Linguistic and Literacy Predictors of Early Spelling in First and Second Language Learners

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Abstract

Error analyses using a multidimensional measure were conducted on the misspellings of Kindergarten children speaking English as a first (EL1) and English as a second language (ESL) in order to detect any differences in early spelling ability between language groups. Oral vocabulary, syntactic knowledge, phonological processing, letter/word reading, and alphabet writing fluency tasks were also administered. The speakers of EL1 and ESL achieved similar spelling sophistication scores despite lower oral vocabulary and syntactic knowledge for the ESL group. More sophisticated spelling approaches were related to better-developed phonological processing, syntactic knowledge, and early word reading irrespective of language status.

Résumé

Afin de détecter des compétences orthographiques précoces différentes, une analyse multidimensionnelle des erreurs d'orthographe s'est effectuée chez des élèves en maternelle dont l'anglais est la langue natale (AL1) et ceux dont l'anglais est une langue seconde (AL2). On a également testé le vocabulaire à l'oral, l'alphabet à l'écrit, les connaissances syntaxiques, la procédure phonologique et la lecture des lettres et des mots. Malgré un vocabulaire à l'oral plus restreint et moins de connaissances syntaxiques chez les élèves AL2, les deux groupes atteignaient des scores de sophistication orthographique pareils. Indépendamment de la langue maternelle, les démarches orthographiques plus sophistiquées correspondaient à une procédure phonologique plus avancée, aux connaissances syntaxiques et à la lecture précoce des mots.

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Introduction

Considerable evidence to date indicates that children learning English as a second language (ESL) follow a similar developmental trajectory as native English-speaking (EL1) children in learning to read (decoding and word recognition) in English. Facility with English phonology is the strongest predictor of word level reading skills irrespective of oral vocabulary and syntactic knowledge and individual differences in phonological processing predict reading disabilities regardless of language status (see August & Shanahan, 2006, for a comprehensive research synthesis). Although spelling has not been studied as extensively as reading, the evidence to date suggests that the cognitive-linguistic components important to spelling for ESL children are similar to EL1 children, especially in relation to the importance of phonological processing for early spelling. Learning to spell, as in learning to read, requires gradual mastery in mapping a word's phoneme to associated graphemes (Adams, 1990; Ehri, 1987; Moats, 1995; Treiman, 1993) via well-developed phonological knowledge and a rich store of orthographic representations in the mental lexicon (Ehri, 1997). The opacity of English orthography requires the amalgamation of phonological and orthographic components to spell words, specifically words that vary in their sound-spelling correspondence (e.g., *yacht*) and young children also become increasingly more sophisticated in their use of phonological and orthographic approaches when spelling (Ehri, 1987; Treiman, 1993). Early influential work on children's spelling development highlighted the qualitative changes that occur through maturation and formal literacy instruction signifying pivotal shifts in children's understanding about the relationship between spoken and written language (Read, 1980; Tangel & Blachman, 1992; Treiman, 1993). Not only do children become more accurate spellers over time and in response to instruction, but their facility in representing increasingly more sophisticated cognitive-linguistic aspects of word-specific knowledge also increases (Caravolas, Hulme, & Snowling, 2001; Ehri, 1997; Treiman & Cassar, 1994).

Comparisons Between ESL and EL1 Children's Spelling Development

Research has indicated that young ESL and EL1 children perform similarly on English spelling tasks despite the fact that ESL children consistently perform more poorly than EL1 children on English oral language measures such as oral vocabulary and syntactic knowledge (Geva, 2006). In a study with second grade ESL and EL1 children, Wade-Woolley and Siegel (1997) found that English phonological processing and decoding measures (phoneme deletion and pseudoword decoding) predicted the accuracy of real-word spelling in both ESL and EL1 children. Spelling error patterns across both language groups were also similar. However, in their large-scale longitudinal study, Lesaux and Siegel (2003) found that ESL kindergarteners performed significantly lower than EL1 kindergarteners on a measure of spelling to dictation when assessed concurrently; however, by Grade 2 the ESL children had actually surpassed their EL1 peers, performing significantly higher on this task in addition to other spelling tasks assessing real-word and pseudoword spelling. These findings have some parallel to research conducted in early French immersion where initial lags in English literacy disappear following the

introduction of literacy instruction in English at about Grade 2 or 3 (e.g., Genesee & Jared, 2008). ESL children also achieved significantly higher scores on timed and untimed word and non-word reading tasks, a naming speed task, and a math computation task. The ESL children continued to lag behind their EL1 peers on a measure of English oral syntactic knowledge, however. Comparisons between at-risk and average readers indicated no differences between ESL and EL1 children, but at-risk readers in both groups exhibited a similar profile of cognitive processing and literacy skills deficits compared to average readers (Lesaux & Siegel, 2003).

Reading proficiency and proficiency with its component processes are related to spelling ability in ESL and EL1 children rather than oral English language skills, at least in the first three years of elementary school (e.g., Jongejan, Verhoeven, & Siegel, 2007; Wade-Woolley & Siegel, 1997). Jongejan et al. (2007) examined the cognitive-linguistic predictors of reading and spelling ability as a function of lower (Grades 1-2) or upper (Grades 3-4) grades and ESL/EL1 language status. Children completed a series of measures assessing phonological awareness (sound mimicry, phoneme recognition, location, deletion, and substitution tasks); lexical access (object naming speed); syntactic awareness (syntactic error judgment task); verbal working memory (working memory for sentences) defined as the simultaneous processing, storage, and retrieval of verbal information (Salthouse, 1990); word and pseudoword reading; in addition to word and pseudoword spelling. The researchers performed cross-sectional analyses comparing grades and language groups. Irrespective of grade, ESL and EL1 children performed similarly on the spelling and reading tasks, and a similar developmental trajectory for both spelling and reading was observed between ESL and EL1 children, despite performance disadvantages of the ESL children on the syntactic awareness task. Thus, although ESL and EL1 children perform similarly on English spelling tasks, and spelling skills appear to develop similarly between both language groups, the older ESL and EL1 children seem to be drawing on a different subset of skills to spell than the EL1 group. For example, in the lower grades (Grades 1-2) phonological awareness explained the most variance in spelling ability in both language groups, but verbal working memory was also an important predictor for the EL1 children only. For the older children (grades 3-4), phonological awareness and lexical access were the best predictors of spelling for the ESL group, but syntactic awareness and verbal working memory explained the most variance in spelling ability for the EL1 children, with syntactic awareness identified as the strongest predictor of spelling ability. Verbal working memory was therefore a statistically significant predictor of spelling at both grade levels for the EL1 children, but not for ESL children. While the authors did not elucidate on this finding, they did suggest that ESL children's continued reliance on English phonological processing in addition to rapid retrieval of name codes in memory in the upper grades may be a compensatory mechanism for their less well-developed oral English syntactic skills.

Research on spelling ability in ESL children has mainly examined spelling accuracy and only a few studies have undertaken in-depth analyses of children's misspellings comparing the errors made by ESL children to the errors made by their EL1 peers. While the cross-sectional and longitudinal studies reviewed have shown that ESL children's spelling skills develop on par with and in some cases above those of their EL1 classmates, whether both language groups are relying on the same approaches to spell, especially early on when they are beginning formal literacy instruction, has been understudied. Of the few studies that have examined errors, a main focus has been on the influence of children's first language (L1) on second language (L2) spelling (e.g., Fashola, Drum, Mayer, & Kang,

1996; Wang & Geva, 2003), or on ESL children's knowledge of linguistic conventions in written English, especially in representing vowels (e.g., Wade-Woolley & Siegel, 1997). One classic method of analysis evaluates children's misspellings in relation to the degree of spelling sophistication that is evident. Based on the influential work of Read (1980) and Henderson and Beers (1980), Morris and Perney's (1984) spelling sophistication scoring method provides composite scores based on the developmental progression from using random letter strings (yielding low scores) to conventional representations of phonemic and orthographic constituents in word spellings (yielding high scores). Monolingual English-speaking children's spellings were scored at three points in their first grade year (beginning, middle, and end of the school year) and their performance on the spelling sophistication measure taken at the three points in time was a strong predictor of their end of the year word-reading skills. Similar scoring systems have been used by others (e.g., Liberman, Rubin, Duques, & Carlisle, 1985; Mann, Tobin, & Wilson, 1987; Tangel & Blachman, 1992; Treiman & Bourassa, 2000) reflecting approaches that differ in the degree of sensitivity in capturing particular shifts in children's linguistic and literacy knowledge evident in their spelling. In one of the few studies examining ESL and EL1 children's spelling errors in terms of developmental sophistication, Wang and Geva (2003) scored children's misspellings on a 5-point scale similar to the one used by Morris and Perney that represented two main features: the number of phonemes observed and the degree of orthographic representation. Data were collected from a cohort of Grade 1 ESL (Cantonese-speaking) and EL1 children assessed at four points in time from Grades 1 to 2. Although specific differences due to negative transfer between L1 and L2 in representing select phonemes in some words were observed for the ESL children, overall results indicated similar levels of spelling sophistication between language groups concurrently and longitudinally based on the scoring system. Moreover, in a recent study conducted in Hong Kong with Kindergarten Mandarin L1-English L2 and English L1-Mandarin L2 children, Yeong and Rickard Low (2011) found that the English L1 children's performance was better than the Mandarin L1 children on a measure of spelling sophistication developed by Treiman and Bourassa (2000). These researchers also reported that English phonological awareness was the strongest predictor of spelling sophistication for both groups of children; however rapid digit naming was a unique predictor of spelling sophistication for Mandarin-L1 children only. Letter-sound knowledge rather than letter-name knowledge was also identified as a statistically significant literacy predictor variable for spelling sophistication for both groups.

The Present Study

There are some mixed findings, then, in relation to early spelling ability in ESL children with the majority of this research based on spelling accuracy. There is also extremely limited research comparing the spelling sophistication of ESL and EL1 children. The present study examined whether children who begin formal literacy instruction in a language other than their native language demonstrate a similar or a different degree of sophistication in their early spelling as their EL1 peers. Three questions related to early spelling ability in ESL and EL1 children were addressed: (a) Do ESL and EL1 kindergartners differ in their early spelling approaches as assessed by an analysis of their spelling errors? (b) What are the linguistic and early literacy profiles of ESL and EL1 children who demonstrate more sophisticated spelling approaches in Kindergarten? (c)

What linguistic and literacy variables are most predictive of ESL and EL1 children's early spelling approaches?

Method

Participants

The present study included a total of 77 Kindergarten children with parental consent to participate from seven public elementary schools in middleclass neighbourhoods in a Canadian multiethnic suburban community about 60 miles east of Vancouver. Thirty-seven children (20 boys, 17 girls; mean age 67.6 months) whose primary language was not English were designated as ESL students within the school district. All but five of these children spoke Punjabi as their L1. The other languages spoken at home were Korean, German, Spanish (two students), and Vietnamese. Forty participants (22 boys, 18 girls; mean age 68.6 months) spoke English as their L1. Instructional approaches were similar across the classrooms, reflecting a balanced literacy curriculum that emphasised: connections between language and literacy, reading and writing for communication, and direct instruction aimed at developing children's phonological awareness and letter-sound knowledge. Preliminary results also indicated no statistical differences on the measures based on school or gender. Upon Kindergarten entry, all of the ESL children were receiving supplemental English language instruction by certified teachers within a small groups pullout program in addition to their regular classroom instruction. Participants represented a subgroup of ESL and EL1 children who were part of a larger longitudinal study examining writing development in ESL children from Kindergarten to Grade 1. As part of the larger study, students completed a battery of measures assessing early reading, spelling, and writing skills in addition to phonological processing, oral vocabulary, and syntactic knowledge. The current study focused on the spelling sophistication scores of a subgroup of students who were able to provide at least five legible misspellings on the administration of a standardised spelling dictation test that was subjected to an error analysis.

Measures

Oral vocabulary.

The Peabody Picture Vocabulary Test-4th Edition (PPVT-4; Dunn & Dunn, 2007) assessed children's receptive vocabulary. Children pointed to a picture that corresponded with a verbally presented word from an array of four choices. Starting and stopping points described in the manual were followed. Raw scores were recorded. The manual reports internal consistency reliability estimates ranging from .92 to .96 for children aged 5 to 6 years.

Syntactic knowledge.

The Syntax Construction task from the Comprehensive Assessment of Spoken Language (CASL; Carrow-Woolfolk, 1999) was administered. Children were required to provide a word, phrase, or sentence that was semantically or grammatically compatible with a picture and verbal target presented by the examiner. Starting and stopping points as

described in the manual were followed and raw scores were recorded. Internal consistency estimates range from .73 to .84 for the age range of our participants, as reported in the manual.

Phonological processing.

Two tasks from the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999) were administered. The first task assessed children's ability to match initial and final sounds of orally presented words combined with picture prompts (Sound Matching) and the second task required children to repeat pseudowords orally presented by the examiner (Non-Word Repetition). Starting and stopping points described in the manual were used, and raw scores were recorded. Internal consistency estimates of .93 for Sound Matching and .80 for Non-Word Repetition are reported in the manual for children aged 5 to 6 years.

Alphabet knowledge.

Research indicates that young children's knowledge of the alphabet is a strong predictor of reading and spelling skills (Caravolas et al., 2001; Ritchey, 2008; Treiman & Cassar, 1994). We administered two tasks to assess alphabet knowledge. The first examined children's ability to name the letters of the alphabet. This task, similar to the task used by Lesaux and Siegel (2003) in their longitudinal study with Kindergarten ESL children, required children to point to 12 random letters orally presented by the examiner. Letters of the alphabet were arranged in lower case on an 8 x 12 page. Total correct scores were recorded. The second task assessed children's alphabet writing fluency with the Alphabet Writing subtest from the Wechsler Individual Achievement Test-2nd Edition (WIAT-II; The Psychological Corporation, 2002). Children's early spelling skills have been empirically linked to the automatic translation of orthographic-phonological representations from memory into writing (Abbott & Berninger, 1993). Children were required to write as many letters of the alphabet in order as accurately and as quickly as they could in 15 seconds. Scores were the total number of correctly formed letters written within the time limit. A test-retest reliability estimate of .87 is reported in the manual for this subtest.

Early word reading.

The Reading subtest (tan form) from the Wide Range Achievement Test-3rd Edition (WRAT-3; Wilkinson, 1993) assessed children's early letter and word reading skills. Starting and stopping points as described in the test manual were followed and raw scores were recorded. Internal consistency reliability as reported in the manual ranges from .90 to .91 across the age range of our participants.

Early word spelling.

Children completed the Spelling subtest (blue form) of the Wide Range Achievement Test-3rd Edition (WRAT-3; Wilkinson, 1993), a standardised spelling to dictation task. Although ceiling rules as described in the manual require 10 misspellings, many children fatigued or refused to spell any more words incorrectly once they had

produced five incorrect spellings. Raw scores were recorded based on the total number correct. Estimates of reliability range from .86 to .89 for 5- to 6-year old children.

Spelling sophistication.

Evaluating children's spelling on the basis of the degree of sophistication evident in their misspellings rather than by conventional methods of spelling accuracy is considered more advantageous (Yeong & Rickard-Liow, 2011). In contrast to accuracy assessments alone, examining spelling sophistication reflects the multidimensional aspects of spelling development (e.g., Rittle-Johnson & Siegler, 1999; Steffler, Varnhagen, Friesen, & Treiman, 1997) and as noted by Yeong and Rickard-Liow (2011), is more sensitive to individual differences in processing leading to greater insight into children's developing knowledge of the connections between spoken and written language. Such an analysis is particularly relevant within the context of the current study focusing on young ESL children learning to spell in a language other than their native language. We used an adapted version of Morris and Perney's (1984) approach as our study also focused on the relationship between spelling sophistication and young children's early reading skills. Unlike Morris and Perney, we were also interested in oral language correlates of spelling sophistication.

Each of the five misspellings from the WRAT-3 spelling subtest was subjected to an analysis of their approximation to conventional spelling with higher scores indicative of greater sophistication in spelling approach. Table 1 provides an example of the scoring system for the hypothetical target, *truck*. A score of 0 indicated random letter strings with no phonemes in the word represented, a score of 1 was achieved when only the beginning phoneme was represented, and 2 points were scored when the misspelling included correct initial and ending phonemes or the initial phoneme and an attempt to represent the vowel segment, regardless of vowel pronunciation (e.g., *sail* spelled *siw*). Misspellings were awarded 3 points when children appeared to be spelling the whole word phonetically, representing the consonant sounds and an appropriate phonemic representation of a vowel segment regardless of consonant blend omissions. Long vowels represented as vowel letter names (e.g., *sail* spelled *sal*) or short vowels representing letter sounds (e.g., *dress* spelled *jras*) were permissible. Allowable substitutions for short vowels were /a/ for short /e/ and /e/ for short /i/. Finally, 4 points were awarded for misspellings that indicated an emerging awareness of the orthographic patterns in monosyllabic words (e.g., *consonant-vowel-consonant* or CVC; *consonant-vowel-consonant-final e* or CVCe; *consonant-vowel-vowel-consonant* or CVVC) and the most accurate rendering of phoneme-grapheme correspondences. Misspellings awarded 4 points included conventional letters representing initial and final phonemes plus correct short or long vowel phonemic representations (e.g., *dress* spelled *dres*, *feet* spelled *fete*). Both letters representing the phoneme written conventionally in a beginning consonant cluster (e.g., *dr* in *dress*) also had to be present.

Using this scoring system, a total of 385 misspellings across participants were scored. Total raw scores that reflected the sum of scores across all five misspellings were recorded in addition to a mean spelling sophistication score (total raw score divided by four) for each child. The latter score was used in delineating two groups differing in terms of lower or higher spelling sophistication for subsequent profile analysis described in the results section. Two raters each completed separate evaluations on all misspellings using the scoring system and a high inter-rater reliability coefficient of .93 was obtained.

Table 1
Example of Spelling Sophistication Scoring System for the Hypothetical Target Word "Truck"

Spelling	Description	Points
xqprs, *bi*	Random letter string, no letters are related to sounds in the word.	0
tvij	Begins with letter related to initial phoneme.	1
tc, *chk*, *tav*	Begins and ends with initial and final phoneme related to first and last phonemes or begins with conventional letter related to first phoneme and any letter representing the vowel segment.	2
twruc, *jruk*	All phonemes in the word are represented, including vowel segment. May omit consonant blends.	3
truk, *chruck*	Conventional letters representing initial and final phonemes, correct short or long vowel phonemic representations, and both letters representing the phoneme written conventionally in a beginning consonant cluster are present.	4

Procedure

Children were assessed just after the midpoint of their Kindergarten year (February) and completed all of the tasks individually in one 45-minute session in a quiet room in their school. Graduate students who had completed advanced graduate-level assessment courses in educational psychology received additional training in administering, scoring, and interpreting the measures.

Results

Descriptive Statistics and ESL/EL1 Group Differences

All analyses were conducted using raw scores as none of the measures have been standardised on ESL populations consistent with previous research (e.g., Geva & Yaghoub Zadeh, 2006; Jean & Geva, 2009). Table 2 presents the means and standard deviations for all of the predictors and outcome measures across ESL and EL1 groups. Initial inspection of the scores obtained by children across the measures indicated that they were normally distributed, with the exception of scores on the alphabet identification task, which was negatively skewed ($s > 1$). Scores on this variable were therefore transformed using the Reflect and Inverse procedure recommended by Tabachnick and Fidell (2007) and analyses were based on this transformed data. Preliminary analyses indicated no differences due to age or gender. A set of one-way Analysis of Variance (ANOVA) with the p value set at .01 to control for Type II error examined whether there were any differences on the linguistic (sound matching, non-word repetition, oral vocabulary, syntactic knowledge) and literacy (alphabet identification, alphabet writing fluency, word reading, spelling, spelling sophistication) measures between ESL and EL1 groups. Effect sizes were computed using

Cohen's *d* and fell with the moderate to high range (Cohen, 1988). For the linguistic measures, ESL children performed significantly lower than EL1 children on the oral vocabulary, $F(1, 75) = 58.52$, $p < .001$, $d = 1.73$; syntactic knowledge, $F(1, 75) = 42.44$, $p < .001$, $d = 1.48$; and non-word repetition tasks, $F(1, 75) = 11.23$, $p = .006$ $d = .766$. There was no significant difference in performance between groups on the sound matching measure. For the literacy measures, the only significant difference was found on the alphabet writing fluency measure, $F(1, 75) = 9.69$, $p = .008$, $d = .528$, in favour of the ESL group. No other differences were detected. Importantly, ESL and EL1 children achieved similar spelling accuracy and sophistication scores, despite an ESL disadvantage on the oral vocabulary, syntactic knowledge, and non-word repetition measures.

Table 2
Descriptive Statistics for ESL and EL1 Children

	ESL (n = 37)		EL1 (n = 40)	
Measure	*M*	*SD*	*M*	*SD*
PPVT-4	77.27	18.10	106.77	15.72
CASL Syntax Construction	10.30	4.91	17.42	4.67
CTOPP Sound Matching	9.94	4.53	11.02	5.28
CTOPP Non-word Repetition	6.83	2.40	8.76	2.60
Alphabet Identification	11.68	.88	11.78	.78
Alphabet Writing Fluency	3.81	1.94	2.32	2.22
WRAT-3 Reading	16.40	1.97	18.22	6.02
WRAT-3 Spelling	15.75	1.90	15.62	2.63
Spelling Sophistication (total)	6.37	3.89	7.72	4.88
Spelling Sophistication (*M*)	1.27	.78	1.54	.98

Note. PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL = Comprehensive Assessment of Spoken Language; CTOPP = Comprehensive Test of Phonological Processing; WRAT-3 = Wide Range Achievement Test-3rd Edition.

Linguistic and Literacy Profiles of More or Less Sophisticated Spellers

The next set of analyses examined the linguistic and literacy profiles of children who achieved lower and higher spelling sophistication scores. Lower spelling sophistication scores were defined as a mean score of either 0 or 1, and higher scores represented a mean score of 2, 3, or 4. ESL (low: $n = 21$; high: $n = 16$) and EL1 (low: $n = 21$; high: $n = 19$) groups were comparable in the number of children representing each of the two levels of sophistication. A 2 (low/high) x 2 (ESL/EL1) crosstabs analysis indicated no significant relationship between level of spelling sophistication and language status ($\chi = .140$, $df = 1$, $p = .820$). Therefore, the language groups were combined for the analysis examining performance differences on the linguistic and literacy tasks based on degree of spelling sophistication. Since our scoring system is theoretically related to developmental changes in spelling sophistication, we also examined whether levels of spelling sophistication differed as a function of children's ages. We found no significant differences in age between less (low: mean age = 67.78 months, $SD = 3.69$) or more (high: mean age =

68.57 months, *SD* = 3) sophisticated spellers, $t(75) = -.941$, $p = .350$. A series of one-way ANOVAs with Bonferroni correction indicated significant differences in favour of the more sophisticated spellers in their performance on both of the phonological processing tasks, sound matching, $F(1, 75) = 21.18$, $p < .001$, $d = 1.05$, and non-word repetition, $F(1, 75) = 14.22$, $p < .001$, $d = .867$; and on the oral vocabulary, $F(1, 75) = 9.56$, $p = .003$, $d = .708$, and syntactic knowledge measures, $F(1, 75) = 17.27$, $p < .001$, $d = .949$; with moderate to high effect sizes across all of the measures (Cohen, 1988). Children who demonstrated more sophisticated spellings also achieved significantly higher scores on the word reading measure, $F(1, 75) = 9.76$, $p = .003$, $d = .716$. Less sophisticated spellers therefore demonstrated less well-developed phonological processing skills, oral vocabulary and syntactic knowledge, and achieved lower scores on the early word reading task regardless of language status.

Linguistic and Literacy Predictors of Early Spelling

Tables 3 and 4 show the results of correlation analyses run separately for ESL and EL1 groups, respectively. As shown in Table 3, for the ESL group spelling sophistication was moderately to highly significantly correlated with oral vocabulary (PPVT-4) syntactic knowledge (CASL), both measures of phonological processing from the CTOPP, and early word reading as assessed by the WRAT-3. As shown in Table 4, a similar pattern of associations was found between spelling sophistication and the linguistic and literacy measures for the EL1 group, with the exception that sound matching, but not non-word repetition, was significantly correlated with spelling sophistication. The alphabet measures (identification and writing fluency) were not significantly correlated with spelling sophistication across both groups. Several notable differences in the pattern of associations between the language groups were found for spelling accuracy and word reading as assessed by the WRAT-3. WRAT-3 spelling performance correlated significantly with all of the linguistic and literacy measures for the EL1 children, but did not significantly correlate with PPVT-4 oral vocabulary or alphabet writing fluency for the ESL children. The strength of the association between spelling and CTOPP sound matching was also considerably weaker for the ESL ($r = .49$) than for the EL1 children ($r = .71$). Moreover, reading was associated with performance on the CTOPP non-word repetition task only for the ESL children ($r = .55$).

To address the final research question, a series of hierarchical multiple regression analyses run separately for ESL and EL1 groups were conducted to assess the influence of English linguistic and literacy predictors on early spelling as captured by children's spelling sophistication scores. The first model examined the influence of linguistic predictors (oral vocabulary, syntactic knowledge, sound matching, and non-word repetition) on early spelling. Due to their causal relationship with spelling, the phonological tasks (CTOPP non-word repetition and sound matching) were entered first in two successive steps, followed by CASL syntactic knowledge and then PPVT-4 oral vocabulary in the final two steps. Table 5 summarises the results of the regression analyses for the linguistic predictors across ESL and EL1 groups. For the ESL group, non-word repetition explained 20.6% of the variance in early spelling and sound matching explained an additional 13.6% of early spelling

Table 3
Correlations Among the Linguistic, Literacy, and Spelling Sophistication Measures for ESL

	1	2	3	4	5	6	7	8
1. Spelling Sophistication[a]								
2. PPVT-4	.453**							
3. CASL-Syntax Con.	.504**	.576**						
4. CTOPP-Sound Matching	.558**	.183	.266**					
5. CTOPP-Non-Word Rep.	.453**	.412*	.378*	.551**				
6. Alphabet Identification	.168	.058	.119	.095	.359*			
7. Alphabet Writing Fluency	-.093	-.013	-.235	-.080	.059	.297		
8. WRAT-3-Reading	.628**	.389*	.510**	.557**	.387*	.181	-.037	
9. WRAT-3 Spelling	.817**	.317	.397*	.497**	.342*	.426**	-.020	.704**

Note. PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL = Comprehensive Assessment of Spoken Language; CTOPP = Comprehensive Test of Phonological Processing; WRAT-3 = Wide Range Achievement Test-3rd Edition.
[a]Spelling sophistication score based on total raw score.
**$p < .01$. *$p < .05$.

Table 4
Correlations Among the Linguistic, Literacy, and Spelling Sophistication Measures for EL1

	1	2	3	4	5	6	7	8
1. Spelling Sophistication[a]								
2. PPVT-4	.408**							
3. CASL-Syntax Con.	.578**	.617**						
4. CTOPP-Sound Matching	.622**	.448**	.412**					
5. CTOPP-Non-Word Rep.	.295	.357*	.302	.393*				
6. Alphabet Identification	.310	-.007	-.108	.287	.188			
7. Alphabet Writing Fluency	.301	.130	-.033	.355*	.395*	.194		
8. WRAT-3-Reading	.586**	.302	.409**	.562**	.178	.237	.530**	
9. WRAT-3 Spelling	.755**	.382*	.473**	.712**	.474**	.391*	.441**	.767**

Note. PPVT-4 = Peabody Picture Vocabulary Test-4th Edition; CASL = Comprehensive Assessment of Spoken Language; CTOPP = Comprehensive Test of Phonological Processing; WRAT-3 = Wide Range Achievement Test-3rd Edition.
[a]Spelling sophistication score based on total raw score.
**$p < .01$. *$p < .05$.

variance. The addition of syntactic knowledge explained 11% more variance in spelling approach, but receptive vocabulary did not add any additional significant variance. Only CTOPP sound matching was a significant contributor to the final model ($p = .012$). For the EL1 group, non-word repetition did not contribute significant variance to early spelling, but sound matching explained 30.3% of the variance in early spelling. The addition of syntactic knowledge contributed 12.1% more variance, and receptive vocabulary did not contribute significant variance. Both sound matching ($p = .012$) and syntactic knowledge ($p = .015$) were significant contributors to the final model.

Table 5
Hierarchical Regression Analyses Predicting Spelling Sophistication From The Linguistic Measures for ESL and EL1 Kindergarteners

	ESL			EL1		
Step Predictor	β^a	β^b	ΔR^2	β^a	β^b	ΔR^2
1. CTOPP-Non-word Repetition	.453**	.029	.206**	.295	.004	.087
2. CTOPP-Sound Matching	.442**	.435**	.136*	.599**	.47**	.303**
3. CASL-Syntax Construction	.360*	.253	.110*	.388**	.42**	.121**
4. PPVT-4	.216	.216	.029	-.066	-.066	.002

Note. CTOPP = Comprehensive Test of Phonological Processing; CASL = Comprehensive Assessment of Spoken Language; PPVT-4 = Peabody Picture Vocabulary Test-4th Edition.
[a]Standardised beta coefficient for the step at which the predictor first entered the model.
[b]Standardised beta coefficient for the final step of the model.
**$p < .01$. *$p < .05$.

The second regression model assessed the contribution of the literacy predictors (alphabet identification, alphabet writing fluency, and word reading) to early spelling. Since children's alphabetic knowledge is theoretically considered an important prerequisite skill for spelling (Caravolas et al., 2001), alphabet identification was entered into the model first, followed by alphabet writing fluency and then reading. Table 6 summarises the regression results across the literacy predictors for both language groups. For the ESL group, only reading contributed significant variance to the final model explaining 35.5% of the variance ($p < .001$). Alphabet identification and alphabet writing fluency did not uniquely contribute to early spelling. For the EL1 group, alphabet identification uniquely explained 9.6% of the variance and reading explained an additional 21.9% of the variance in spelling approach. Alphabet writing fluency did not contribute any unique variance to the model. Reading was the only significant contributor to the final model ($p < .001$), however.

Table 6
Hierarchical Regression Analyses Predicting Spelling Sophistication from the Literacy Measures for ESL and EL1 Kindergarteners

	ESL			EL1		
Step Predictor	β^a	β^b	ΔR^2	β^a	β^b	ΔR^2
1. Alphabet Identification	.168	.087	.028	.310*	.184	.096*
2. Alphabet Writing Fluency	-.157	-.096	.022	.250	-.031	.060
3. WRAT-3 Reading	.609**	.609**	.355**	.559**	.559**	.219**

Note. WRAT-3 = Wide Range Achievement Test-3rd Edition.
[a]Standardised beta coefficient for the step at which the predictor first entered the model.
[b]Standardised beta coefficient for the final step of the model.
**$p < .01$. *$p < .05$.

Discussion

This study examined ESL and EL1 children's misspellings to gain insight into the degree of sophistication with respect to the phonological and orthographic aspects of their early spelling approaches. Spelling has been understudied in ESL populations, and most of the research is based on measures of spelling accuracy, rather than the more multidimensional measure of spelling sophistication. Specifically, our research questions addressed whether there would be any differences in spelling sophistication between ESL and EL1 speakers, the relationship amongst the linguistic and literacy measures for more or less sophisticated spellers, and the identification of linguistic and literacy predictors of early spelling for ESL and EL1 children.

Although ESL children achieved significantly lower scores on the oral vocabulary, syntactic knowledge, and non-word repetition measures, no differences in spelling accuracy or sophistication were evident between the language groups. These results are consistent with previous research that has examined spelling accuracy. The findings also provide an important extension by shedding insight into the nature of ESL children's early spelling approaches that parallels the approaches used by their native English-speaking peers as Geva (2006) has also described.

There were also no differences between language groups on the sound-matching task, a measure of phonemic processing, or on the alphabet identification and reading measures. The performance disadvantage for the ESL group on the oral vocabulary and syntactic measures replicates the results reported extensively in the literature and is unsurprising given ESL children's developing English proficiency. Whereas neither group differed in phonemic processing as assessed by sound matching, consistent with other research (e.g., Lesaux & Siegel, 2003; Wade-Woolley & Siegel, 1997) repeating pseudowords was a more difficult task for the ESL group. This task is thought to measure phonological short-term memory (Lesaux & Geva, 2006), and our findings align with the work of other researchers who have also observed constraints to verbal memory span (i.e.,

conserving verbal information in memory; Baddeley, 1990) when language learners are processing pseudowords in the L2 (e.g., Cheung, 1996; Ellis, 1996; Gathercole & Thorn, 1998). A new contribution to the literature is the performance advantage for ESL children that we found on the alphabet writing fluency task. No research to date has included a writing fluency measure in examining children's spelling in an L2 despite the empirical connection between spelling development and automaticity in translating orthographic-phonological representations from memory into writing (Abbott & Berninger, 1993). Research indicates that it is the combination of motor patterns paired with encoded orthographic representations that children must retrieve from memory for fluent written production (Berninger & Amtmann, 2003; Berninger & Graham, 1998). Similarly, Jongejan et al. (2007) reported an ESL advantage on a measure of lexical access (rapid object naming) that complements our results. Additional research is needed to replicate these fluency advantages and longitudinal research will be important to see whether these advantages remain stable over time for the ESL group.

Spelling is a challenging task to master, and is more challenging to master compared to reading (Ehri, 1997). Examining the linguistic and literacy profiles of more or less sophisticated spellers identified important linguistic and literacy markers that distinguished the two levels of sophistication, independent of language or age. Specifically, less sophisticated spellers in Kindergarten (who were either spelling through random letter sequences or who were representing initial phonemes in words) performed significantly worse than the more sophisticated spellers (who were representing initial and final phonemes in words, including vowel phonemes, and representing conventional phoneme-grapheme patterns including consonant blends) on measures of oral vocabulary and syntactic knowledge, both measures of phonological processing, and on the reading measure. Consistent with the results from the current study, extant research has shown the relationships among these important linguistic and literacy variables to spelling development (Caravolas et al., 2001; Ehri, 1997; Treiman, 1993). We have replicated these results with an assessment of spelling sophistication rather than accuracy, for children becoming both orally proficient and literate in English. Instructionally, these results suggest that regardless of language status, all children may benefit from an approach that combines spelling with important components of word-specific knowledge (based on semantic, syntactic, phonological, and orthographic information) to promote the acquisition of what Perfetti and Hart (2002) have described as rich lexical representations so critical for becoming a more sophisticated speller in English.

In the present study, the predictors of ESL children's spelling sophistication were somewhat different from those of the EL1 children. Firstly, ESL children appear to be relying on phonological short-term memory when they spell in addition to phonemic processing. EL1 children are not drawing on phonological short-term memory, but do draw heavily on their phonemic processing skills. For ESL children, having to spell words in an unfamiliar language places demands on verbal short-term memory not experienced by native speakers. These added demands on short-term memory did not impede ESL children's spelling performance, however. Unlike the study conducted by Jongejan et al. (2007), we did not include a measure of verbal working memory. Comparing the relations among verbal short-term memory, verbal working memory, and early spelling in ESL and EL1 children would be an important extension to the present study.

Secondly, reading was the only significant literacy predictor of spelling sophistication for the ESL children, not their alphabetic knowledge (naming letters, writing

letters of the alphabet quickly). These results replicate previous research on the importance of English reading skills to spelling in ESL children (e.g., Wade-Woolley & Siegel, 1997). However, EL1 children's letter naming and reading skills predicted spelling sophistication. These slightly different findings may suggest that the ESL children in the present study were drawing more on word-level processes when spelling; whereas, EL1 children were drawing on both the word and its constituents (i.e., individual letters), an interesting finding that requires more research to clarify. Despite the fact that ESL and EL1 children came from the same classrooms, ESL children were receiving additional L2 support and may have developed different strategies for spelling within the context of ESL instruction.

It was surprising that alphabet writing fluency did not explain any unique variance with regard to early spelling for both groups in the present study, even though ESL children performed significantly better on this task. Recent research with EL1 kindergarteners reported unique variance in early writing that was explained by children's alphabet writing fluency (e.g., Puranik & Al Otaiba, 2012). We possibly did not replicate these results due to differences in the administration of the fluency measure (e.g., our task from the WIAT-II allowed 15 seconds to write alphabet letters in order and Puranik & Al Otaiba's [2012] study allowed 60 seconds) and differences in the outcome variable (e.g., our study focused on spelling sophistication whereas Puranik & Al Otaiba [2012] examined written expression). Further research is required to examine whether writing fluency exerts an influence on the spelling and writing skills of ESL children, whether it predicts individual differences in writing skills as has been found for native EL1 children (Berninger & Graham, 1998), and if different writing fluency tasks (e.g., writing letters of the alphabet, copying sentences, copying words) yield variation in performance and predictive utility.

Finally, syntactic knowledge, but not oral vocabulary, predicted spelling sophistication for ESL and EL1 children in the present study. Of the limited studies conducted to date, spelling (and word level reading) reportedly develops independently from ESL children's English syntactic knowledge (e.g., Jongejan et al., 2007; Lesaux & Siegel, 2003). However, the results of the present study indicate that English syntactic knowledge contributes about the same amount of variance to spelling sophistication regardless of whether children are EL1 speakers, and in addition to the variance accounted for by measures of phonological processing. Syntactic knowledge and spelling are intricately related providing important clues about word forms such as tense, plural morphemes, and derivatives especially in older children (Muter & Snowling, 1997). Our findings are similar to Jongejan et al.'s (2007) findings for older (Grades 3 to 5) EL1 children; however, no research to date has found a relationship between English syntactic knowledge and spelling in young ESL children. The present findings may be different from previous studies in that, unlike previous research that used experimental measures, we used a norm-referenced measure of syntactic knowledge developed for use in language assessments, and we focused on spelling sophistication—a multi-dimensional construct—rather than spelling accuracy. More research on the relationship between ESL children's concurrently developing oral language, especially syntactic knowledge, and spelling development is required.

Some limitations in the present study are important to note. While variable to sample size ratios were within adequate ranges (Tabachnick & Fidell, 2007), a larger sample size would have led to greater power in our analyses. Also, we did not include a measure of rapid automatised naming (RAN) that has been shown in numerous studies to be a unique cognitive predictor of word-level reading in ESL and EL1 children. Our

rationale for excluding RAN was two-fold. We were concerned that ESL children would not have the English vocabulary to name objects quickly (RAN-Objects), or that they may not yet have the English letter or digit naming knowledge necessary to be successful on alphanumeric RAN tasks. It will be important for future research to include RAN measures, especially since recent findings indicate that they contribute uniquely to the spelling skills of older children becoming proficient in English (e.g., Jongejan et al., 2007; Yeong & Rickard-Liow, 2011).

In conclusion, despite ESL children's more limited oral vocabulary and syntactic knowledge in the L2, this study extends previous research in showing that parallel spelling error patterns between ESL and EL1 children signify similar use of phonological and orthographic information to spell irrespective of language status. The measures related to individual differences in spelling sophistication were also comparable across language groups suggesting that instructional approaches that focus on building rich lexical representations may promote more sophisticated spelling in all children. While early spelling achievement differences were not evident between ESL and EL1 kindergarteners, the results from this study do suggest some subtle variation in the linguistic and literacy influences on early spelling in children from different language backgrounds.

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