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# Revisiting the home literacy model of reading development in an orthographically consistent language

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**Abstract**

We examined the applicability of the Home Literacy Model in an orthographically transparent language (Greek). Seventy Greek children were followed from kindergarten until grade 4. In kindergarten they were tested in non-verbal intelligence, vocabulary, phonological sensitivity, rapid naming, and letter knowledge. The parents of the children also responded on a questionnaire regarding the frequency of storybook reading, the number of books at home, and the frequency of teaching letter names, sounds, and words. Reading fluency and comprehension were measured in grade 4. The results indicated that the early home literacy experience variables were related to the emergent literacy skills but did not directly predict future reading skills. Thus, the Home Literacy Model applies to consistent orthographies before any formal reading instruction takes place.


*Keywords:* Home literacy model; Emergent literacy; Reading fluency; Comprehension; Orthographically consistent languages

Several studies have shown that the home literacy environment (HLE) is important for reading development (e.g., Frijters, Barron, & Brunello, 2000; Hood, Conlon, & Andrews, 2008; Sénéchal, LeFevre, Thomas, & Daley, 1998; Weigel, Martin, & Bennett, 2006; Whitehurst & Lonigan, 1998). However, the evidence is primarily from studies with children learning to read English, an orthographically inconsistent language. The purpose of this study was to examine the applicability of the Home Literacy (HL) model (Sénéchal, 2006) of reading development to an orthographically consistent language (Greek).

## 1. Home literacy environment and reading development

HLE is an umbrella concept that captures a variety of child–parent activities related to literacy (e.g., Burgess, 2002). The best-known HLE variable is the frequency of a parent reading books to his/her child, most often called either *shared book reading* or (*story*)*book exposure*. Although the effects of shared book reading on reading development have been challenged (e.g., Bus, van IJzendoorn, & Pellegrini, 1995; Phillips, Norris, & Anderson, 2008; Scarborough & Dobrich, 1994), there is evidence showing that preschool shared book reading enhances vocabulary (e.g., Aram & Biron, 2004; Frijters et al., 2000; Sénéchal & LeFevre, 2002; Torppa et al., 2007; Weigel et al., 2006), which, in turn, facilitates reading comprehension (e.g., Roth, Speece, & Cooper, 2002; Sénéchal, 2006).

Other aspects of HLE, such as informal teaching activities of reading words, letters, or printing a child's name, seem to be associated more directly with phonological sensitivity (Foy & Mann, 2003), letter knowledge (Evans, Shaw, & Bell, 2000), and early reading skills (Sénéchal & LeFevre, 2002) in studies with English-speaking children. However, these parent teaching activities have not been shown to be as effective in promoting early literacy in orthographically more consistent languages (e.g., Sénéchal, 2006; van Steensel, 2006).

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## 2. The home literacy model

One of the models explaining the role of HLE on reading development is the Home Literacy (HL) model proposed by Sénéchal and her colleagues (Sénéchal, 2006; Sénéchal & LeFevre, 2002; Sénéchal et al., 1998). According to the HL model, children's home experiences with print can be divided into two different and independent types of literacy experiences, the informal and the formal (Sénéchal et al., 1998). Informal literacy experiences are those that expose children to print incidentally through activities such as storybook reading by parents. In turn, formal literacy experiences are those that engage children directly with print through activities such as teaching letters, reading words, or teaching to print their name.

The HL model makes specific predictions on the relation of both literacy experiences on reading development. First, the informal literacy experiences are assumed to promote language skills (vocabulary), while the formal literacy activities are assumed to promote the development of early reading skills, such as letter knowledge and word reading skills. In addition, neither the informal nor the formal literacy experiences are expected to directly influence phonological sensitivity. Instead, the relationship with phonological sensitivity is indirect through the effects of letter knowledge and vocabulary. Presumably, emergent literacy skills help children to understand that the individual words are formed by the individual sounds. In turn, vocabulary contributes to the development of accurate representations of the phonological structure of words (e.g., Torppa et al., 2007; Walley, Metsala, & Garlock, 2003). Studies conducted by Sénéchal and her colleagues have generally corroborated these predictions. For example, Sénéchal and LeFevre (2002) found that a composite measure of language comprehension was predicted significantly by storybook exposure, while parents' reports of teaching letters and words predicted emergent literacy skills such as print concepts, letter knowledge, invented spelling, and decoding of simple words.

Second, the informal literacy experiences are assumed to contribute indirectly to reading skills in later grades through their relation to early language skills. In contrast, the formal literacy experiences are assumed to contribute indirectly to reading skills in later grades through the effects of emergent literacy skills. Again, studies conducted by Sénéchal and her colleagues provide evidence in support of their hypotheses. For example, the informal literacy experiences have been found to contribute to reading comprehension in grade 3 (Sénéchal & LeFevre, 2002) and grade 4 (Sénéchal, 2006), and their effect was mediated by receptive language skills in kindergarten. Formal literacy experiences have also been found to predict indirectly reading skills in grade 1 through kindergarten emergent literacy skills (Sénéchal, 2006; Sénéchal & LeFevre, 2002; see also Stephenson, Parrila, Georgiou, & Kirby, 2008).

There is, however, evidence contradicting the predictions made by the HL model. For example, some studies have shown that HLE aspects are associated with phoneme awareness (e.g., Manolitsis, Georgiou, Stephenson, & Parrila, 2009 Foy & Mann, 2003) and that storybook exposure is not necessarily significantly associated with vocabulary in kindergarten (e.g., Evans et al., 2000; Stephenson et al., 2008). Moreover, in some studies aspects of formal literacy experiences have been found to be directly associated with reading comprehension (e.g., van Steensel, 2006).

The studies that have found support for the predictions of the HL model mostly did not control for the effects of several other known predictors of reading development. Hood et al. (2008), for example, demonstrated that the inclusion of nonverbal ability and verbal short-term memory measures in kindergarten resulted in negligible effects of home literacy measures on literacy outcomes. Rapid naming speed, defined as the ability to name as fast as possible highly familiar symbols, such as colors, objects, digits, and letters, has also been missing from studies examining the HL model. The inclusion of RAN is important for at least two reasons. First, it is known to be the best predictor of reading ability in orthographically consistent languages (e.g., *Italian*: Di Filippo et al., 2005; *Greek*: Georgiou, Parrila, & Papadopoulos, 2008; *Dutch*: de Jong & van der Leij, 1999; *German*: Landerl & Wimmer, 2008). Thus, controlling for its effects would provide a conservative test of the contribution of HLE activities on reading. Second, HLE typically represents environmental influence and its effects can be expected to vary as a function of amount and quality. On the other hand, RAN is, to a large extent, genetically determined (Petrill et al., 2010) and its eventual openness for training is very uncertain (de Jong & Vrielink, 2004). Thus, theoretically, controlling for RAN should not influence the relationship between home literacy practices and reading.

In addition, studies examining the HL model have been conducted mostly with Canadian children from middle- to upper–middle SES families, as indexed by the parental educational level. We expect parental educational level to covary with the amount and quality of home literacy activities (e.g., Kirby & Hogan, 2008; Korat, Klein, & Segal-Drori, 2007). Payne, Whitehurst, and Angell (1994) showed that controlling for caregiver's IQ and educational level reduced the association between storybook exposure and preschoolers' vocabulary skills. van Steensel (2006) also reported that controlling for mother's educational level diminished the effects of storybook exposure to phonological sensitivity in kindergarten and to word decoding and spelling in grades 1 and 2. Taken together, it is possible that the relationships described by the HL model may not hold when there is greater variation in parental educational level or when the effects of parental educational level are controlled.

## 3. The present study

The objective of this study was to examine the applicability of the Home Literacy Model in an orthographically transparent language (Greek). It is an extension of our previous study in which we examined the contribution of cognitive (letter knowledge and phonological sensitivity) and noncognitive (HLE and task-focused behavior) factors – assessed in kindergarten – on reading in English and Greek in grades 1

and 2 (Manolitsis et al., 2009). The results indicated that home literacy was a stronger predictor of reading (fluency and accuracy) in English than in Greek. We extend that study in four important ways. First, this study includes the measures (i.e., rapid naming, initial sound identification) that were not used by Manolitsis et al. (2009) because they did not fit the purpose of that study or because they were not comparable across the two languages and, thus, had to be omitted. The inclusion of these measures is important because rapid naming is considered to be the best predictor of reading in consistent orthographies (e.g., Di Filippo et al., 2005; Georgiou et al., 2008; Landerl & Wimmer, 2008) and initial phoneme identification is expected to be a more age-appropriate phonological sensitivity task than elision or blending, which often show floor effects in kindergarten (e.g., Manolitsis & Tafa, in press; Papadopoulos, Spanoudis, & Kendeou, 2009). Second, we have followed the same children until grade 4. This is important because the developmental span is now exactly the same as in Sénéchal's (2006) study, which allows us to draw direct comparisons. Third, in our previous study vocabulary was used as a control variable and not as a dependent variable. As a result, this prediction of the HL model was not directly tested. Finally, in our previous study we treated frequency of parent–child reading and number of books separately. In this study, they are integral parts of the storybook exposure construct, in line with Sénéchal's (2006) HL model.

To date, the HL model has been tested only in English (Sénéchal & LeFevre, 2002) and in French (Sénéchal, 2006). Although French is more consistent than English, neither is nearly as consistent nor as most other European orthographies, such as Finnish or Greek (Seymour, Aro, & Erskine, 2003). Protopapas and Vlachou (2009) reported that the consistency of Greek orthography at the grapheme–phoneme level is 95.1%. All Greek words are phonologically transparent, which means that they can be read aloud using the grapheme–phoneme correspondence rules. In order to provide a comparable measure of difference across the orthographies at hand we report the entropy values for the initial letter-sound mappings in each language. If a given grapheme maps unambiguously to a specific phoneme, the mapping is absolutely certain and the entropy value is zero (the higher the entropy value the more inconsistent the orthography). Protopapas and Vlachou (2009) reported the entropy value for Greek to be 0.19. In turn, Ziegler et al. (2010) reported the entropy value for French and English to be 0.46 and 0.83, respectively. Thus, Greek is much more consistent than either French or English.

There are several reasons to expect differences in the effects of home literacy activities across languages varying in orthographic consistency. Because learning to read English is so difficult (Seymour et al., 2003), parents of English-speaking children are often concerned that their children will struggle in reading (and in many cases they are correct). In response, they invest a considerable amount of effort at home to supplement, anticipate, and extend school instruction in reading (Audet, Evans, Williamson, & Reynolds, 2008). This is less common in consistent orthographies (Leseman & de Jong, 1998; van Steensel, 2006). Why would parents bother teaching something that the school will successfully teach in six months or less? The differences in the home literacy practices across languages have recently been documented by Manolitsis et al. (2009) who found that Canadian parents reported having more children's books at home, reading more frequently to their children, and teaching them more frequently to identify letters than Greek parents.

Differences in the method of formal reading instruction would also lead us to expect differences in the effects of home literacy activities on reading across languages. In consistent orthographies, children are often taught reading with the phonics approach which places emphasis on the connections between the letters and their sounds. Because of the systematic phonics instruction children master word decoding well before the end of the first grade irrespective of their home literacy background (e.g., Porpodas, 2006; Tafa & Manolitsis, 2008). In addition, if we accept that the effects of home literacy environment on later reading are mediated by the emergent literacy skills (one of the assumptions of the HL model), then these effects would be short-lived in consistent orthographies (at least when phonological awareness is the mediating variable). Several researchers have argued, for example, that the effects of phonological awareness on reading in consistent orthographies are limited to the first one or two years of schooling (e.g., Georgiou et al., 2008; de Jong & van der Leij, 1999; Papadopoulos, Georgiou, & Kendeou, 2009; Verhagen, Aarnoutse, & van Leeuwe, 2008). Therefore, if home literacy practices influence reading through phonological awareness, then their effects will be time limited as well.

The rationale provided for the expected differences on the applicability of the HL model in consistent orthographies have primarily focused on the connection between the home literacy practices and future reading, but not necessarily on the structure of the HL model or its connections to emergent literacy skills. Thus, in line with the first assumption of the HL model (e.g., Sénéchal, 2006; Sénéchal & LeFevre, 2002) we hypothesized that:

(1) Formal literacy practices (parent teaching) and informal literacy practices (storybook exposure) will not be related to each other,
(2) Storybook exposure will predict vocabulary and parent teaching will predict letter knowledge,
(3) Both types of literacy activities will indirectly predict phonological sensitivity through their effect on vocabulary and letter knowledge, and
(4) Neither of the home literacy activities will directly predict reading fluency or comprehension in grade 4 as prior research has shown only indirect relationships with these measures.

## 4. Method

### 4.1. Participants

Ninety-five Greek kindergarten children (50 males and 45 females; Mean age = 67.01 months, SD = 2.93, at the first

time of measurement) from Rethymno, Crete, participated initially in the study. No students were excluded on the basis of linguistic or other grounds. All the participating children were native speakers of Greek, Caucasian, and 65 percent had attended preschool. By Grade 4 the sample consisted of 70 children. Twenty-five children (26.3% of the initial sample) withdrew from the study. The attrition rate is similar to ones reported in previous longitudinal studies (e.g., Sénéchal, 2006; Whitehurst & Lonigan, 1998) and is due to the fact that the children and their families moved to a different district and could not be located ($n = 10$) or to withdrawal of parental consent ($n = 15$). In order to examine if the performance of the children who withdrew from the study differed significantly from the rest of the children, we performed $t$ tests on their kindergarten performance scores and on the HLE scores. None of the $t$ tests reached significance (all $p$s $> 0.11$; all Cohen's $d < 0.28$). In addition, no statistically significant differences were found in parent educational level. Thus, all the data analyses were performed with the 70 children for whom a full data set was available across time.

### 4.2. Kindergarten measures

#### 4.2.1. General cognitive ability

*4.2.1.1. Nonverbal cognitive ability.* Coloured Progressive Matrices (Raven, 1956) were used as a measure of non-verbal intelligence. The task consisted of three sets (Sets A, Ab, and B) and required the participants to select one of the provided options to fill out a pattern. Each set contained 12 items and a participant's score was the total items correct on all three sets. Cronbach's alpha reliability coefficient in our sample was 0.82.

*4.2.1.2. Vocabulary.* The Peabody Picture Vocabulary Test-Third Edition (PPVT-IIIA; Dunn & Dunn, 1997) was adapted in Greek and was used as a measure of receptive vocabulary. For the Greek adaptation we used the original picture templates, but we altered the order of appearance of some items or the target word in some templates. The changes (total of six) took place in the last three sets of items. These changes were made mainly to address differences in the difficulty that certain words pose in each language. Participants were shown four pictures and the examiner said a word to describe one of the four pictures. The participant was required to point to the correct picture for the word given by the examiner. Items were administered in 17 sets of 12 and ordered in terms of difficulty. Testing was discontinued after eight or more errors within the highest set of items administered. Participants' score was the number of correct items. Cronbach's alpha reliability coefficient in our sample was 0.92.

#### 4.2.2. Phonological sensitivity

*4.2.2.1. Elision.* There were three practice items and 29 test items: four test items were two syllable words and required the participant to say the word without saying one of the syllables, and the remaining 25 items required the participant to say a word without saying a designated sound in the word. The position of the phoneme to be removed varied across those 25 items. Testing was discontinued after three consecutive errors. A participant's score was the number of correct items. Cronbach's alpha reliability coefficient in our sample was 0.94.

*4.2.2.2. Blending.* This task required the examinee to listen to a series of separate sounds and then put the separate sounds together to make a whole word. There were five practice items and 20 test items: three test items required the participant to put together two syllables to make a word, five test items required the participant to put an onset and a rime together to make a word, and the remaining 12 items required the participant to put individual sounds together to make a word. The number of phonemes to be blended varied from 2 to 10. Testing was discontinued after three consecutive errors and a participant's score was the number of correct items. Cronbach's alpha reliability coefficient in our sample was 0.91.

*4.2.2.3. Initial sound identification.* This task was adapted from the one developed by Wallach, Wallach, Dozier, and Kaplan (1977). Children were provided with a stimulus word (e.g.,/kota/ → chicken) and were asked to choose one of three words that alliterates with it (e.g.,/γata/,/molivi/,/kalaθi/ → cat, pencil, basket). The words were presented in pictures. Ten items were given to the children, following two practice items. Cronbach's alpha reliability coefficient in our sample was 0.68.

#### 4.2.3. Letter knowledge

*4.2.3.1. Letter-name knowledge.* The participants were asked to name each of the 24 upper and lowercase Greek letters. The letters were arranged randomly on an A4 paper. The maximum score was 48. Cronbach's alpha reliability coefficient in our sample was 0.95.

*4.2.3.2. Letter-sound knowledge.* The participants were asked to provide the sound of each uppercase letter presented in random order on a laptop screen. The maximum score was 24. Cronbach's alpha reliability coefficient in our sample was 0.95.

#### 4.2.4. Home literacy

Home literacy was assessed with five Likert-scale questions adapted from Stephenson et al. (2008) which were taken in turn from Kirby and Hogan (2008). Parents were asked (1) how often their child was taught to identify letters; (2) how often their child was taught letter sounds; and (3) how often their child was taught to read words when the child was 2–4 years of age. In addition, they were asked (4) how often their child is read to at home, and (5) how many children's books are in the home. For questions one to four, the six-point Likert-scale ranged from *never* to *more than once a day*. For question five, the Likert-scale ranged from *less than 10* to *more than*

*200*. Finally, the parents were asked to select their highest achieved educational level among five options (completed elementary school, completed junior high school, completed high school, completed college, completed university).

#### 4.2.5. Rapid naming speed

*4.2.5.1. Color naming*. Color naming task was adapted in Greek from the RAN/RAS test battery (Wolf & Denckla, 2005) and required participants to state as quickly as possible the names of five colors (blue, black, green, red, or yellow). The colors were presented on a laptop computer screen (as opposed to the traditional presentation on a card in the RAN/RAS test battery) and arranged randomly in five rows of ten. The total time to name all 50 stimuli was recorded and was used as the participants score. Prior to beginning the timed naming, each participant was asked to name the colors in a practice trial to ensure familiarity. The corresponding names of colors in Greek are "μπλε" (*/ble/*) for blue, "μαύρο" (*/mavro/*) for black, "πράσινο" (*/prasino/*) for green, "κόκκινο" (*/kokino/*) for red, and "κίτρινο" (*/kitrino/*) for yellow. Because only few naming errors occurred they were not considered further. Wolf and Denckla (2005) reported test–retest reliability for Color Naming to be 0.90.

*4.2.5.2. Object naming*. Object naming task was adapted in Greek from CTOPP (Wagner, Torgesen, & Rashotte, 1999). Participants were required to state as quickly as possible the names of six objects (ball, cat, tree, chicken, key, and apple) that were displayed on a laptop computer screen (as opposed to the traditional presentation on a card in CTOPP) in random sequence six times for a total of 36 stimuli. We replaced the original stimuli in CTOPP with items that had short names in Greek. The total time to name all 36 stimuli was recorded and was used as the participants score. Prior to beginning the timed naming, each participant was asked to name the objects to ensure familiarity. The corresponding names of objects in Greek are "μπάλα" (/bala/) for ball, "γάτα" (/γata/) for cat, "δέντρο" (/ðedro/) for tree, "κότα" (/kota/) for chicken, "κλειδί" (/kliði/) for key, and "μήλο (/milo/) for apple. Because only few naming errors occurred they were not considered further. Wagner et al. (1999) reported test–retest reliability of 0.77 for Object Naming for children ages five to seven.

### 4.3. Grade 4 measures

#### 4.3.1. Reading fluency

Reading fluency was assessed with two measures: a word-reading fluency task and a non-word reading fluency task. Both measures were developed in Greek following the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999). In the word-reading fluency task, the children were asked to read as fast as possible a list of 104 words increasing in difficulty, divided into four columns of 26 words each. The words were selected from the children's grade 1 to 6 language textbooks. In the non-word reading fluency task, the children were asked to read as fast as possible a list of 63 non-words increasing in difficulty. The non-words were developed by substituting letters in real words with some others or by sweeping the position of existing letters in words. A short, 8-word/non-word practice list was presented before each subtest. In each task, children's score was the number of correct words/non-words read within a 45-s time limit.

#### 4.3.2. Reading comprehension

Reading comprehension was assessed with two cloze-based measures. The first task was an adaptation of Woodcock's (1998) reading comprehension task and required the children to read 68 sentences or short passages missing a word that was important to the meaning of the sentence or passage. The children were asked to supply the missing word that fitted the meaning of each sentence or passage. The task was discontinued after four consecutive mistakes. The individual's score was the total number of correct responses. Cronbach's alpha reliability coefficient (excluding the items that were not administered) in our sample was 0.85. The second task was adopted from Triga (2004). This is a standardized reading comprehension task in Greek. The children were asked to read 42 short sentences or short passages missing a word and then select the appropriate word to complete the meaning from five alternatives. The child's score was the number of correctly selected answers. Cronbach's alpha reliability coefficient in our sample was 0.80.

### 4.4. Procedure

In the middle of the kindergarten year, parents completed the home literacy questionnaire and children were administered measures of general cognitive ability (Raven's Matrices, PPVT-IIIA), phonological sensitivity (Phoneme Elision, Phoneme Blending, and Initial Sound Identification), letter knowledge, and rapid naming (RAN Colors and RAN-Objects). The literacy outcomes of reading fluency and reading comprehension were all administered in grade 4. All participants were tested individually in their respective schools during school hours by trained experimenters. In kindergarten, testing lasted roughly an hour. In grade 4, testing lasted roughly 40 min. Parent's written consent for each child was obtained prior to testing.

## 5. Results

Descriptive statistics for all the measures used in the study are shown in Table 1. An initial examination of the distributional properties of the variables revealed some problems. First, the rapid naming tasks were positively skewed (read below how we handled this issue). Second, as was expected (see Manolitsis & Tafa, in press; Tafa & Manolitsis, 2008), the performance on Letter Name Knowledge was very low. In contrast, the performance on Letter Sound Knowledge was significantly higher ($t$ (91) = 4.98, $p < 0.001$), a finding that reflects the common practice of teaching letter sounds instead of letter names in kindergarten in Greece. Third, floor effects were noted for Elision and Blending. Because the

Table 1
Descriptive statistics.

| | Kindergarten | | Grade 4 | |
|---|---|---|---|---|
| | *M* | SD | *M* | SD |
| Number of children books[a] | 3.15 | 0.99 | | |
| Frequency of reading to child[b] | 3.60 | 0.86 | | |
| Teach to identify letters[b] | 2.40 | 1.24 | | |
| Teach letter sounds[b] | 2.46 | 1.24 | | |
| Teach to read words[b] | 1.68 | 1.47 | | |
| Raven's (max. 36) | 15.56 | 3.13 | | |
| Vocabulary (max. 180) | 96.35 | 25.63 | | |
| Deletion (max. 29) | 3.50 | 5.42 | | |
| Blending (max. 20) | 3.87 | 3.17 | | |
| ISI (max. 10) | 7.22 | 2.54 | | |
| RAN-Colors | 88.64 | 29.11 | | |
| RAN-Objects | 59.49 | 15.38 | | |
| Letter-sound knowledge | 12.85 | 7.93 | | |
| Letter-name knowledge | 7.53 | 11.63 | | |
| WRE (max. 104) | | | 58.14 | 13.08 |
| PDE (max. 63) | | | 38.80 | 7.82 |
| RC Triga (max. 42) | | | 16.71 | 6.40 |
| RC Woodcock (max. 68) | | | 35.37 | 9.89 |

*Note*. ISI = Initial Sound Identification; RAN = Rapid Automatized Naming; WRE = Word Reading Efficiency; PDE = Phonemic Decoding Efficiency; RC = Reading Comprehension.

[a] 1 = less than 10; 2 = 10–24; 3 = 25–99; 4 = 100–199; 5 = more than 200.

[b] 0 = never; 1 = less than once a month; 2 = A few times a month; 3 = A few times a week; 4 = about once a day; 5 = more than once a day.

transformations did not improve the distribution, we used the raw scores in further analyses.

Parents reported that they read frequently to their children, while they taught less frequently letters or reading words[1] (see Table 1). Parental educational level was as follows: 7.3% of the mothers had attended only elementary school, 7.3% had attended only junior high school, 31.7% had obtained a high school degree, 20.7% had obtained a college degree, and 33% had obtained a university degree. In turn, 12.2% of the fathers had attended only elementary school, 22.0% had attended only junior high school, 29.3% had obtained a high school degree, 15.9% had obtained college degree, and 20.6% had obtained a university degree[2].

Similar to our previous study (Manolitsis et al., 2009) we used composite scores for phonological sensitivity, rapid naming, letter knowledge, reading fluency, and comprehension. We derived the composite scores for phonological sensitivity and rapid naming (RAN) speed by averaging the *z* scores of the independent measures for each construct (for phonological sensitivity we averaged the *z* scores of Blending, Elision, and Initial Phoneme Identification and for RAN we averaged the *z* scores of RAN color and RAN objects). Similarly, we derived composite scores for reading fluency and reading comprehension by averaging the *z* scores of the two reading fluency tests and the two reading comprehension tests respectively.

The home literacy measures were summarized in two composite variables following Sénéchal's (2006) categorization. Principal component analyses with oblique rotation on all five responses of the parents' questionnaire revealed a two factor solution with eigenvalues above 1: the responses on the question about children's books at home and the question about how frequently parents read to their child loaded on one factor, and the responses on the other three questions loaded on the second factor (see Table 2). Following Sénéchal's (2006) protocol the first factor was called storybook exposure and represents the informal home literacy activities, and the second factor was called parent teaching and represents the formal home literacy activities. Parent teaching correlated ($r = 0.19$) with storybook exposure (Hypothesis 1).

Table 3 displays the zero-order correlations between the variables used in the study. Preschool attendance (dummy coded variable: 1 = attended preschool and 0 = not attended preschool) did not correlate significantly with any of the measures and was left out from further analyses. Parent teaching did not correlate significantly with vocabulary and letter knowledge in kindergarten or literacy skills in grade 4. However, it correlated negatively with phonological sensitivity. Storybook exposure correlated significantly with vocabulary in kindergarten and comprehension in grade 4, but not with reading fluency. Vocabulary, in turn, correlated significantly with reading comprehension, but not with reading fluency. Emergent literacy skills in kindergarten correlated with parental education and non-verbal ability. Reading fluency was related only to rapid naming; the latter correlated also significantly with reading comprehension. Finally, reading comprehension was related to parental education and non-verbal ability.

### 5.1. Prediction of emergent literacy and literacy skills

Next, in order to examine the predictions made by the HL model, we performed two sets of hierarchical regression analyses. In the first set of analyses, we replicated the order in which the independent variables were entered in the regression analyses in Sénéchal's (2006) study. Specifically, when

[1] The frequency of storybook reading and the frequency of teaching letters and words are lower than the ones reported in Stephenson et al.'s (2008) and Sénéchal's (2006) study. Bruck, Genesee, and Caravolas (1997) reported no significant differences between English- and French-speaking children on shared book reading in kindergarten. This may partly explain why the HL model could be applied in French without any deviations from the English model.

[2] Parent educational level in this study is lower than in Sénéchal's (2006) study. Specifically, Sénéchal (2006) reported that, on average, 43% of her sample obtained university-level education, 40% pursued college studies, and 17% completed high school only.

Table 2
Factor loadings from principal components analysis with oblimin rotation of the home literacy questionnaire.

| | Factor 1 (Parent teaching) | Factor 2 (Storybook exposure) |
|---|---|---|
| Number of children books | 0.06 | 0.83 |
| Frequency of reading to child | 0.20 | 0.62 |
| Teach to identify letters | 0.93 | 0.06 |
| Teach letter sounds | 0.92 | 0.15 |
| Teach to read words | 0.86 | 0.06 |

Table 3
Zero-order correlations between home literacy and child cognitive variables with language/literacy variables.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.PAT | | −0.06 | −0.09 | −0.07 | −0.02 | 0.11 | −0.20 | −0.12 | −0.08 | −0.12 | −0.02 |
| 2.PAREDU | | | −0.11 | 0.35** | 0.37** | 0.43** | −0.14 | 0.52** | 0.41** | 0.24* | 0.44** |
| 3.Parent teaching | | | | 0.13 | −0.02 | −0.05 | −0.06 | −0.17 | 0.18 | 0.00 | −0.15 |
| 4.Storybook exposure | | | | | 0.15 | 0.38** | −0.16 | 0.18 | 0.16 | 0.07 | 0.28* |
| 5.Raven's_K | | | | | | 0.31* | −0.17 | 0.53** | 0.49** | 0.23 | 0.59** |
| 6.Vocabulary_K | | | | | | | −0.02 | 0.20 | 0.22 | 0.13 | 0.50** |
| 7.RAN_K | | | | | | | | −0.31* | −0.23 | −0.53** | −0.27* |
| 8.PS_K | | | | | | | | | 0.49** | 0.19 | 0.40** |
| 9.LK_K | | | | | | | | | | 0.25* | 0.43** |
| 10.Fluency G4 | | | | | | | | | | | 0.45** |
| 11.Comprehension G4 | | | | | | | | | | | |

*Note*. PAT = Preschool Attendance; PAREDU = Parent Education; RAN = Rapid Automatized Naming; PS = Phonological Sensitivity; LK = Letter Knowledge; *K* = Kindergarten; G4 = Grade 4.
*$p < 0.05$, **$p < 0.01$. $N = 70$.

vocabulary was the dependent variable, phonological sensitivity and letter knowledge were used as control variables. When letter knowledge was the dependent variable, parent education, vocabulary, and phonological sensitivity were used as control variables. Finally, when phonological sensitivity was the dependent variable, parent education, vocabulary and letter knowledge were used as control variables. This allows us to examine if the findings reported in Sénéchal's (2006) study can be replicated in Greek. In those instances where the home literacy variables predicted significantly the outcome literacy variables, a second set of analyses was performed. In this second set, we included non-verbal ability (Raven's raw scores) or RAN as additional control variables before testing for the effects of storybook exposure and parent teaching on literacy development. Table 4 presents the results with vocabulary, letter knowledge, and phonological sensitivity in kindergarten as dependent variables. Table 5 presents the results with reading fluency and reading comprehension in grade 4 as dependent variables. Standardized beta coefficients from the specific step in which the variable was entered in the regression equation and $R^2$ changes are presented in all tables.

Model 1 in Table 4 indicates that vocabulary was predicted by storybook exposure and not by parent teaching (Hypothesis 2). However, controlling for parental education (Model 1.2) limited substantially the predictive value of storybook exposure, which is in line with Sénéchal's (2006) findings. Because vocabulary was not affected by the HL variables in Model 1.2, we did not perform the third set of multiple regression analyses with Raven's and RAN as additional control variables.

Parent teaching accounted for 14% of unique variance in letter knowledge (Hypothesis 2) after controlling for the effects of parental education, vocabulary, phonological awareness, and storybook exposure (Model 2.1 in Table 4). This finding is surprising, given the non-significant correlation between parent teaching and letter knowledge (see Table 3) and likely reflects the effect of suppression (Cohen, 1988). In the second set of analyses parent teaching continued to predict significantly letter knowledge beyond the effects of non-verbal ability (Model 2.2 in Table 4) or RAN (see Model 2.3 in Table 4). Similar results were found when phonological sensitivity was the dependent variable (Hypothesis 3). However, the contribution of parent teaching was negative ($\beta = -0.25$). We will return to these results in the discussion.

The results presented in Table 5 indicate that the two home literacy variables did not account for significant variance in the literacy measures assessed in grade 4 (Hypothesis 4). Specifically, in grade 4, reading fluency was not predicted by any of the independent variables, while reading comprehension score was predicted only by parent education.

## 6. Discussion

The present study examined the applicability of the HL model in an orthographically consistent language (Greek). Our findings provided only partial support for the HL model. First, in line with the prediction of the HL model, the two aspects of home literacy environment, storybook exposure and parent teaching, were distinct factors and weakly correlated with each other (Hypothesis 1). A weak correlation between the two home literacy factors has also been reported in previous studies (e.g., Evans et al., 2000; Hood et al., 2008; Sénéchal, 2006). The lack of a significant correlation between the two home literacy factors likely reflects the fact that some parents who read to their children also tutor their children to learn early literacy skills, whereas others do not.

The second prediction that the two home literacy factors would hold distinct associations with children's literacy and language skills in kindergarten was also confirmed in our study (Hypothesis 2). As was expected, vocabulary was predicted by informal literacy experiences (storybook exposure) and letter knowledge was predicted by formal literacy experiences (parent teaching). In contrast to our third hypothesis, phonological sensitivity was directly predicted by parent teaching and the association was negative ($\beta = -0.25$), indicating that more parent teaching of letters and words was associated with lower levels of phonological sensitivity. This result differs from previous findings with English-speaking and French-speaking populations (Evans et al., 2000; Sénéchal, 2006), but is in line with the findings of a recent study conducted in Korean–Hangul, a consistent orthography (Kim, 2009).

Table 4
Hierarchical regression analysis for vocabulary, letter knowledge, and phonological sensitivity in Kindergarten.

| Dependent variable | | | |
|---|---|---|---|
| Predictor's order | $\beta$ | $\Delta R^2$ | $R^2$ |
| Vocabulary | | | |
| *Model 1.1* | | | |
| 1.Phonological sensitivity | 0.31* | 0.09* | 0.09 |
| 2.Letter knowledge | 0.09 | 0.01 | 0.10 |
| 3.Parent teaching | 0.03 | 0.00 | 0.10 |
| 4.Storybook exposure | 0.30 | 0.08* | 0.18 |
| *Model 1.2* | | | |
| 1.Parent education | 0.43** | 0.18** | 0.18 |
| 2.Phonological sensitivity | 0.09 | 0.01 | 0.19 |
| 3.Letter knowledge | −0.02 | 0.00 | 0.19 |
| 4.Storybook exposure | 0.22 | 0.04 | 0.23 |
| Letter knowledge | | | |
| *Model 2.1* | | | |
| 1.Parent education | 0.41** | 0.16** | 0.16 |
| 2.Vocabulary | 0.03 | 0.00 | 0.16 |
| 3.Phonological Sensitivity | 0.58*** | 0.21*** | 0.37 |
| 4.Storybook exposure | 0.03 | 0.00 | 0.37 |
| 5.Parent teaching | 0.38*** | 0.14*** | 0.51 |
| *Model 2.2* | | | |
| 1.Parent education | 0.41** | 0.16** | 0.16 |
| 2.Raven | 0.40** | 0.14** | 0.30 |
| 3.Vocabulary | −0.04 | 0.00 | 0.30 |
| 4.Phonological sensitivity | 0.46** | 0.10** | 0.40 |
| 5.Parent teaching | 0.37** | 0.13** | 0.53 |
| *Model 2.3* | | | |
| 1.Parent education | 0.41** | 0.16** | 0.16 |
| 2.RAN | 0.14 | 0.02 | 0.18 |
| 3.Vocabulary | −0.04 | 0.00 | 0.18 |
| 4.Phonological sensitivity | 0.59*** | 0.19*** | 0.37 |
| 5.Parent teaching | 0.38*** | 0.14*** | 0.51 |
| Phonological sensitivity | | | |
| *Model 3.1* | | | |
| 1.Parent education | 0.61*** | 0.36*** | 0.36 |
| 2.Vocabulary | 0.09 | 0.01 | 0.37 |
| 3.Letter knowledge | 0.44*** | 0.16*** | 0.53 |
| 4.Storybook exposure | −0.04 | 0.00 | 0.53 |
| 5.Parent teaching | −0.28** | 0.07** | 0.60 |
| *Model 3.2* | | | |
| 1.Parent Education | 0.61* | 0.36*** | 0.36 |
| 2.Raven | 0.44** | 0.16*** | 0.53 |
| 3.Vocabulary | −0.01 | 0.00 | 0.53 |
| 4.Letter knowledge | 0.31*** | 0.07** | 0.60 |
| 5.Parent teaching | −0.25** | 0.05** | 0.65 |
| *Model 3.3* | | | |
| 1.Parent education | 0.61*** | 0.36*** | 0.36 |
| 2.Vocabulary | 0.07 | 0.01 | 0.37 |
| 3.Letter knowledge | 0.40*** | 0.16*** | 0.53 |
| 4. RAN | −0.19* | 0.04* | 0.57 |
| 5.Parent teaching | −0.27** | 0.06** | 0.63 |

*Note*. K = Kindergarten; RAN = Rapid Automatized Naming.
*$p < 0.05$, **$p < 0.01$.

The negative association between parent teaching and phonological sensitivity may be interpreted as an indication that Greek parents begin to teach print concepts more frequently only when they notice a potential learning difficulty on behalf of their children. When they do not notice any early signs of reading difficulties they follow a low involvement strategy, because of the expectation that their children will eventually master reading. This interpretation appears also to be supported by a negative correlation ($r = -0.26$) between parent expectations about their children's future reading ability (i.e., *How well do you think your child will read in the future*?) and parent teaching (Manolitsis et al., 2009). The parents reported more teaching of letter sounds and letter names when they expected their child to do less well in reading in the future.

Table 5
Hierarchical regression analysis for reading comprehension and reading fluency in grade 4.

| Dependent variable | | | |
|---|---|---|---|
| Predictor's order | $\beta$ | $\Delta R^2$ | $R^2$ |
| *Reading comprehension* | | | |
| 1.Parent education | 0.43** | 0.18** | 0.18 |
| 2.Parent teaching | −0.09 | 0.01 | 0.19 |
| 3.Storybook exposure | 0.16 | 0.02 | 0.21 |
| *Reading fluency* | | | |
| 1.Parent education | 0.23 | 0.05 | 0.05 |
| 2.Parent teaching | 0.02 | 0.00 | 0.05 |
| 3.Storybook exposure | 0.01 | 0.00 | 0.05 |

*Note*. **$p < 0.013$.

A second explanation may be related to the feedback the parents receive from the kindergarten teachers regarding their children's performance. In response to the identified educational needs, the parents may spend more time teaching their children letter sounds, names, and words in order to reach acceptable performance levels in kindergarten. Finally, it is plausible that parents simply "overestimate" their teaching activities in order to avoid the notion that problems are just a consequence of lacking parental engagement.

The present findings also contradicted the HL model prediction in regards to the longitudinal relations between home literacy activities and literacy outcomes. The HL model hypothesizes that both types of home literacy activities predict reading indirectly through the effects of emergent literacy skills (Sénéchal, 2006; Sénéchal & LeFevre, 2002). For mediation to take place the predictors (in this case the types of home literacy activities) should independently predict the outcome variables before controlling for the effects of the intervening/mediating variable. Our results indicated that neither parent teaching nor storybook exposure had a direct effect on reading fluency or comprehension (see Table 5).

Taken together, the findings of the present study suggest that the premises of the HL model as introduced by Sénéchal and her colleagues (Sénéchal, 2006; Sénéchal & LeFevre, 2002) are associated with children's literacy skills in Greek only before any formal reading instruction takes place. From grade 1 onwards, it is possible that the nature of the Greek orthography as well as the systematic phonics instruction act as a protective factor that diminish any advantages that children coming from rich home literacy environments may have obtained in kindergarten. It would be interesting to examine in a future study the possible effects of home literacy activities on reading at the beginning of grade 1 before reading instruction has been given a lot of time to level out any advantages of a rich home literacy environment. Moreover, it

would be interesting to ask parents, perhaps in an interview rather than on a questionnaire, what they do in terms of home literacy teaching and why they are doing it. This would reveal in a more descriptive way their observations, beliefs, and expectations regarding their children's current and future literacy performance.

Although the HL model assumes a unidirectional relationship between parent teaching, storybook exposure, and literacy skills, there is some empirical evidence that the relationship may, in fact, be reciprocal. Kim (2009), for example, demonstrated that children's word and pseudoword reading skills prior to the measurement of home literacy practices were negatively related with parent teaching such that children who had lower reading scores tended to have parents who reported more frequent teaching at home. Similarly, working with Finnish children, Silinskas, Leppänen, Aunola, Parrila, and Nurmi (2010) found that the lower the children's academic performance in reading and mathematics at the beginning of grade 1, the more teaching the parents reported later on. Taken together, the findings of these studies suggest that parents adjust the frequency of their teaching at home depending on the child's literacy achievement. In order to examine a reciprocal relationship between parent teaching and literacy skills, future studies should measure home literacy practices on several occasions over time starting well before formal literacy instruction and continuing into children's literacy acquisition.

Some limitations of the current study are worth mentioning. First, we did not include any reading accuracy measures in the study because, in general, reading accuracy in Greek reaches ceiling after grade 1 (Georgiou et al., 2008; Seymour et al., 2003). Second, only receptive vocabulary knowledge was measured in this study. Future studies should also assess expressive vocabulary knowledge to obtain a more comprehensive evaluation of the role of vocabulary. Third, information on HLE was collected by sending out a self-report questionnaire to the parents. The request to indicate frequency of reading at home, number of books, and frequency of teaching letter sounds and words is subject to a social-desirability bias if parents attach a high value to these aspects of HLE. Fourth, the phonological sensitivity composite score was derived from Elision, Blending, and Initial Sound Identification scores. Because Elision and Blending were affected by floor effects this may have influenced the variability within the composite variable and the relationship of the composite variable with the rest of the measures in the study. Finally, the variability in the performance of letter knowledge and phonological sensitivity suggests that there were possibly some readers already in kindergarten. Pre-reading ability could have been the best predictor of their reading ability in later grades. Unfortunately, we did not measure reading in kindergarten and therefore we could not estimate its effects.

To conclude, the present findings provided partial support of the HL model. In line with the HL model predictions, we found that two distinct home literacy activities exist, storybook exposure and parent teaching, which are differentially related to the emergent literacy skills. In contrast to the HL model predictions, we found that parent teaching predicted directly and negatively phonological sensitivity. It appears that in consistent orthographies such as Greek, school instruction effectively decreases the variation in early literacy that results from the amount and the quality of home literacy activities.

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