English as a foreign language spelling: comparisons between good and poor spellers

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This study examined English as a foreign language (EFL) spelling development amongst 233 fifth-grade, eighth-grade and 10th-grade Hebrew first-language speakers to examine effects of English orthographic exposure on spelling. Good and poor speller differences were examined regarding the acquisition of novel phonemes (/æ/, /Λ/ and /)/ and orthographic conventions (/ð/, /θ/, /aʊ/ and silent ‘e’). Hebrew measures included standardised spelling and orthographic and phonological tasks. Experimental English measures included real-word and pseudoword spellings, orthographic tasks and standardised spellings. Results showed significant differences in spelling accuracy between good and poor spellers at all grades. Spelling accuracy for most conventions did not improve after the eighth grade. Spellings of consonantal clusters, initial h and /b/ differed between good and poor spellers in the fifth grade only. Hebrew spelling was one of the strongest predictors of EFL real-word and pseudoword spellings in both fifth and eighth grades. Implications for teaching practice are discussed.

Practitioner points

What is already known about this topic

- The depth of the English orthography makes spelling acquisition an extended process for first-language (L1) English speakers.
- Reading and spelling are reliant on similar cognitive and linguistic mechanisms.
- Different linguistic components impact on L1 and foreign-language spelling accuracy at different stages.
What this paper adds

• The gap between good and poor English as a foreign language (EFL) spellers whose L1 is Hebrew is already evident at early stages of spelling acquisition, and although good spellers show improvement in spelling accuracy up to the eighth grade and poor spellers show continued improvement in spelling accuracy across grades, the gap between good and poor spellers remains significant.
• Poor fifth-grade EFL spellers demonstrate difficulties with basic grapheme–phoneme correspondence knowledge as well as minimal orthographic pattern knowledge.
• Proficiency with specific phonological and orthographic features of EFL distinguishes between good and poor spellers in the fifth grade.

Implications for practice and/or policy

• Greater emphasis should be placed on explicit spelling instruction in EFL.
• As accurate spelling for consonantal clusters, initial h and /ð/ discriminate very clearly between good and poor EFL spellers whose L1 is Hebrew in the initial stages of EFL letter–sound knowledge acquisition, it would be beneficial to include these features in assessment measures to identify struggling Hebrew L1 EFL learners at early stages of EFL literacy acquisition.

Introduction

Spelling is an integral part of word knowledge. Accurate spelling in English is based on layers of linguistic knowledge, which include phonological, orthographic, morphological and semantic information pertaining to any particular word. Spelling provides a window into knowledge of these various linguistic components. Just as accurate and fluent word recognition is a necessary precursor to reading comprehension, knowledge of spelling conventions is a necessary precursor to written expression and further linguistic development. Knowing how to spell a word accurately is dependent on the same underlying linguistic representations involved in knowing how to read a word. First-language (L1) research has shown that spelling and reading develop in a mutually dependent fashion for English as an L1 (EL1) (Caravolas, Hulme & Snowling, 2001; Conrad, 2008; Ehri, 2000; Ellis & Cataldo, 1990; Ritchey, 2008) as well as other languages (e.g., Leppanen, Niemi, Aunola & Nurmi, 2006). Similar to EL1 reading–spelling connections, previous research has shown a strong correlation between English as a foreign language (EFL) reading and spelling (Fender, 2008; Kahn-Horwitz, Shimron & Sparks, 2005; Kahn-Horwitz, Sparks & Goldstein, 2012). Thus, the development of accurate spelling in EFL is dependent on the same underlying linguistic knowledge base as the development of EFL reading. Therefore, acquiring EFL spelling skills should support and facilitate EFL reading skills. Whereas there is extensive research on the development of spelling in EL1 (Arndt & Foorman, 2010; Caravolas et al., 2001; Ehri, 1991; Foorman & Petscher, 2010; Treiman & Cassar, 1997; Varnhagen, McCallum & Burstow, 1997), considerably less is known about the linguistic processes involved in the acquisition of spelling in EFL (Figueredo, 2006). The present study aimed to examine differences in spelling accuracy amongst good and poor spellers at early, middle and later stages of literacy acquisition in EFL with a specific focus on the development of phonological and orthographic representations for familiar as well as unfamiliar (novel) patterns.
EL1 and EFL spelling development

The ability to establish sound–letter correspondence knowledge is based on the ability to perceive, discriminate and store speech sounds and then the ability to match these specific and distinct speech sounds to the appropriate orthographic symbols. In EL1, beginning spellers tend to rely more heavily on sound–letter correspondence knowledge, together with phoneme awareness, in the absence of orthographic pattern knowledge (Caravolas et al., 2001). Evidence for this has been found in EFL as well. Within the framework of a longitudinal study, Kahn-Horwitz et al. (2012) reported that knowledge of English letter names and sounds predicted rudimentary English spelling after 1 year of EFL literacy instruction.

Accurate spelling for both EL1 and EFL is reliant on stable and reliable lexical representations. Stage models of spelling development for EL1 concur that after an initial stage of phonetic writing where phonological knowledge is the main source of information, beginning spellers need to learn orthographic conventions. This in turn enables them to accurately represent more complex orthographic patterns (Davis & Bryant, 2006). This is accomplished through repeated exposure and practice (Caravolas et al., 2001; Wang & Geva, 2003). However, phonological and/or orthographic strategies are used to differing degrees as a result of exposure to print (Lennox & Siegel, 1993). Ultimately, accurate spelling relies on the use of multiple sources of phonological, orthographic and morphological linguistic information (Treiman & Bourassa, 2000).

L1 and EFL spelling connections

Theories such as the Linguistic Coding Differences Hypothesis (Sparks, 1995; Sparks & Ganschow, 1993a, 1993b), the Central Processing Hypothesis (Geva & Siegel, 2000) and the Interdependence Hypothesis (Cummins, 1979) provide a framework for understanding the connection between underlying linguistic abilities measured in L1 and literacy abilities in the target foreign language (FL). These theories suggest that linguistic abilities measured in L1 should predict literacy outcomes in additional languages. In other words, if a learner has strong phonological, orthographic, semantic and/or syntactic skills in L1, one would expect to see similarly strong linguistic abilities in the target FL, whereas, if the learner has weak phonological, orthographic, semantic and or syntactic skills in L1, these would be expressed as similarly weak skills in the target FL. Supporting cross-linguistic evidence from different L1 backgrounds to additional language spelling has been found for the following languages: English (Sparks, Patton, Ganschow & Humbach, 2009), Arabic (Fender, 2008), Spanish (Sun-Alperin & Wang, 2005), Welsh (James, Scholfield, Garrett & Griffiths, 1993) and Chinese (Wang & Geva, 2003). In the case of EFL spelling development amongst Hebrew L1 students, a longitudinal study conducted at the beginning, middle and end of EFL studies in school found that Hebrew word attack and Hebrew spelling measured at the end of the fourth grade accounted for most of the variance in explaining EFL spelling 6 years later. The word attack measure in Hebrew represented a more phonological strategy contributing to English spelling. EFL spelling at the end of the 12th grade was mainly explained by English spelling measured at the end of the ninth grade, which demanded an orthographically based strategy (Kahn-Horwitz et al., 2012). Thus, different language and literacy components, measured in both L1 and EFL, impact on EFL spelling at different stages of development. The present study expands on findings of this study by focusing on the development of EFL spelling abilities in relation to specific phonological and orthographic features that are familiar as well as unfamiliar (novel) to native Hebrew speakers from a cross-sectional perspective.

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The challenges of acquiring the English orthography

The English orthography is considered to be a deep orthography with a complex syllable structure impacting on vowel pronunciation (Frost, 2005; Goswami, 1986, 1988; Shankweiler & Fowler, 2004; Venezky, 1999) as well as inconsistent grapheme–phoneme relationships for both reading and spelling (e.g., cut as opposed to put). As a result of the complexity and depth of the English orthography, spelling acquisition in English is considered to be a lifelong process (Bruck, 1990; Kemp, 2009). This is in contrast with languages that are represented by relatively more shallow orthographies, such as German and Finnish, where accurate spelling might be expected much earlier (Leppanen et al., 2006; Ravid, 2001, 2011; Wimmer & Landerl, 1997).

English spellings, which reflect the unique orthographic profile of the language, can be categorised into words with regular spellings (phonemically transparent words), as opposed to words whose spelling relies on knowledge of word patterns, orthographic rules and morphophonemic relationships, and finally opaque irregular words (sight words), which can mostly be learned by rote (Fischer, Shankweiler & Liberman, 1985). Inherent in this categorisation is attention to linguistic information and conventions that facilitate the learning process, such as knowing when and why to double consonants, as in cut–cutting. Categorising spellings according to orthographic properties can be instrumental in the construction of spelling instruction and intervention programmes. In the case of interventions, programmes can be tailored on the basis of specific pupil needs as opposed to using generic spelling lists. The present study aimed to examine the development of spelling accuracy in this deep orthography amongst native Hebrew-speaking pupils.

The influence of novel linguistic and orthographic features on EFL spelling

The Hebrew orthography is a consonantal orthography that provides full phonological information in its vowelled form, with vowels or diacritical marks appearing above, below or within consonants (Ravid, 2011; Share & Levin, 1999; Shimron, 2006). The vowelled form of the Hebrew orthography is thus considered to be an example of a shallow orthography. Up to the third grade, Hebrew L1-speaking children read most texts in their vowelled form (Share & Levin, 1999), but from the first grade, they mostly spell without vowels (Navon & Shimron, 1984). From the third grade onwards, children are gradually exposed to unvowelled texts, where they become dependent on the orthographic, morphological, semantic and contextual cues to decode and spell without full phonological information (Ravid, 2001; Share & Levin, 1999). The unvowelled version of the Hebrew orthography would be considered to be an example of a deep orthography because accurate decoding is dependent on contextual as well as morphological information to compensate for the missing phonological information (Benuck & Peverly, 2004). The Hebrew-speaking participants in the current study were all literate in both vowelled and unvowelled Hebrew.

Based on differences between Hebrew and English, different linguistic and orthographic English features are expected to be novel for Hebrew L1 speakers. Novel features in the target language of additional language learners have been found to be particularly challenging as a result of lack of experience with these features (Raynolds & Uhry, 2010; Russak & Saiegh-Haddad, 2011; Wang & Geva, 2003). Evidence supporting this comes from numerous studies that examined the effect of novelty on additional language and literacy acquisition. Kahn-Horwitz, Schwartz and Share (2011) found that children
who were literate in Russian and Hebrew had greater success in spelling and decoding the English short vowels as opposed to children who were literate in Hebrew only. The Russian orthography fully represents vowel sounds as opposed to the unwovelled Hebrew orthography, where vowels are not represented (Share & Levin, 1999). The Phonological and Orthographic Proximity Hypothesis was proposed to explain and predict the impact of L1 phonological and orthographic features on the literacy development of an additional language (Kahn-Horwitz et al., 2011). This hypothesis is compatible with the Linguistic Affiliation Constraint Hypothesis (Russak & Saiegh-Haddad, 2011; Saiegh-Haddad, 2003), which postulates that phonemes from the second language (L2) that do not exist in the L1 phonemic inventory will be more difficult to process than phonemes that are familiar from the L1 inventory. This difficulty was illustrated in a study of the impact of novel phonemes on the phonological awareness abilities of a group of native Hebrew-speaking adults learning EFL with and without reading disabilities. Words that included novel EFL phonemes were found to be more difficult to segment for both populations tested (Russak & Saiegh-Haddad, 2011).

Evidence from other languages and literacies contributes further to our understanding of how L1 phonology and orthography were found to have an impact on English as an L2 (ESL) spelling. Wang and Geva (2003) found that Chinese L1 speakers at the start of ESL literacy acquisition struggled with accurate spellings of particular English phonemes that do not exist in the Chinese phonemic inventory. Similarly, Uhry and Raynolds (2011) found a strong impact of Spanish (L1) phonemes on the English (L2) spellings of Spanish-speaking (L1) first graders. In the present cross-sectional study, the development of novel linguistic and orthographic features was examined amongst Hebrew L1 spellers.

Differences between good and poor spellers in L1 and EFL

Similar to the interest in the differences between good and poor readers (Elbro, 1998; Siegel, Share & Geva, 1995; Spear-Swerling & Sternberg, 1996), there has been a noticeable interest in the differences between good and poor spellers (Arndt & Foorman, 2010; Cassar & Treiman, 2004; Van Bon & Uit De Haag, 1997). Differences between good and poor spellers have been examined with regard to specific error types. A recent study by Arndt and Foorman (2010) comparing typically developing with poor second-grade spellers found that the poor spellers graphemically represented all phonemes of the dictated words and showed quantitatively but not qualitatively more errors than their typically developing peers. However, difficulty in spelling short and long vowel sounds was observed amongst these poor spellers, whereas this was not observed amongst typically developing children. This finding has been confirmed for spellers with dyslexia as well (Bernstein, 2008; Moats, 1996; Sawyer, Wade & Kim, 1999). Errors with the accurate representation of vowel sounds in spelling seem to be the result of inaccurate phonological representations, as evidenced in vowel substitutions of other vowels with many shared articulatory features (Bernstein, 2008; Moats, 1996; Sawyer et al., 1999).

Further fine-grained analyses of spelling errors indicate that there is greater heterogeneity in the spelling errors of spellers with dyslexia (Moats, 1996), who tend to omit consonants when spelling consonantal clusters (Bruck & Treiman, 1990; Cassar, Treiman, Moats, Pollo & Kessler, 2005; Moats, 1996; Van Bon & Uit De Haag, 1997). Regarding spellings of orthographic conventions, it was found that children with dyslexia have more difficulties with accurate spelling of the silent ‘e’, although these differences were not
necessarily reflected in real-word spellings (Bourassa & Treiman, 2003). In addition, certain high-frequency sight words such as ‘want’ and ‘because’ seem to be problematic for spellers with dyslexia (Moats, 1996). In the present study, we were interested in examining the differences between good and poor EFL spellers in both L1 (Hebrew) and EFL with specific attention to the effect of novel phonological and orthographic features. Whereas the aforementioned studies focused on dyslexic spellers, the current study used a method of fine-grained analysis to better understand the differences between good and poor spellers.

**EFL literacy instruction in Israel**

EFL literacy instruction in Israel usually begins in the third grade after one or more years of exposure to the oral language. EFL instruction takes place on an average of 3–4 hours per week. Spelling instruction begins with the introduction of letter names, followed by sound–letter matching instruction for most of the letters. However, after this initial stage of letter–sound matching, it is common for EFL teachers in Israel to move directly to a more whole language-based approach (for a more complete description of this approach, see Masterson & Apel, 2010; Schlagel, 2001). At this point, target content words are studied for the purposes of spelling and vocabulary acquisition. Within this framework, children are required to memorise lists of words for weekly dictation tests. There is little explicit instruction regarding orthographic conventions, and this is reflected in the fact that spelling receives little emphasis in official Israel Ministry of Education guidelines for teachers regarding prefoundation literacy instruction (State of Israel Ministry of Education English Inspectorate, 2009). Although spelling is mentioned as one of the 10 ‘musts’ for teaching in prefoundation literacy instruction and spelling is stated as important for supporting reading, there is no mention of explicit instruction of English orthographic conventions. Teachers are told to ‘engage pupils in extensive spelling practice’ (State of Israel Ministry of Education English Inspectorate, 2009, p. 9); however, they are not given any guidelines as to what kind of practice will result in optimal outcomes. Whereas in many EFL classrooms in Israel routine spelling tests are given throughout elementary school, this practice tapers off during junior high school. By the time an EFL learner reaches high school in Israel, there is virtually no emphasis placed on spelling instruction. However, some high school EFL textbooks draw attention to morphological components of the English language to facilitate vocabulary acquisition for reading comprehension for the matriculation exam (Loney, 2005). In these same matriculation examinations, spelling errors are hardly penalised. This perhaps best expresses the lack of recognition of spelling being the link between the respective linguistic elements involved in knowing a word.

**The present study**

In the present study, we were interested in reaching a deeper understanding of the development of accurate EFL spelling amongst L1 Hebrew-speaking good and poor spellers. Within the framework of the current study, we were interested in examining the following two questions:

1. What are the differences in accuracy levels between good and poor EFL spellers in the fifth, eighth and 10th grades specifically regarding phonological and orthographic
representations for novel as well as non-novel phonemes and orthographic patterns? From previous findings, it was expected that good spellers would spell with higher levels of accuracy than poor spellers. We hypothesised that increased exposure and practice across grades would lead to more accurate phonological and orthographic representations for both novel and non-novel phonological and orthographic patterns. However, we expected to see more difficulties with accurate representations for novel as opposed to non-novel features.

2. To what extent does performance on orthographic and phonological choice tasks in L1 Hebrew and orthographic choice and sensitivity tasks in EFL account for EFL spelling? From previous studies, we expected to find a stronger impact for phonological measures on EFL spelling earlier on and a stronger impact for orthographic measures later on.

Method

Participants

A total of 233 children participated in the study. They had all begun English studies in the third grade and began formal literacy instruction in the fourth grade. Fifth, eighth and 10th graders were targeted to represent the beginning, middle and advanced stages of literacy acquisition. There were 81 fifth graders from two elementary schools, 72 eighth graders from one regional middle school and 80 10th graders from one regional high school in the centre of Israel. The schools are all considered middle–high socioeconomic background. This is based on an index determined by the Israeli Central Bureau of Statistics (Central Bureau of Statistics, 2011, http://www.cbs.gov.il/locals.htm). This index is based on demographic information, parent education, standard of living, employment and unemployment data and percentage of the population in that particular area receiving government subsidies. Initially, children were divided into good and poor spellers on the basis of their Hebrew L1 spelling scores. However, all tenth graders obtained ceiling results, and so the median score of the standardised Wide-Range Achievement Test, a test that has been standardised on the English L1 population, was used to divide the grades into good versus poor spellers. The poor EFL speller group included children whose scores were −0.5 standard deviations below the median score or lower, and the good speller group included children whose scores were 0.5 standard deviations or more above the median score. The groups were divided this way to clearly differentiate between good spellers, as opposed to spellers who are potentially at risk for EFL spelling difficulties and poor spellers, while removing a group of spellers from the middle range around the median. There were 22 good spellers and 24 poor spellers in the fifth grade, 19 good spellers and 20 poor spellers in the eighth grade and 25 good spellers and 29 poor spellers in the 10th grade.

Baseline measures: L1 Hebrew

Phonological choice (Shatil & Nevo, 2007). This timed-standardised Hebrew task involves circling food items from a list of 104 misspelled words that can be phonologically decoded but are orthographically incorrect, for example, lachmanya (Hebrew for bread roll). The maximum correct score on this task is 29 for the fifth grade and 31 for the eighth and
10th grades. The K-R20 internal consistency is .87 for the fifth grade, .87 for the seventh grade and .89 for the ninth grade.

*Orthographic choice* (Shatil & Nevo, 2007). This timed-standardised Hebrew task involves circling 42 animal words out of a list of 149 correctly spelled words for the fifth grade and 43 animal words out of a list of 149 correctly spelled words for the eighth and 10th grades, for example, kof (Hebrew for monkey) קוף. The maximum correct score is 42 for the fifth grade and 43 for the eighth and 10th grades. The K-R20 internal consistency is .94 for the fifth grade, .93 for the seventh grade and .94 for the ninth grade.

*Spelling dictation* (Shatil & Nevo, 2007). This standardised Hebrew task is a dictation of a text comprising 35 words for the fifth grade and 42 words for the eighth and ninth grades. One form was given to the fifth grade and another form to the eighth and 10th graders. The K-R20 internal consistency is .95 for the fifth grade, .96 for the seventh grade and .96 for the ninth grade. The Cronbach alpha value is .91 for the fifth grade, .89 for the eighth grade and .95 for the 10th grade.

**Baseline measures: EFL**

*Orthographic sensitivity.* This task, which is an adaptation of a similar task used by Cunningham, Perry and Stanovich (2001) as well as Stanovich and Siegel (1994), examines sensitivity towards orthographic conventions appearing in pseudowords in English. The orthographic conventions include both legal letter sequences and legal letter positions within words. Fifteen pseudoword pairs are presented, and children are required to circle the word that looks most like a real English word in each pair (for a full description of this task, see Russak, 2007). The task includes homophone–pseudoword pairs such as *sckap/skap, gake/gayk* and *qoast/quost*. The Cronbach alpha is .63. The maximum score for this task is 15.

*Orthographic choice.* This task, which is an adaptation of a similar task used by Cunningham et al. (2001) as well as Stanovich and Siegel (1994), tests knowledge of orthographic patterns in real words. Children are presented with 20 pairs of words where one of the pair is correctly spelled and the other is not; however, all word pairs are homophonous, for example, *place* versus *plase, thum* versus *thumb* and *more* versus *moar*. All of the real-word targets appear in the list of the 2,000 most frequent words compiled from spoken and written text corpora (http://www.lextutor.ca/vp/). Children are required to circle the correctly spelled word in the pair (for a full description of this task, see Russak, 2007). The Cronbach alpha is .83. The maximum score for this task is 20.

*Spelling dictation.* Words were dictated from the standardised Wide-Range Achievement Test 3 (Wilkinson, 1993). However, raw scores were used as this test has not been standardised for EFL populations.
Experimental EFL spelling measures

Word spelling task. To create this task, we targeted phonological and orthographic properties that are novel to the Hebrew L1 speaker. Five categories included the various items that made up this task. First, three novel phonemes, /æ/, /Λ/ and /∀/, were included in eight words (e.g., hand, but and thin). Second, three orthographic conventions that comprise both novel phonological and orthographic properties, /ð/ , /θ/ and /Λ忘记了/, appeared in 11 words (e.g., this, with and out). Phonologically, these phonemes do not exist in Hebrew, and orthographically, there are no digraphs in Hebrew. The third category consisted of words that are orthographically novel for Hebrew L1 speakers: the silent ‘e’ (split digraph) appeared in four words (e.g., time). The fourth category included six sight words, which include letters that do not follow grapheme–phoneme correspondences (e.g., people, want and does). The fifth category consisted of two non-novel phonemes, /e/ and initial /h/, and consonant clusters (which exist in Hebrew in a restricted manner and to a lesser degree), which appeared in 19 words (e.g., help and best). Target words were chosen from the first 400 words in Brown Corpus (2009) and included 24 one-syllable words and four two-syllable words of which six were sight words. A total of 28 words were dictated to the children (Appendix). Each word was read out loud. It was then presented within the context of a meaningful sentence, and finally, the tester read it out loud again. Children then wrote the target words. For example, the word ‘just’ includes two targets, the Λ and the consonant cluster -st. The Cronbach alpha is .95.

Pseudoword spelling task. The same phonological and orthographic properties novel to the Hebrew L1 speaker and targeted in the preceding experimental word spelling task were used for creating pseudowords. Pseudowords were created by substituting one nontarget grapheme in the beginning, middle or end of each real word with an orthographically legal grapheme (e.g., nith instead of with). An attempt was made to limit the number of orthographically ambiguous options that could be accepted. No substituted pseudowords were created for the sight words, resulting in a list of 22 pseudowords (Appendix). Children were told that they would hear a list of words with no meaning in English and they were to write them. Each target pseudoword was read out twice, and children wrote what they heard. For example, the pseudoword ‘thip’ includes two targets, the /t/ and the digraph /θ/. All orthographically legal options for representing a phoneme were accepted. For example, for the target ‘mome’, the alternate spelling ‘moam’ was also accepted. The Cronbach alpha is .88.

Procedure

Permission was obtained from the Israeli Ministry of Education Chief Scientist’s Office to conduct the study. Towards the end of the school year, the first author conducted group testing in the fifth-grade, eighth-grade and 10th-grade classrooms. The order of test administration was counterbalanced so that in each grade, half of the participants began with the Hebrew section and half with the English section. The order of task administration within each language section remained constant. Testing took one full 45-minute lesson.

Results

The aim of this research was to examine differences between good and poor EFL spellers amongst L1 Hebrew-speaking children in the fifth, eighth and 10th grades with specific
attention to accuracy in the spelling of novel phonemes and orthographic patterns. This was tested by conducting ANOVAs, which enabled examination of EFL spelling accuracy across the three grades and amongst good versus poor spellers. In addition, we were interested in examining the connections between L1 underlying phonological, orthographic and spelling ability and EFL spelling. Hierarchical regression analyses were conducted to perform this.

Differences between good and poor EFL spellers across grades

Means and standard deviations were calculated for all tasks. Table 1 shows the means and standard deviations for all tasks across grades amongst good and poor spellers. Scores are reported as percentages except for the standardised Hebrew measures, which are reported as *z* scores.

Standard deviations on the experimental real-word spelling task showed greater variance amongst the poor spellers as opposed to the good spellers, particularly for the eighth and 10th grades. In other words, poor spellers demonstrated greater heterogeneity in their EFL spelling ability than good spellers. Good spellers in the fifth grade scored 67% as opposed to good spellers in the eighth and 10th grades who spelled with 93% accuracy or above. Poor spellers in fifth grade showed dramatically poor spelling. Mean scores for experimental pseudoword spelling showed generally very low scores across grades. Here, 10th-grade good spellers scored 61%, whereas fifth-grade good spellers scored 52%.

Main effects were found for grade and group in all four of the English measures: real-word spelling (grade, *F*(2, 139) = 107.88, *p* < .001; group, *F*(1, 139) = 225.04, *p* < .001), pseudoword spelling (grade, *F*(2, 139) = 17.09, *p* < .001; group, *F*(1, 139) = 111.77, *p* < .001), orthographic sensitivity (grade, *F*(2, 139) = 15.83, *p* < .001; group, *F*(1, 139) = 10.17, *p* < .01) and orthographic choice (grade, *F*(2, 139) = 56.21, *p* < .001; group, *F*(1, 139) = 30.67, *p* < .001). Main effects were found for grade and group in the Hebrew phonological choice task (grade, *F*(2, 139) = 17.51, *p* < .001; group, *F*(1, 139) = 20.56, *p* < .001). Main effects were found for grade and group in the Hebrew spelling task as well (grade, *F*(2, 139) = 8.91, *p* < .001; group, *F*(1, 139) = 7.26, *p* < .01). No main effects were found for the Hebrew orthographic choice task.

Significant interactions were found between grade and group for English experimental real-word spelling, *F*(2, 133) = 5.72, *p* < .01. Bonferroni post hoc tests showed that the good spellers scored higher than the poor spellers at every grade. For both groups of spellers, the scores in the fifth grade were significantly lower than the scores in the eighth and 10th grades. For the good spellers, there was no significant difference between spelling accuracy scores in the eighth and 10th grades, whereas for the poor spellers, there was a significant improvement between the eighth and 10th grades.

An interaction was found between grade and group for English pseudoword spelling, *F*(2, 133) = 3.79, *p* < .05. Bonferroni post hoc tests showed that the good spellers scored higher than the poor spellers at every grade. However, observation of the means in Table 1 indicates generally depressed scores. For the poor spellers, the scores in the fifth grade were significantly lower than the scores in the eighth and 10th grades, and despite the fact that there was an improvement in accuracy scores between the eighth and 10th grades, this improvement was not statistically significant. For the good spellers, there was no significant difference on scores between grades.
Table 1. Means and standard deviations (in parentheses) for English measures as percentage values and for Hebrew standardised measures as \( z \) scores.

<table>
<thead>
<tr>
<th>Variables (range)</th>
<th>Fifth graders</th>
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<th>Eighth graders</th>
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<td>Experimental real-word spelling (0–28)</td>
<td>66.56 (14.60)</td>
<td>22.47 (16.23)</td>
<td>93.05 (7.85)</td>
<td>56.43 (17.60)</td>
<td>96.86 (5.29)</td>
<td>71.31 (15.87)</td>
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<td>Experimental pseudoword spelling (0–22)</td>
<td>51.65 (13.57)</td>
<td>16.48 (13.19)</td>
<td>58.61 (13.63)</td>
<td>33.18 (17.70)</td>
<td>60.55 (14.05)</td>
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<td>Orthographic sensitivity (0–15)</td>
<td>69.40 (18.59)</td>
<td>55.28 (23.79)</td>
<td>74.39 (10.95)</td>
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<td>76.78 (13.29)</td>
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<td>Phonological choice</td>
<td>0.95 (0.88)</td>
<td>0.29 (1.05)</td>
<td>−0.09 (0.83)</td>
<td>−0.63 (0.95)</td>
<td>0.16 (0.66)</td>
<td>−0.61 (0.73)</td>
</tr>
<tr>
<td>Orthographic choice</td>
<td>0.12 (0.71)</td>
<td>−0.02 (0.87)</td>
<td>−0.03 (1.40)</td>
<td>−0.28 (1.05)</td>
<td>0.08 (0.88)</td>
<td>0.07 (1.08)</td>
</tr>
<tr>
<td>Spelling</td>
<td>0.03 (0.76)</td>
<td>−0.86 (1.48)</td>
<td>0.19 (0.59)</td>
<td>−0.16 (1.45)</td>
<td>0.38 (0.26)</td>
<td>0.35 (0.23)</td>
</tr>
</tbody>
</table>
An interaction was found for English orthographic word choice, $F(2, 133) = 4.07, p < .05$, with significant differences between good and poor spellers in the fifth and eighth grades but not in the 10th grade. In addition, within both groups, the differences between the fifth and eighth grades and the differences between the fifth and 10th grades were significant, but the differences in accuracy scores between the eighth and 10th grades were not statistically significant for either group of spellers.

No interactions were found for the three Hebrew measures: phonological choice, orthographic choice and spelling.

Spelling development of novel phonemes and orthographic patterns

To better understand development of novel phoneme and orthographic pattern knowledge amongst poor versus good spellers across grades, ANOVAs were performed with the target novel phoneme or orthographic pattern as the within-subject factor and grade (fifth, eighth and 10th grades) and group (good vs poor) as the between-subject factors. Table 2 shows the means and standard deviations for all novel and non-novel linguistic features across grades amongst good and poor spellers.

Main effects were found for group for every linguistic (phonological and orthographic) feature, with good spellers outperforming poor spellers (novel phonemes: /l/ – $F(1, 139) = 19.96, p < .001$; /æ/ – $F(1, 139) = 62.32, p < .001$; /æ/ – $F(1, 139) = 35.78, p < .001$; non-novel phonemes and patterns: /æ/ – $F(1, 139) = 42.66, p < .001$; initial ‘h’ – $F(1, 139) = 23.45, p < .001$; consonant clusters – $F(1, 139) = 22.25, p < .001$; novel orthographic patterns: silent ‘e’ – $F(1, 139) = 69.40, p < .001$; sight words – $F(1, 139) = 136.25, p < .001$; novel phonemes and novel orthographic patterns: /θ/ – $F(1, 139) = 47.53, p < .001$; /θ/ – $F(1, 139) = 48.84, p < .001$; /ʌ/ – $F(1, 139) = 107.48, p < .001$). Main effects for grade were found for every linguistic feature (novel phonemes: /l/ – $F(2, 139) = 3.26, p < .05$; /æ/ – $F(2, 139) = 15.1, p < .001$; /æ/ – $F(2, 139) = 9.94, p < .001$; non-novel phonemes and patterns: /æ/ – $F(2, 139) = 39.15, p < .001$; initial ‘h’ – $F(2, 139) = 5.37, p < .01$; consonant clusters – $F(2, 139) = 8.83, p < .001$; novel orthographic patterns: silent ‘e’ – $F(2, 139) = 8.65, p < .001$; sight words – $F(2, 139) = 104.15, p < .001$; novel phonemes and novel orthographic patterns: /θ/ – $F(2, 139) = 7.56, p < .01$; /θ/ – $F(2, 139) = 13.95, p < .001$; /ʌ/ – $F(2, 139) = 23.05, p < .001$).

An interaction was found between grade and group for sight words, $F(2, 133) = 3.67, p < .05$. Bonferroni post hoc tests showed that there was a significant difference between good and poor spellers in all grades. For both the good and poor spellers, there was a significant development in spelling accuracy for sight words from the fifth to eighth grades. Whereas the difference in spelling accuracy for sight words was not significant between the eighth and 10th grades for the good spellers, the difference between scores for the poor spelling group was significant, with higher scores in the 10th grade than in the eighth grade.

An interaction between grade and group was found for the silent ‘e’, $F(2, 133) = 6.11, p < .01$. Bonferroni post hoc tests showed that there was a significant difference between good and poor spellers in all grades. For the good spellers, there was no significant development in spelling ability for silent ‘e’ across grades. For the poor spellers, however, there was a statistically significant development in spelling accuracy from the fifth to eighth grades, and although accuracy scores continued to improve in the 10th grade, this improvement was not statistically significant.
Table 2. Means and standard deviations (in parentheses) for novel and non-novel linguistic features as percentage value.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Fifth graders</th>
<th>Eighth graders</th>
<th>10th graders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>Novel phonemes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>.53</td>
<td>86.36 (20.01)</td>
<td>55.21 (36.10)</td>
</tr>
<tr>
<td>Λ</td>
<td>.60</td>
<td>51.82 (25.94)</td>
<td>13.33 (17.36)</td>
</tr>
<tr>
<td>æ</td>
<td>.64</td>
<td>77.27 (22.15)</td>
<td>41.67 (33.69)</td>
</tr>
<tr>
<td>Non-novel phonemes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>.84</td>
<td>68.69 (22.13)</td>
<td>31.02 (29.30)</td>
</tr>
<tr>
<td>Initial h</td>
<td>.85</td>
<td>97.73 (5.28)</td>
<td>67.50 (38.36)</td>
</tr>
<tr>
<td>Novel orthographic patterns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silent 'e'</td>
<td>.65</td>
<td>78.57 (14.46)</td>
<td>35.12 (31.52)</td>
</tr>
<tr>
<td>Sight words (from 400 frequent words)</td>
<td>.79</td>
<td>41.67 (17.63)</td>
<td>12.50 (16.49)</td>
</tr>
<tr>
<td>Consonant clusters</td>
<td>.83</td>
<td>92.53 (7.14)</td>
<td>67.26 (31.59)</td>
</tr>
<tr>
<td>Novel phonemes within novel orthographic patterns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>δ</td>
<td>.75</td>
<td>85.61 (19.45)</td>
<td>38.89 (34.98)</td>
</tr>
<tr>
<td>θ</td>
<td>.77</td>
<td>64.55 (28.91)</td>
<td>17.50 (27.23)</td>
</tr>
<tr>
<td>ø</td>
<td>.88</td>
<td>51.82 (29.70)</td>
<td>7.08 (13.02)</td>
</tr>
</tbody>
</table>
A significant interaction between grade and group was found for the phoneme /ɛ/, $F(2, 133)=4.40, p < .001$. Bonferroni post hoc tests showed that the difference between good and poor spellers was significant in the fifth and eighth grades but not in the 10th grade. For both the good and poor spellers, there was a significant difference between accuracy scores in the fifth and eighth grades, whereas there was no statistically significant development in accuracy between the eighth and 10th grades.

An interaction was found between grade and group for consonant clusters, $F(2, 133)=5.74, p < .01$. Bonferroni post hoc tests showed that there was a significant difference between good and poor spellers in the fifth grade only. For the good spellers, there was no significant development in spelling ability for consonant clusters. For the poor spellers, however, there was a significant development in spelling accuracy for consonant clusters from the fifth to eighth grades, whereas the difference in spelling accuracy for consonant clusters was not significant between the eighth and 10th grades.

A similar interaction between grade and group was found for the initial $h$, $F(2, 133)=5.29, p < .01$. Bonferroni post hoc tests showed that once again, there was a significant difference between good and poor spellers in the fifth grade only. For the good spellers, there was no significant development in spelling ability for initial $h$. For the poor spellers, however, there was significant development in spelling for initial $h$ from the fifth to eighth grades.

Yet another similar interaction between grade and group was found for the phoneme /ð/, $F(2, 227)=6.54, p < .01$. Bonferroni post hoc tests showed a significant difference between good and poor spellers in the fifth grade only. For the good spellers, there was no significant development in spelling ability for the phoneme /ð/. For the poor spellers, however, there was a significant development in spelling accuracy from the fifth to eighth grades. The difference in spelling accuracy was not significant between the eighth and 10th grades.

To better understand the different results found for /ð/ as opposed to /θ/, an ANOVA was performed with /ð/ versus /θ/ as the within-subject measure and grade and group as the between-subject factors. An interaction between grade and /ð/ versus /θ/ was found, $F(2, 133)=4.76, p < .01$. A Bonferroni post hoc analysis indicated that scores for the /ð/ were significantly higher than scores for /θ/ across each of the three grades. Whereas the scores for /ð/ did not change significantly across grades, there was a significant improvement in accuracy scores for /θ/ between the fifth and eighth grades.

The contributions of L1, EFL and ability level to EFL spelling

The second question examined to what extent underlying orthographic and phonological measures in L1, EFL and ability level (good vs poor spellers) account for EFL spelling development. Hierarchical regression analyses were conducted in three stages. In the first stage, the three Hebrew measures – Hebrew spelling, Hebrew orthographic choice and Hebrew phonological choice – were entered to examine the contributions of L1 Hebrew to EFL spelling. In the second stage, EFL orthographic sensitivity and EFL orthographic choice were entered to see if English variables contribute additionally to the explained variance. Finally, in the third stage, the ability level variable was entered. In what follows, the data will be reported by grade, first focusing on predictors of EFL real-word spelling, followed by predictors of EFL pseudoword spelling. Table 3 shows the findings for the hierarchical regression analyses.
Table 3. Hierarchical regression analysis: L1 Hebrew measures predicting EFL word and pseudoword spellings.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Grade 5</th>
<th></th>
<th>Grade 8</th>
<th></th>
<th>Grade 10</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta R^2$</td>
<td>$\beta$</td>
<td>$\Delta R^2$</td>
<td>$\beta$</td>
<td>$\Delta R^2$</td>
<td>$\beta$</td>
</tr>
<tr>
<td>EFL experimental word spelling</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1</td>
<td>.22***</td>
<td>.31***</td>
<td>.27***</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>HS</td>
<td>.29*</td>
<td></td>
<td>.50***</td>
<td></td>
<td>-.03</td>
<td></td>
</tr>
<tr>
<td>HPC</td>
<td>.22</td>
<td>.15</td>
<td>.52***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOC</td>
<td>.07</td>
<td>-.04</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Step 2</td>
<td>.23***</td>
<td>.26***</td>
<td>.18***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>.15</td>
<td>.28**</td>
<td>-.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPC</td>
<td>.25*</td>
<td>.11</td>
<td>.32**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOC</td>
<td>.04</td>
<td>-.06</td>
<td>-.02</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>EOS</td>
<td>.14</td>
<td>.06</td>
<td>-.80</td>
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<tr>
<td>EOC</td>
<td>.42***</td>
<td>.55***</td>
<td>.49***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>.14***</td>
<td>.09***</td>
<td>.07***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS</td>
<td>.12</td>
<td>.33**</td>
<td>-.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPC</td>
<td>.20*</td>
<td>.04</td>
<td>.25*</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>HOC</td>
<td>.04</td>
<td>-.08</td>
<td>.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOS</td>
<td>.07</td>
<td>.06</td>
<td>-.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOC</td>
<td>.28**</td>
<td>.41***</td>
<td>.42***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>.42***</td>
<td>.33***</td>
<td>.31**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.58***</td>
<td>.66***</td>
<td>.52***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>81</td>
<td>72</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

EFL experimental pseudoword spelling

| Step 1                                 | .19***  | .27*** | .09     |        |          |        |
| HS                                     | .37**   | .49*** | .07     |        |          |        |
| HPC                                    | .08     | .16    | .24*    |        |          |        |
| HOC                                    | .05     | -.15   | .11     |        |          |        |
| Step 2                                 | .17***  | .05    | .04     |        |          |        |
| HS                                     | .24*    | .39**  | .06     |        |          |        |
| HPC                                    | .11     | .17    | .16     |        |          |        |
| HOC                                    | .01     | -.14   | .10     |        |          |        |
| EOS                                    | .21*    | .12    | -.15    |        |          |        |
| EOC                                    | .30**   | .18    | .24     |        |          |        |
| Step 3                                 | .15***  | .10**  | .17***  |        |          |        |
| HS                                     | .21*    | .44*** | .04     |        |          |        |
| HPC                                    | .05     | .10    | .05     |        |          |        |
| HOC                                    | .01     | -.17   | .17     |        |          |        |
With regard to EFL real-word spelling at the end of the fifth grade, Hebrew spelling was found to explain 22% of the variance, $F(3, 77) = 7.27, p < .001$. Adding EFL orthographic sensitivity and orthographic knowledge tasks resulted in an additional 23% of explained variance, $F(2, 75) = 15.26, p < .001$. When spelling ability was added, an additional 14% of the variance, $F(1, 74) = 24.00, p < .001$, was explained.

Similarly, with regard to EFL pseudoword spelling at the end of the fifth grade, Hebrew spelling accounted for 19% of the variance in EFL pseudoword spelling, $F(3, 77) = 5.95, p < .001$. Adding EFL orthographic sensitivity and orthographic choice tasks resulted in an additional 17% of the explained variance, $F(2, 75) = 10.07, p < .001$. When spelling ability was added, an additional 15% of the variance, $F(1, 74) = 22.20, p < .001$, was explained.

At the end of the eighth grade, Hebrew spelling explained 31% of the variance in EFL word spelling, $F(3, 66) = 9.67, p < .001$. Adding EFL orthographic sensitivity and orthographic choice tasks explained an additional 26% of the variance, $F(2, 64) = 19.45, p < .001$. When spelling ability was added, an additional 9% of the variance, $F(1, 63) = 15.75, p < .001$, was explained.

With regard to EFL pseudoword spelling at the end of the eighth grade, Hebrew spelling explained 27% of the variance, $F(3, 66) = 7.97, p < .001$. Adding EFL orthographic sensitivity and orthographic choice tasks did not contribute additional variance. However, when spelling ability was added to the Hebrew and English tasks, an additional 10% of the variance was explained, $F(1, 63) = 10.61, p < .01$.

Hebrew phonological choice accounted for 27% of the variance in EFL word spelling at the end of the 10th grade, $F(3, 76) = 9.38, p < .001$. Adding EFL orthographic sensitivity and orthographic choice tasks contributed an additional 18% variance, $F(2, 74) = 11.67, p < .001$. When spelling ability was added, an additional 7% of the variance, $F(1, 73) = 11.32, p < .001$, was explained.

With regard to EFL pseudoword spelling at the end of the 10th grade, this contribution was not significant, $F(3, 76) = 2.54, p = ns$. When the EFL orthographic sensitivity and orthographic choice tasks were added to the Hebrew tasks, an additional 4% of the variance was explained, which was also nonsignificant, $F(2, 74) = 1.86, p = ns$. However, when spelling ability was added to the Hebrew and English tasks, 17% of the variance was explained, $F(1, 73) = 17.31, p < .001$.

---

### Table 3. (Continued)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Grade 5 $\Delta R^2$</th>
<th>$\beta$</th>
<th>Grade 8 $\Delta R^2$</th>
<th>$\beta$</th>
<th>Grade 10 $\Delta R^2$</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>EOS</td>
<td>.14</td>
<td>.12</td>
<td>-.24*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOC</td>
<td>.16</td>
<td>.03</td>
<td>.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>.44***</td>
<td>.36**</td>
<td>.46***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total $R^2$</td>
<td>.51***</td>
<td>.42**</td>
<td>.30***</td>
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<td>$n$</td>
<td>81</td>
<td>72</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HOC = Hebrew orthographic choice, HS = Hebrew spelling, HPC = Hebrew phonological choice, EOS = English orthographic sensitivity, EOC = English orthographic choice, Group = strong versus weak spellers.

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

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Discussion

The present study examined differences between good and poor EFL spellers amongst L1 Hebrew-speaking children in the fifth, eighth and 10th grades, focusing on the development of novel phonemes and orthographic pattern knowledge, as well as the connections between L1 underlying phonological, orthographic and spelling ability, and EFL spelling.

Differences in accuracy for spelling amongst good and poor spellers

First, we investigated the development of accurate EFL spelling across three grades for good and poor spellers. Accuracy scores for good spellers in the fifth grade on both real-word and pseudoword spellings showed basic grapheme–phoneme correspondence knowledge together with some orthographic pattern knowledge. This is in contrast with poor spellers in the fifth grade whose scores were remarkably low, reflecting minimal orthographic pattern knowledge and suggesting difficulties even at the level of basic grapheme–phoneme correspondence knowledge. These findings for EFL poor spellers are in contrast with findings regarding poor English L1 spellers in the second grade who were found to represent all phonemes in dictated words (Arndt & Foorman, 2010). Similar to Moats’ (1996) findings amongst dyslexic English L1 spellers, poor spellers in the current study demonstrated greater heterogeneity in their EFL spelling ability than good spellers. Further, despite the fact that the accuracy levels of the poor spellers continued to improve significantly, the gap between good and poor spellers remained significant across grades. Similar findings were reported by Sparks et al., (1998) who found that although language abilities of weak FL students improved over time, the gap in spelling between good and poor language learners did not close. By the eighth grade, the good spellers were already spelling real words with over 90% accuracy. However, this does not necessarily reflect their independent encoding abilities as can be seen in the fact that their spellings for novel phonemes as well as novel orthographic patterns remained lower in comparison. In other words, good spellers seem to have good orthographic memory for highly frequent words. This could be a reflection of the type of instruction they have received, which places emphasis on whole-word memorisation.

The current study also tested differences between good and poor EFL spellers on underlying English orthographic measures. The correlation between these orthographic tasks indicates that they both tap into a basic level of orthographic awareness ($r = .43, p < 0.01$). However, the orthographic choice task is more word specific, in that children must recognise the correct spelling for a real word, whereas for the orthographic sensitivity task, children are required to identify legal orthographic strings embedded within pseudowords. This may explain the overall lower scores for the orthographic sensitivity task, as opposed to the orthographic choice task where scores were almost at ceiling. Scores for orthographic tasks amongst poor spellers from the eighth grade up reflect similar results in EL1 research, where it was found that poor spellers perform as well as good spellers on orthographic recognition tasks (Cassar et al., 2005; Lennox & Siegel, 1996; Stanovich, Siegel & Gottardo, 1997). However, in the case of the EFL learners in the present study, this orthographic recognition ability did not seem to help the poor spellers spell more accurately, as can be seen in the real-word and pseudoword spelling scores. In other words, despite the fact that the poor spellers scored commensurately to the good spellers on measures of orthographic knowledge, this knowledge did not enable them to spell at a
similar level of accuracy to their good spelling peers. It appears that although the poor spellers are able to recognise a misspelled word from a choice of a pair of correct and incorrectly spelled words, they are still not able to apply this knowledge in the production of accurate spellings.

In sum, the gap between good and poor spellers is already evident at early stages of FL acquisition and remains significant across grades. Whereas good spellers show improvement in spelling accuracy for real words up to the eighth grade, poor spellers continue to develop their spelling accuracy on all English spelling measures across grades.

The development of knowledge of novel phonological and orthographic patterns in EFL

Another focus of this study was a more fine-grained investigation of the development of knowledge of novel phonemes and novel orthographic patterns amongst good and poor EFL spellers. A developmental trend was found for consonantal clusters, initial h and /ð/, whereby significant differences between good and poor spellers were found in the fifth grade only. Although the scores for poor fifth-grade spellers on these three target items were not the lowest of their scores of target items in general, their scores here were low enough to differentiate them from the good spellers. These results indicate that accurate spelling for these three targets discriminates very clearly between good and poor spellers in the initial stages of letter–sound knowledge acquisition. Information of this nature may be useful in designing assessment measures to identify struggling Hebrew L1 EFL learners at early stages of EFL literacy acquisition. Further, for the good spellers, there was no significant development in accuracy of spelling these target items across grades. For non-novel targets, the good spellers reached ceiling by the eighth grade. The fact that good spellers did not show improvement in accuracy scores for novel targets could indicate that across the years, these learners had not acquired sufficient phonological, orthographic and lexical knowledge. This is particularly evident where even in the tenth grade, accuracy scores for the silent ‘e’ were not above 82% for good spellers. These continued difficulties might be due to the complex nature of the English orthography, coupled with a lack of explicit and direct EFL instruction in Israel. The striking development in sight word spelling accuracy observed from the fifth to eighth grades might be further evidence of the strong emphasis placed on whole-word learning strategies, as opposed to attention to smaller linguistic units in EFL instruction in Israel. In addition, the fact that EFL instruction takes place on an average of 3–4 hours per week, as opposed to the total immersion experience of English L1 literacy instruction, may illustrate that this is simply not enough exposure to facilitate the construction of accurate phonological and orthographic word-level representations.

Difficulties with the graphemic representation of consonant clusters were only found amongst the poor spellers in the fifth grade. In English L1 spelling research, there have been mixed findings. Whereas Bruck and Treiman (1990) found that children with dyslexia had more difficulties than normally developing children with the spelling of initial consonant clusters, Cassar et al. (2005) found that both first-grade typically developing and older dyslexic learners exhibited difficulties in spelling consonant clusters. Difficulties with the representation of consonant clusters in spelling were also found amongst Dutch poor spellers (Van Bon & Uit De Haag, 1997). The current study found that the spelling of consonant clusters was particularly difficult for the poor spellers in the fifth grade. In general, we did not find consonant clusters to be a problematic orthographic pattern, possibly because it is the linguistic concept of two consecutive consonant sounds being
represented by two separate graphemes that is initially challenging, and once this concept has been mastered, it is easily transferred across language-learning experiences. This trend was also found in a study by Kahn-Horwitz et al. (2011), where fifth-grade Russian–Hebrew-speaking children who could read in Russian and Hebrew, as well as Russian–Hebrew-speaking and Hebrew-speaking children who could only read in Hebrew, did not demonstrate difficulties in spelling consonant clusters.

Initial h was included as a target non-novel phoneme because Hebrew speakers often omit its pronunciation when it appears in a word initial position in English. Therefore, we were interested to see whether there would be difficulties with the representation of this phoneme in EFL spelling. Representation of initial h only differed between good and poor spellers in the fifth grade. All other spellers scored close to ceiling on the spelling of this phoneme. This indicates that although native Hebrew speakers may omit this phoneme in word initial position in English oral language production, they do represent it in English spelling.

It is noteworthy that the scores for the non-novel /æ/ sound were not higher than scores for some of the novel phonemes. In other words, the fact that this phoneme is familiar to the native Hebrew-speaking pupils does not guarantee that they will represent it accurately in the EFL context. Despite the fact that this is considered a familiar phoneme from the L1 inventory, there are two confounding issues to consider. Firstly, the idea of equal orthographic representation of vowels and consonants is not to be taken for granted for these EFL learners as their experience in Hebrew is that the vowels appear fully represented in initial grades and then are gradually dispensed with. Secondly, because of phonemic proximity with other short vowel sounds in English, the choice of which grapheme to use may present a challenge.

Correct spelling of the /Λ/ sound proved to be the most challenging of all novel phonemes examined in the present study. Even the good spellers did not score much higher than 60% accuracy across grades. In the case of EFL instruction in Israel, inaccurate and incorrect pronunciation may explain these difficulties. Many EFL teachers pronounce the /æ/ as /Λ/. Further, Hebrew names written in English that contain the /Λ/ are graphemically represented as ‘a’, for example, Tel Aviv. This graphemic misrepresentation could further hinder the already poor phonological representation of the /Λ/, leading to incorrect spelling.

Higher scores for the /ð/ as opposed to the /θ/ sound could possibly attest to the salience of the voicing feature (Jaeger, 1992; Maassen, Groenen, Crul, Assman-Hulsmans & Gabreëls, 2001) so that, despite the fact that these targets are novel both phonologically and orthographically, the voiced target proved to be easier to spell.

The impact of underlying Hebrew L1 abilities and English underlying abilities on EFL spelling

Finally, the present study investigated the connection between Hebrew L1 underlying linguistic and literacy abilities and EFL spelling across grades. Hebrew spelling was found to be a strong predictor of EFL real-word and pseudoword spellings in both fifth and eighth grades. This may point to common underlying linguistic components for spelling in these two completely different orthographies. This finding provides support for the Linguistic Coding Differences Hypothesis. Further support comes from a longitudinal study that showed that Hebrew L1 spelling combined with Hebrew word attack tested at the end of the
fourth grade explained EFL spelling at the end of the ninth grade (Kahn-Horwitz et al., 2012). In addition to the finding that Hebrew spelling predicted EFL spelling, findings of the present study highlight the significant contribution of L1 phonological components to EFL spelling across grades. Here, Hebrew phonological choice was also found to predict EFL real-word spelling in the fifth and 10th grades, thereby supporting earlier cross-linguistic studies showing phonological predictors of L2 literacy skills, specifically reading (Comeau, Cormier, Grandmaison & Lacroix, 1999; Kahn-Horwitz et al., 2005). The current study expands the scope of the cross-linguistic influence of phonological knowledge measured in L1 to include EFL spelling.

The absence of Hebrew orthographic knowledge as a predictor of EFL real-word and pseudoword spellings across grades is noteworthy, in that it indicates a strongly language-specific component to spelling development in EFL. In other words, English orthographic measures supersede the Hebrew orthographic measure in predicting EFL spelling. This was evident by the finding that for real-word spelling, English orthographic word choice contributed significant variance over and above Hebrew spelling and phonological choice. Thus, we see language-general as well as language-specific contributors to accurate EFL spelling. Hebrew phonological choice contributed language-general knowledge to EFL spelling, whereas English orthographic choice contributed language-specific knowledge.

Conclusions and educational implications

In conclusion, it appears that exposure and practice with the English orthography does not necessarily lead to more accurate EFL spelling amongst all L1 Hebrew-speaking pupils. It is possible that the amount of exposure and practice that the good spellers get with the English orthography allows them to reach an orthographic accuracy threshold by the eighth grade and that for them to continue to improve their accuracy levels in spelling, they would need direct and explicit instruction regarding novel orthographic patterns and conventions. On the other hand, the continued improvement in spelling amongst the poor spellers might be due to the extra years of exposure to the English orthography. However, the gap in spelling accuracy levels remains significant between the good and poor spellers across grades. It is possible that explicit spelling instruction would benefit the poor speller group as well. Carefully designed intervention studies focusing on explicit spelling instruction could shed light on this question.

A second conclusion is that poor EFL spellers show a disadvantage early on in their FL learning experience. In all probability, these linguistic differences would be evident in the L1 learner performance profiles as well (Kahn-Horwitz, Shimron & Sparks, 2006). For assessment purposes, it would be advantageous to include the specific novel and non-novel phonemes and orthographic patterns that were found to distinguish between good and poor spellers in the fifth grade, namely initial h, consonant clusters and /ð/. Further, as these specific phoneme–grapheme patterns, in addition to the others tested, proved to be challenging, it is highly recommended to focus on these target items through the use of a language teaching programme that is both direct and explicit.

Finally, this study highlights the complex nature of EFL spelling, which develops in an asynchronous manner. Accurate phoneme–grapheme correspondence knowledge occurs at different rates and reaches different levels of accuracy at different grades, and in relation to different ability levels, despite the uniform nature of the EFL language instruction provided.
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References


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Appendix

Words from experimental word spelling task: name, went, three, because, found, hand, south, this, help, had, with, just, our, want, about, that, left, but, people, house, does, time, question, them, home, like, best, school.


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