and *id*) to polysyllabic pseudowords (e.g., *depnoniel* and *bafmotbem*). Once a child produced five consecutive errors, the task was discontinued. This task had a maximum score of 55.

RHYME DETECTION. The Rhyme Detection task from the Phonological Awareness Test (Muter et al., 1997) was administered. In this task, children were shown four pictures. A picture of the target word appeared above three pictures. Children were asked which of the three words rhymed with the target word. For example, the examiner asked: "Which word rhymes with cat: fish, gun, or hat?" There were three practice trials, in which the child received corrective feedback. For example, if the child replied, "fish," the examiner would respond: "It is true that cats like to eat fish. But I am looking for a word that goes with cat in a different way. The word I am looking for ends with the same sound as cat, which is hat. Do you hear how they sound alike? Cat. Hat." The three practice trials in which children received corrective feedback were followed by 10 test trials with no feedback. The maximum score was 10.

SYLLABLE AND PHONEME IDENTIFICATION. These tasks from the Phonological Awareness Test (Muter et al., 1997) were administered. The two identification tasks were administered only in November. In these tasks, children were required to complete words. In the Syllable Identification task, the examiner

said, "Here is a picture of a rabbit. I'm going to say the first part of the word. Can you finish it for me. Here is a ra . . ." If the child failed to give the correct response, the examiner provided the correct answer, saying, "If I say ra, you finish the word by saying bit. Let's try it again with rabbit. Ra . . ." Corrective feedback was provided for the two practice trials, but not for the eight test trials without feedback. This task was followed immediately by the Phoneme Identification task. To introduce the Phoneme Identification task, examiners said: "Now we are going to do something that is a bit more difficult. Here is a picture of a watch. I'm going to say the first part – you finish it off. Wa . . ." Corrective feedback was given in the three practice trials, but not in the eight subsequent test trials. For both the Syllable and Phoneme Identification tasks, children were shown pictures of the target words to reduce the memory load. The maximum score for syllable identification and phoneme identification was 8.

PHONEME DELETION. The fourth task assessed children's ability to delete phonemes from words. The Phoneme Deletion task from the Phonological Awareness Test (Muter et al., 1997) was administered in both sessions. First, children were required to delete the initial phoneme of words. The examiner introduced this task to the child by saying: "Here is a picture of a bus. If I say the word bus without the /b/, we'll be left with us. Bus without /b/ says us. Let's try some more." This was followed by three additional practice trials, in which corrective feedback was provided, and eight test trials without feedback. The initial phoneme deletion task was followed by four practice trials (with corrective feedback) and eight test trials (without feedback) in which the child deleted the final phoneme of words ("Bus without /s/ says . . ."). The final phoneme deletion task was administered in the same way as the initial phoneme deletion task. For all trials, children were shown pictures of the target words to minimize the memory load. The maximum score for this task was 16.

RAN TASKS. Phonological recoding in lexical access, or word retrieval, was assessed using a variation of the RAN task (Denckla & Rudel, 1976). In this task, the child named 40 items on a chart with eight rows and five columns. The chart consisted of five stimuli repeated eight times, which were line drawings of a tree, a chair, a bird, a pear, and a car. To ensure that all children knew the target words, a practice chart of the 5 items was presented immediately before the chart of 40 items was presented. If a child could not name one of the five practice items, its name was provided by the examiner and the child was asked to name the five practice items a second time. If the child was unable to readily produce the names of the five practice items after the prompting, the test chart of 40 items was not presented to the child and the RAN task was not administered. The score on the RAN task was the children's naming rate, which was calculated by dividing the total number of items named (40) by the time taken to complete the chart (in seconds).

Syntactic awareness. Children's syntactic awareness was assessed using an oral cloze task developed by Willows and Ryan (1981) and Siegel and Ryan (1988). In the oral cloze task sentences were read to the children, and the chil-

dren attempted to provide the missing word. Examples include *Jane _____ her sister ran up the hill* and *Jim set the lamp on the desk so he could _____*. In November this task had a maximum score of 12. However, a different set of 13 sentences was used in May. The sets of sentences used in November and May are presented in the Appendix.

Verbal memory. Verbal short-term memory was assessed using the Memory for Sentences subtest of the Stanford Binet (Thorndike, Hagen, & Sattler, 1986). Children repeated sentences that were read to them by the experimenter. These sentences ranged in difficulty from simple, two word sentences (i.e., *Drink milk*.), to complex sentences (i.e., *Ruth fell in a puddle and got her clothes all muddy*.). The raw score was used as the dependent measure.

Procedure

For both sessions, tests were administered individually to each child in one session lasting 40 min. All instructions were presented in English.

RESULTS

Table 1 summarizes the children's performance on the early literacy measures for each session. A multivariate analysis of variance (MANOVA) on the six measures of literacy (WRAT-3 reading raw scores; letter identification; simple spelling; and environmental print's logo, stylized print, and typeface conditions) was calculated to determine whether language background influenced performance on the literacy measures in the fall and spring. There were significant effects of language group in both the fall, $F(12, 1{,}220) = 2.18$, $p < .05$, $\eta^2 = .021$, and spring, $F(12, 1{,}278) = 4.67$, $p < .001$, $\eta^2 = .042$. However, a subsequent series of ANOVAs using the Bonferroni adjustment for multiple comparisons revealed significant differences between the language groups only for the logo condition of the environmental print measure in both the fall, $F(2, 615) = 7.67$, $p < .001$, $\eta^2 = .024$ and spring, $F(2, 644) = 14.62$, $p < .001$, $\eta^2 = .043$. Scheffé post hoc tests indicated that NS and BL children obtained higher scores than ESL children on this measure in both sessions. None of the other literacy measures revealed a significant effect of language group.

Next, we wished to determine whether children from different language backgrounds showed comparable growth in literacy during kindergarten. Two literacy composite variables were calculated as the mean percentage of items correct on the WRAT reading subtest, letter identification, and spelling tasks in the fall and the spring. A 3 (Language Group) × 2 (Session) repeated measures ANOVA, with session as a repeated measure, revealed that all children showed significant growth in literacy between November and May, $F(1, 655) = 518.08$, $p < .001$, $\eta^2 = .442$. Although there were no significant differences between the three language groups, $F(2, 655) < 1$, *ns*, $\eta^2 = .002$, the interaction between language group and session was significant, $F(2, 655) = 4.29$, $p < .05$, $\eta^2 = .013$. This interaction revealed that ESL children showed greater growth in literacy than the NS or BL children.

Table 1. *Mean scores on measures of early literacy*

	November			May		
	NS	BI	ESL	NS	BI	ESL
WRAT-3						
Raw score	9.77	9.80	9.25	14.34	13.61	14.68
	(5.12)	(5.48)	(5.38)	(4.04)	(3.96)	(3.89)
Percentile	45.04	46.12	43.38	50.08	45.75	52.20
	(29.17)	(31.76)	(31.79)	(23.32)	(24.00)	(26.40)
Letter identification						
(max. 26)	12.60	13.24	12.36	19.68	19.34	20.75
	(7.63)	(8.26)	(9.47)	(5.42)	(6.00)	(5.81)
Spelling (max. 6)	1.97	1.70	1.48	3.66	3.04	3.30
	(1.63)	(1.50)	(1.33)	(1.87)	(1.68)	(1.69)
Literacy composite	31.75	31.80	28.58	51.48	49.23	51.64
	(19.17)	(19.28)	(19.52)	(17.40)	(17.50)	(16.68)
Environmental print						
Logos	2.58	2.57	1.82	3.00	2.72	1.93
	(1.48)	(1.38)	(1.23)	(1.52)	(1.39)	(1.34)
Stylized print	0.35	0.22	0.30	0.79	0.95	0.82
	(0.80)	(0.46)	(0.74)	(1.30)	(1.34)	(1.31)
Typeface	0.11	0.05	0.05	0.30	0.10	0.28
	(0.56)	(0.29)	(0.22)	(1.01)	(0.67)	(0.87)

Note: The literacy composite is the mean percentage of items correct in WRAT-3 reading, letter identification, and spelling. Standard deviations are in parentheses.

Children's experience with environmental print was examined using a 3 (Language Group) × 3 (Stimulus Type: logo vs. stylized print vs. typeface) × 2 (Session) repeated measures ANOVA, with session and degree of completeness as repeated measures. There was a significant main effect of session, $F(1, 647) = 40.46$, $p < .001$. $\eta^2 = .059$, indicating that the children had higher scores in May than in November. The children were more successful at identifying stimuli presented as logos than as stylized print or typeface, $F(2, 646) = 483.52$, $p < .001$, $\eta^2 = .60$. There was also a significant main effect of language group, $F(2, 647) = 5.54$, $p < .01$, $\eta^2 = .017$. Scheffé post hoc tests indicated that NS children had higher environmental print scores than ESL children. The significant interaction between stimulus type and language group, $F(2, 647) = 14.99$, $p < .001$, $\eta^2 = .038$, reflected that, although the groups did not differ in the stylized print or typeface conditions, the NS and BL children were more familiar with the logos that appear in the environment. No other effects were significant.

Children's performance on the measures of phonological processing is presented in Table 2. A pair of MANOVAs on the six phonological measures in the fall (GFW sound mimicry raw scores, rhyme detection, syllable identification, phoneme identification, phoneme deletion, and RAN rate) and the four phonological measures in the spring (GFW sound mimicry raw scores, rhyme detection, phoneme deletion, and RAN rate) was calculated. Significant effects of

Table 2. *Mean scores on measures of phonological processing*

	November			May		
	NS	BI	ESL	NS	BI	ESL
GFW Sound Mimicry Test						
Raw score (max. 55)	46.87	46.02	44.74	47.14	45.63	45.81
	(7.60)	(7.38)	(8.64)	(6.93)	(6.67)	(6.10)
Percentile	75.98	72.44	68.33	72.16	63.39	64.19
	(23.53)	(26.04)	(26.93)	(39.23)	(26.85)	(24.54)
Rhyme detection (max. 10)	5.98	4.81	3.92	7.85	6.83	5.70
	(3.38)	(3.16)	(2.95)	(2.31)	(2.76)	(3.14)
Syllable identification (max. 8)	3.76	3.92	3.67			
	(2.81)	(2.62)	(2.45)			
Phoneme identification (max. 8)	1.94	2.22	2.17			
	(2.67)	(2.68)	(2.56)			
Phoneme deletion (max. 16)	2.56	1.53	1.73	6.11	5.36	4.51
	(3.92)	(3.01)	(3.13)	(5.36)	(5.31)	(5.18)
RAN (items/s)	0.58	0.53	0.52	0.63	0.60	0.63
	(0.19)	(0.16)	(0.18)	(0.17)	(0.16)	(0.20)
Phonological composite	53.81	47.15	44.21	67.42	61.85	55.83
	(16.29)	(15.06)	(14.87)	(16.49)	(18.70)	(16.69)

Note: The phonological composite is the mean percentage correct in GFW sound mimicry, rhyme detection, and phoneme deletion. Standard deviations are in parentheses.

language group were revealed in both the fall, $F(12, 1{,}234) = 3.84$, $p < .001$, $\eta^2 = .036$, and spring, $F(8, 1{,}258) = 5.75$, $p < .05$, $\eta^2 = .035$. A subsequent series of ANOVAs using the Bonferroni adjustment for multiple comparisons revealed significant differences between the language groups on rhyme detection in the fall, $F(2, 625) = 11.87$, $p < .001$, $\eta^2 = .073$, and the spring, $F(2, 632) = 21.29$, $p < .001$, $\eta^2 = .063$, and on RAN rate in the fall, $F(2, 625) = 6.61$, $p < .001$, $\eta^2 = .021$. Scheffé post hoc tests indicated that NS children obtained higher scores than the ESL children in rhyme detection and RAN rate in the fall. In the spring the NS children had higher scores in rhyme detection than the BL children, who obtained higher scores than the ESL children. None of the other phonological measures revealed significant effects of language group.

Next, we wished to determine whether children from different language backgrounds showed comparable growth in processing English phonology. A pair of phonological composite variables was calculated as the mean percentage of items correct on GFW sound mimicry, rhyme detection, and phoneme deletion in the fall and in the spring. A 3 (Language Group) × 2 (Session) repeated measures ANOVA revealed that all children showed significant growth in phonological processing in English between November and May, $F(1, 655) = 157.26$, $p < .001$, $\eta^2 = .194$. There was a significant effect of language background, $F(2, 655) = 18.86$, $p < .001$, $\eta^2 = .054$; and Scheffé post hoc tests revealed that the NS children were more successful in phonological processing

Table 3. *Mean scores on language measures as a function of language group*

	November			May		
	NS	BI	ESL	NS	BI	ESL
Oral cloze	1.76	0.88	0.50	5.31	3.79	2.59
	(2.32)	(1.63)	(1.10)	(2.74)	(2.66)	(2.34)
Memory for sentences	16.04	14.17	12.70	16.85	14.67	13.28
	(3.50)	(3.63)	(4.24)	(3.20)	(3.45)	(2.76)
Language composite	26.45	20.53	17.63	40.50	32.02	25.89
	(11.76)	(8.94)	(8.91)	(12.67)	(12.72)	(11.09)

Note: The language composite is the mean percentage of items correct in oral cloze and memory for sentences. Standard deviations are in parentheses.

in English than ESL and BL children. However, the interaction between language group and session was not significant, $F(2, 655) < 1$, *ns*, $\eta^2 = .002$.

The children's performance on the language measures is summarized in Table 3. A pair of MANOVAs on the two language measures (oral cloze and memory for sentences) was calculated for the fall and spring. Significant effects of language group were revealed in both the fall, $F(4, 1{,}276) = 15.51$, $p < .001$, $\eta^2 = .047$, and the spring, $F(4, 1{,}280) = 24.35$, $p < .001$, $\eta^2 = .073$. A subsequent series of ANOVAs using Bonferroni adjustments for multiple comparisons revealed significant differences between the language groups in oral cloze in the fall, $F(2, 639) = 11.88$, $p < .001$, $\eta^2 = .036$, and the spring, $F(2, 641) = 32.35$, $p < .001$, $\eta^2 = .092$. Scheffé post hoc tests indicated that the NS children obtained higher oral cloze scores than BL and ESL children in both sessions. Although the BL and ESL children obtained comparable oral cloze scores in the fall, the BL children received higher scores than the ESL children in the spring. There were also significant differences between the language groups in memory for sentences in the fall, $F(2, 639) = 28.32$, $p < .001$, $\eta^2 = .081$, and the spring, $F(2, 641) = 40.50$, $p < .001$, $\eta^2 = .112$. For both sessions, Scheffé post hoc tests revealed that the NS children obtained higher scores than the BL children, who had higher scores than the ESL children.

To determine whether children from different language backgrounds showed comparable growth on the language measures, two language composite variables were calculated as the mean percentage of items correct on oral cloze and memory for sentences in the fall and in the spring. A 3 (Language Group) × 2 (Session) repeated-measures ANOVA revealed that all children showed significant growth on the language measures between November and May, $F(1, 639) = 195.22$, $p < .001$, $\eta^2 = .234$. There was a significant effect of language background, $F(2, 639) = 45.72$, $p < .001$, $\eta^2 = .125$, with Scheffé post hoc tests revealing that the NS children were more accurate on the language measures than the BL children, who obtained higher scores than the ESL children. The interaction between language group and session was also significant, $F(2, 639) = 6.15$, $p < .001$, $\eta^2 = .019$, indicating that the NS children showed greater growth in performance than the ESL children.

Table 4. *Correlations among literacy and phonological and linguistic variables as a function of language group*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
NS Children	—	.86***	.59***	.12**	.30***	.30***	.17***	.12**	.17***	.33***	.27***	.26***	.17***	.18***
1. WRAT raw score														
2. Letter identification	.80***	—	.64***	.14***	.29***	.25***	.12**	.13**	.21***	.32***	.28***	.27***	.15**	.17***
3. Spelling	.61***	.63***	—	.09	.30***	.24***	.21***	.17***	.25***	.36***	.32***	.26***	.18***	.17***
4. EP: Logos	.28***	.18***	.18***	—	.12**	.14**	.11*	.06	.13**	.07	.12**	.08	.11*	.12**
5. EP: Label	.52***	.27***	.29***	.23***	—	.50***	.09	.06	.10*	.26***	.20***	.11*	.06	−.03
6. EP: Type	.57***	.26***	.25***	.34***	.63***	—	.09	.03	.15**	.27***	.24***	.11*	.15**	.02
7. Sound mimicry	.16***	.14**	.29***	.08	.15***	.17***	—	.10*	.14**	.10*	.06	.06	.12**	.26***
8. Rhyme detection	.10*	.03	.13**	−.01	.05	.03	.15***	—	.22***	.20***	.17***	.14**	.24***	.29***
9. Syllable ident.									—	.51***	.27***	.05	.22***	.23***
10. Phoneme ident.										—	.41***	.08	.23***	.17***
11. Phon. deletion	.40***	.28***	.39***	.17***	.28***	.32***	.24***	.16***			—	.12*	.25***	.24***
12. RAN rate	.33***	.26***	.28***	.16***	.19***	.22***	.06	.11*			.19***	—	.07	.11**
13. Oral cloze	.20***	.19***	.30***	.15***	.09*	.15***	.23***	.26***			.33***	.14**	—	.34***
14. Memory	.19***	.16***	.22***	.09*	.09*	.10*	.32***	.19***			.26***	.19***	.43***	—
Bilingual Children	—	.93***	.53***	−.04	.11	.19	.12	.32*	.35**	.39**	.27*	.18	.26*	.19
1. WRAT raw score														
2. Letter identification	.84***	—	.55***	−.03	.06	.22	.12	.27*	.22	.28*	.21	.29*	.20	.20
3. Spelling	.74***	.68***	—	.02	.07	−.01	.18	.32*	.14	.32*	.19	.15	.25	.19
4. EP: Logos	.22	.15	.36**	—	.14	.10	.38**	.05	.10	.13	−.03	.24	.21	.21
5. EP: Label	.47***	.41***	.36**	.10	—	.16	−.12	−.03	.06	−.04	−.12	.15	.02	−.09
6. EP: Type	.47***	.18	.27*	.20	.50***	—	.06	−.18	.05	−.08	−.09	.08	−.10	.01

7. Sound mimicry	.28*	.19	.13	.05	.23	.13	—	.09	.13	.17	.19	.06	.10	.53***
8. Rhyme detection	.27*	.24	.19	.16	.32*	.18	.30*	—	.30*	.25	.29*	.05	.27*	.40**
9. Syllable ident.									—	.49***	.29*	.08	.27*	.05
10. Phoneme ident.										—	.38**	.09	.32*	.06
11. Phon. deletion	.30*	.12	.47***	.24	.36**	.31*	.37** .10	.35** .29*			— .25	.31*	.38**	.23
12. RAN rate	.26*	.22	.25	.16	.36**	.21						—	.33*	.22
13. Oral cloze	.35**	.34**	.42***	.30*	.26	−.05	.36**	.45***			.50***	.26*	—	.28*
14. Memory	.21	.20	.20	.16	.23	−.09	.54**	.45***			.43***	.34**	.50***	—
ESL Children	—	.92***	.44***	−.01	.24	.29*	−.15	−.10	.20	.11	.02	.32*	.33*	−.10
1. WRAT raw score														
2. Letter identification	.82***	—	.49***	−.03	.28*	.31*	−.17	−.13	.18	.14	.02	.29*	.30*	−.11
3. Spelling	.62***	.53***	—	.26	.48***	.22	.03	.21	.16	.26	.11	.19	.40**	.29*
4. EP: Logos	.13	.06	.23	—	.36*	.22	−.04	.39**	.02	−.07	.06	.08	.34**	.06
5. EP: Label	.46***	.24	.36**	.06	—	.32*	−.09	−.26*	.09	.06	.22	−.03	.49***	.10
6. EP: Type	.43***	.24	.41***	.15	.57***	—	.02	.09	.06	.14	.37**	.00	.44**	−.10
7. Sound mimicry	.13	.18	.29*	−.05	.25	.21	—	−.02	.30*	.09	.00	.02	−.05	.44***
8. Rhyme detection	−.06	−.01	−.12	.06	−.15	.03	.08	—	.04	.33*	.22	−.02	.17	.30*
9. Syllable ident.									—	.33*	.02	.09	.25	.36**
10. Phoneme ident.										—	.31*	.14	.06	.16
11. Phon. deletion	.46***	.28*	.39**	.07	.23	.43***	.13	.11			—	.11	.31*	−.06
12. RAN rate	.41**	.38**	.30*	.15	.00	−.0	.10	−.08			.21	—	.04	.13
13. Oral cloze	.00	.01	.21	.24	.07	.37**	.14	.31*			.21	.14	—	.20
14. Memory	−.05	.07	.24	.24	−.09	.12	.26	.46***			−.02	.16	.59***	—

Note: Correlations for fall variables are presented above the diagonal and correlations for spring variables are presented below the diagonal.
*$p < .05$; **$p < .01$; ***$p < .001$.

Correlations among literacy, phonological, and linguistic variables

Table 4 presents the Pearson product-moment correlations among the kindergarten variables in the fall and the spring for the children from the three language groups. The children showed comparable patterns of performance when the correlations were examined among the literacy measures, which showed moderate to high correlations in the fall and in the spring. Although the correlations among the phonological measures were lower for the three groups of children, the NS and BL children showed low to moderate correlations among the measures of phonological awareness in both sessions. With the exception of the low correlations shared by phoneme identification with the syllable identification and phoneme deletion measures in November, the ESL children did not show significant correlations among the phonological measures.

Next, we examined the relations among the literacy variables, environmental print, and phonological and language variables. The NS children showed similar patterns of correlation in November and in May. Their performance on WRAT-3 reading, letter identification, and spelling showed low to moderate correlations with the label and typeface conditions of environmental print, the two measures of phonemic awareness (phoneme identification and phoneme deletion), and RAN rate. In contrast, the BL and ESL children showed different patterns of correlation among the variables. For the BL children in the fall, performance on all three literacy measures was correlated with rhyme detection and phoneme identification, whereas only WRAT-3 reading was correlated with syllable identification, phoneme deletion, or oral cloze. Whereas BL children's knowledge of environmental print was uncorrelated with early literacy performance in the fall, the label and typeface conditions did show significant correlations with the literacy measures in the spring. All of the May phonological measures were correlated with WRAT-3 reading, but not with letter identification, in the spring. Only oral cloze was correlated with the three literacy measures for the BL children in May. Finally, although the relationships among the variables for the ESL children were dissimilar to those of the NS children in November, the patterns of correlation for the two groups were similar in May. In the fall the ESL children showed low to moderate correlations between the literacy measures, the label and typeface conditions of environmental print, RAN rate and oral cloze. None of the phonological awareness measures was correlated with the literacy measures in November. However, the phoneme deletion and RAN rate were both correlated with all three literacy measures and the label and typeface conditions were correlated with both the WRAT-3 reading and Spelling in May.

Prediction of literacy skill at the end of kindergarten

Stepwise regression analyses were used to select the fall variables that were the best predictors of children's performance on the literacy measures in May. All of the November variables were entered into the regression equations as predictor variables. The three criterion variables were WRAT-3 reading raw scores, letter identification, and spelling in May. Two nonorthogonal contrasts were en-

Table 5. *Stepwise regression analysis of November variables predicting children's literacy performance in May*

	β	R^2	ΔR^2	Probability
WRAT-3 raw scores	.372	.503	.503	<.001
WRAT-3 raw scores				
Letter identification	.335	.535	.032	<.001
Phoneme deletion	.115	.548	.013	<.001
RAN rate	.064	.552	.004	<.05
NS vs. BL and ESL	.010			*ns*
ESL vs. NS and BL	−.042			*ns*
Letter identification	.419	.443	.443	<.001
Letter identification				
WRAT-3 raw scores	.282	.462	.019	<.001
NS vs. BL and ESL	−.018			*ns*
ESL vs. NS and BL	−.049			*ns*
Spelling				
Letter identification	.219	.329	.329	<.001
Spelling	.263	.389	.060	<.001
GFW Sound Mimicry Test raw scores	.096	.400	.011	<.001
WRAT-3 raw scores	.199	.409	.009	<.01
Rhyme detection	.083	.416	.007	<.05
NS vs. BL and ESL	.063			*ns*
ESL vs. NS and BL	.007			*ns*

tered into the three regression equations. The first contrast reflects the comparison between the NS children and both the ESL and BL children. The coding for this contrast is +1 for the NS children, and −1 for the BL and ESL children. A positive beta weight for this contrast would indicate that being a native English speaker was associated with superior performance on the task in question. The second contrast reflects the comparison between the ESL children and both the NS and BL children. A negative beta weight for this contrast would indicate that ESL status would be associated with weaker performance on a given literacy task. The results are summarized in Table 5.

Four November variables predicted WRAT-3 reading in May: WRAT-3 reading raw scores, $F(1, 590) = 597.61$, $p < .001$, letter identification, $F(1, 589) = 39.75$, $p < .001$, phoneme deletion, $F(1, 588) = 17.48$, $p < .001$, and RAN rate, $F(1, 587) = 4.83$, $p < .05$. Neither planned contrast was significant (NS vs. BL and ESL: $t[586] < 1$, *ns*; ESL vs. NS and BL: $t[586] = -1.51$, *ns*), indicating that the children's language backgrounds do not explain the variance in WRAT-3 reading performance.

Only two November variables explained variance in letter identification in May: letter identification, $F(1, 587) = 467.04$, $p < .001$, and WRAT-3 reading, $F(1, 586) = 20.16$, $p < .001$. As in the WRAT-3 reading analysis, neither planned contrast was significant (NS vs. BL and ESL: $t[585] < 1$, *ns*; ESL vs. NS and BL: $t[585] = -1.61$, *ns*).

Five variables predicted spelling performance in May: letter identification,

$F(1, 580) = 283.91$, $p < .001$, spelling, $F(1, 579) = 56.86$, $p < .001$, GFW sound mimicry raw scores, $F(1, 578) = 10.83$, $p < .001$, WRAT-3 reading, $F(1, 577) = 9.17$, $p < .01$, and rhyme detection, $F(1, 576) = 6.45$, $p < .05$. Neither planned contrast was significant (NS vs. BL and ESL: $t[575] = 1.94$, *ns*; ESL vs. NS and BL: $t[575] < 1$, *ns*), confirming that the children's language backgrounds failed to explain the variance in literacy acquisition.

DISCUSSION

In this study, the acquisition of basic literacy skills for children with different language backgrounds developed in a similar manner. In fact, the ESL and BL children showed performance and growth comparable to native English speakers on measures of letter identification, spelling, and word recognition, as measured by the WRAT-3 and the environmental print task. In fact, although the NS and BL children were more successful than the ESL children at identifying logos from the environment, children from the three language groups performed equally well when the logos were removed and the environmental print task became a decoding task.

However, children's language backgrounds influenced their proficiency in manipulating and remembering English. For example, the children with the greatest proficiency in English (the native English speakers) had the highest scores in rhyme detection, whereas the children with the least exposure to English (the ESL children) had the lowest rhyme detection scores. Furthermore, the differences between the children from the three language groups on measures of phonological processing were stable throughout kindergarten. These differences might be expected, because ESL and BL children are acquiring a new phonology with new phonemic contrasts. Similar results were found in other studies (Gholamain & Geva, in press; Wade-Woolley & Siegel, 1997). Language background was also an important contributor to performance on measures of syntactic awareness and verbal working memory throughout kindergarten. In fact, the native English speakers had the strongest performance on both language measures whereas the children with the least exposure to English (the ESL children) showed the weakest performance. However, despite slower word retrieval in November, the ESL children named pictures as rapidly as the NS children in May. Thus, the performance gap between the NS and ESL children closes earlier for naming speed than it does for phonological awareness, supporting arguments for a dissociation between naming speed and phonological awareness. These findings, together with those of Wade-Woolley et al. (1998), suggest that, despite their limited proficiency in the manipulation and interpretation of oral English, young ESL and bilingual children develop literacy skills in English with the same ease as their NS peers.

The current study examined whether the relations between literacy measures and measures of phonological awareness, alphabetic knowledge, naming speed, syntactic awareness, and verbal working memory were the same for native and nonnative speakers of English. For children from the three language groups, phonemic awareness was correlated with literacy skill by the end of kindergarten. In fact, phonemic awareness tended to be more highly related to literacy

skill than rhyme detection and syllable identification for children from all language groups, which is consistent with the literature (Høien et al., 1995; Torgesen, Wagner, & Rashotte, 1994). Thus, the view that metalinguistic processing at the phonemic level may be more highly related to reading acquisition may be extended to children learning to read in a foreign language.

Although phonemic awareness was correlated with the literacy measures for the ESL children in May, they were uncorrelated in November. The absence of a relationship between phonemic awareness and literacy skill for ESL children in November may result from a lack of familiarity with English phonology. There are two possible reasons for the growth in the relationship between phonemic awareness and literacy for ESL children. On the one hand, ESL children had 6 months to become familiar with English phonology. The increased exposure and familiarity with English may have contributed to growth in their literacy and phonological skills and boosted the relationship between the two. On the other hand, native English speakers and bilingual children also showed stronger correlations between phonemic awareness and literacy skills in May than they did in November. Thus, the growing connection between phonemic awareness and literacy skill for ESL children may result from the early literacy instruction that was common to all children, rather than a developing familiarity with English. Indeed, a critical component of literacy instruction in this school board was building connections between oral and written language. Learning the letter–sound correspondences may have contributed to growth in phonemic awareness (Malicky & Norman, 1999) and strengthened the relationship between phonemic awareness and literacy for children from all language groups. The second possibility may be more plausible, as it is consistent with the view that there is a reciprocal relationship between phonemic awareness and reading acquisition (Ehri, 1985; Malicky & Norman, 1999; Morais, Bertelson, Cary, & Alegria, 1979; Perfetti, Beck, Bell, & Hughes, 1987). Thus, the reciprocal relationship between phonemic awareness and literacy acquisition may hold for children from all language backgrounds.

Finally, although the language group contrasts were not predictive of performance on any of the literacy measures, alphabetic knowledge and phonological awareness were important predictors of literacy performance for all children. In fact, alphabetic knowledge in November was a significant predictor of WRAT-3 reading, letter identification, and spelling in May. Furthermore, phonemic awareness and RAN rate in November were predictive of WRAT-3 reading in May, and sound mimicry and rhyme detection were predictive of spelling skill. Thus, other reports of the importance of letter-name knowledge and phonemic awareness as predictors of early reading skills may be generalized to children from different language backgrounds (e.g., Adams, 1990; Chall, 1967; Bruck et al., 1997; Majsterek & Ellenwood, 1995; Vellutino & Scanlon, 1987). In other words, the same component skills are important for literacy development for all children, regardless of their native language.

In summary, we can conclude that although measures of phonological awareness, syntactic awareness and verbal working memory are more difficult for children learning English, their limited exposure to English does not inhibit their acquisition of basic literacy skills, including word recognition and spelling. In

fact, the same underlying skills, alphabetic knowledge, spelling and phonological processing, were strongly related to literacy acquisition in English for children from the three language groups. Thus, the same instructional methods can foster the development of literacy for children from different language backgrounds early in their academic careers.

APPENDIX

Oral cloze sentences used in November

1. The _____ little pigs ate corn.
2. Fred put the big turkey _____ the oven.
3. The _____ put his dairy cows in the barn.
4. Jane _____ sister walk up the hill.
5. It was a sunny day with a pretty _____ sky.
6. Betty _____ a hole with her shovel.
7. Jim set the lamp on the desk so he could _____.
8. The boy had big brown eyes and a pleasant _____.
9. The children put on their boots _____ it snows.
10. Jeffrey wanted to go _____ the roller coaster.
11. When we go _____ the building, we must be quiet.
12. Dad _____ Bobby a letter several weeks ago.

Oral cloze sentences used in May

1. Sally has a party dress and a school dress. She has two _____.
2. We have done the work already. We _____ it yesterday.
3. John is a good player. Bill is a better player than John. But Tom is the _____ player of them all.
4. Bob is a child. Mary is a child. They are two _____.
5. The brown dog is small; the gray dog is smaller; but the white one is the _____.
6. I have one mouse here and one mouse there. I have two _____.
7. Joe throws a ball every day. Yesterday, he _____ the ball.
8. Yesterday, Tina and Marie _____ walking down the street.
9. The hungry dogs have _____ all the food.
10. Jane _____ sister walk up the hill.
11. It was a sunny day with a _____ sky.
12. Jim set the lamp on the desk so he could _____.
13. Jeffrey wanted to go _____ the roller coaster.

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