

**Literacy Acquisition in Greek: Research Review of the Role
of Phonological and Cognitive Factors**

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Introduction

Understanding the ways in which young children acquire literacy and process reading and spelling, seems to be of interest not only to the researcher, who focuses on the cognitive and linguistic processes of literacy acquisition and development, but to have implications for the pedagogy and methodology of teaching young children to read and spell too. What's more, if this has a certain value for languages (like English) that are widely spoken and in which literacy acquisition has been studied extensively, then for languages like Greek, the investigation of every aspect of the issue *how Greek children acquire literacy and process reading and spelling*, seems to be a necessity for reading theorists and educationists alike. This is justified on the grounds that the Greek language has its own orthographic identity which is distinct and different from other orthographies. It follows, therefore, that the teaching of literacy acquisition in Greek should be based on research evidence from the Greek language.

In view of the above, the aim of this paper is to present a summarized review of the existing evidence from empirical research into the role of phonological and

cognitive factors in reading and spelling of the Greek language. For this purpose, the chapter will begin with a section on the main features of the Greek writing system and the identity of the orthography. Then, a brief overview will be given on the issue of phonology and literacy acquisition in shallow and deep orthographies (like English and Greek respectively). Finally, a summarised review will be presented referring to the main research findings concerning the role of phonological and cognitive skills in reading and spelling Greek.

1. The Greek writing system and its orthography

The development of the Greek alphabet

The Greek writing system was the first system in which symbols were used to represent the sounds of language completely. Although it is not known when exactly the Greek alphabetic system was invented or developed, it has been calculated that it must have happened not later than the 8th century B.C. and not earlier than the 11th century B.C. Based on the existing evidence, according to which the Greek alphabet was used in the 8th century B.C. (in *Dipilos script – Nestor's cup*), the hypothesis dating the development of the Greek alphabet in the 10th century B.C. seems highly probable (Coulmas, 1989).

Based on the Phoenician alphabet (which did not have letters to represent vowels), the Greeks improved that writing system in order to represent vowels and consonants. “Transforming a consonant script into a full alphabet with letters for both consonants and vowels clearly is a significant step because the script can more easily

and more faithfully map the relevant sounds of language. Not being confined any more to consonants only, the alphabet is no longer the script of a particular language or of the language of a particular type” (Coulmas, 1989, p. 162-163).

The invention of letters for the representation of phonemes seems to have been the most decisive step in the history of writing, which facilitated the one-to-one phoneme-grapheme representation. So, for the first time in human history there was a development that led from logograms through syllabic signs to the decomposition of syllables into signs for consonants and vowels (Gelb, 1963). From this point of view, only the Greek alphabet is really worthy of that name. Semitic consonant writing that preceded it and from which it was derived cannot rightly be called “alphabetic”. Indeed the principle of one letter to one sound is celebrated as the very foundation of Western culture and thinking: “By the meaningless sign linked to the meaningless sound we have built the shape and meaning of western man” (McLuhan, 1962, p. 65).

The “meaningless sign linked to the meaningless sound” in this understanding is, of course, the letter of the Greek alphabet, rather than a meaningless syllable sign linked to a meaningless syllable in cuneiform or any other writing system. The Greeks are thus credited with nothing less than uplifting humankind (Coulmas, 1989, p. 160). From this perspective, for some scholars, who philosophize about the literature revolution in Greece, “the Greek alphabet has created the literature we read, whether in Greek, Latin, English, or any other contemporary European tongue” (Havelock, 1986, 411). For this reason, the Greek writing system had all the characteristics entitling it to be called an *alphabet* (Gelb, 1963).

Bearing in mind the principles characterising the development of the Greek alphabet, the linguist Florian Coulmas (1989) points out that “in principle the Greek alphabet was suitable for representing all the phonemes of the Greek language. It was

undoubtedly the simplest and most flexible writing system developed so far, since with it any word could be spelled out without recourse to the cumbersome device of classifiers, logograms or imperfectly fitted syllable signs. However, the Greek alphabet underwent considerable changes from the earliest attested documents to the classical period. An important feature whose representation changed significantly was vowel quality. While in the early documents vowel length was not marked, in the classical system only *alpha* and *iota* continued to be used for both short and long vowels. Short /e/ was differentiated from /e:/ . The *omega* ‘big o’, Ω and ω, was introduced to distinguish /o:/ from *omikron* ‘little o’, /o/. Vowel length could thus be marked for /o/ and /e/, but the Greek alphabet took no note of and neither did it develop distinct symbols for long as opposed to short /i/, /a/ and /u/. The representation of /u/ which was first expressed by Old Phoenician *waw* also changed as this sound came to be realized as /u:/ in many contexts. The /u/ sound was therefore represented by combining *omikron* and *ypsilon*” (p.164-165).

However, that was not the final form of the Greek alphabet. As Coulmas (1989) mentions “further modifications of the archaic alphabet followed later as supplementary signs were introduced for the aspirated stops /ph/ and / kh/ - that is, φ and χ respectively, and for the double consonant /ps/, ψ. After these supplementary letters no further additions were made, but in other respects the Greek script was not complete in the early documents. Word boundaries were not marked, and there was no punctuation. Neither was there a distinction between capital and small letters. Moreover, while the Greek alphabet was one unitary system, it was not used in a uniform way. There was, in other words, no standardized orthography. The Classical Greek alphabet achieved its standardized form only late in the fifth century BC” (p.165).

The Greek orthography

During its long history from antiquity to the present day, the *spoken form* of the Greek language (as is the case in many other languages) has undergone some evolutionary and developmental changes. Those changes can be observed in the phonetic identity of words, in morphology, in syntax and in the pronunciation of new words. However, in comparison with other Indo-European languages, the changes which the Greek language has undergone through the centuries could be regarded as moderate. So, many aspects of the spoken form have remained almost unchanged throughout its long history. Among the aspects that have remained constant are the pronunciation of many words, many grammatical forms, various elements used in the construction of new words, some elements of syntax and a great number of morphemes (Tombaidis, 1987).

On the other hand, the *written form* of the Greek language did not follow those (even moderate) changes of the spoken language and has remained essentially unchanged throughout its long history. As a result of the differences in the changes between the oral and the written forms, the Greek language is now written not as it is pronounced today but as it was probably pronounced almost twenty five centuries ago. So, between its spoken and written forms a number of inconsistencies exist. Some of those inconsistencies are as follows (cf. Triantaphyllidis, 1913; Tombaidis, 1987; Zakestidou & Maniou-Vakali, 1987):

- (a). Some phonemes are written with different letters or letter combinations.

For example:

- The phoneme [i] is written with the letters: **η, ι, υ, ει, οι, υι**, (e.g. *συνειρμικός / sinirmikos /, οικιστής / ikistis /, υικός / iikos /*).
- The phoneme [o] is written with the letters: **ο, ω**, (e.g. *όμος / omos /, ώμος / omos /*).
- The phoneme [e] is written with the letter - **ε** - and the letter combination - **αι** - (e.g. *φαίνεται / fenete /*).
- The phoneme [u] is written with the letter combination - **ου** - (e.g. *ουρανού / uranu /*).
- The phoneme [s] is written with the letters: **σ, ς, σσ**, (e.g. *σύσσωμος / sisomos /*).

(b). Some letters, depending on the context, represent different phonemes. For example:

- The letter - **υ** - is pronounced as:

[i] (e.g. *κύβος / kivos /*),

[f] (e.g. *ευχαριστώ / epharisto /*),

[v] (e.g. *άριο / avrio /*),

or it is almost silent (e.g. *έφορος / eforos /*).

- The letter - **τ** - is pronounced as:

[t] (e.g. *κάτω / kato /*),

or as [d] (*πέντε / pede /*).

(c). In some cases some letters are not pronounced and they are almost voiceless. For example:

- The letter - **υ** - (e.g. *Εύβοια / Evia /*).

- The double consonants: **λλ**, **κκ**, **ββ**, **μμ**, etc. (e.g. *κάλλος* / *kalos* /, *λάκκος* / *lakos* /, *Σάββατο* / *Savato* /, *γράμμα* / *grama* /).
- The letter - **π** - in the consonant cluster - **μπτ** - (e.g. *πέμπτη* / *pemti* /).

As a result of this situation, modern Greek spelling can not be characterised either as phonetic or phonological orthography but rather as a *historic orthography*, which reflects the initial phonetic identity and etymology of words (Babiniotis, 1980, p. 95).

In comparison to English orthography, Greek, like English, is a *morphophonemic* script but is much more transparent than English in the representation of phonology. The English spelling system has variable and inconsistent grapheme-phoneme relationships due to many irregular spellings and it is considered as *deep* orthography, with higher level morphological constraints (Chomsky & Halle, 1968). The Greek spelling system, however, is much more consistent in grapheme-phoneme correspondences (approaching the 1 : 1 mapping from graphemes to phonemes) and can be characterized as a *shallow* orthography where, as a rule, pronunciation is predictable from print. The grapheme-phoneme inconsistencies existing in Greek (mainly applying to digraph spelling patterns) are to a large extent rule-learned and apply in almost every case in which the particular spelling pattern occurs. It would be expected, therefore, that the existing systematic relationship between individual letters and individual phonemes, would enable Greek children to develop a fully specified orthographic lexicon in which representations would be underpinned at the phonemic level. Consequently, it would also be expected that in learning to read the Greek language, Greek children would build on the nature of their writing system and they would learn to read by a sequential decoding process.

In spelling, however, Greek is *phonologically opaque* since there is a 1 : many phonemes - graphemes mapping and, therefore, spelling can not always be predictable from phonology. So, in a number of cases (mainly those following the *historic orthography* spelling rules, (according to which the spelling of a word is derived from its initial or etymological basis) a word's phonemic structure can be represented by more than one graphemic alternative. Since most of such spelling patterns are explained through reference to etymological and grammatical knowledge, spelling can be assisted by gradually learned rules based on morphology and lexical information.

2. Phonology and literacy acquisition in deep and shallow orthographies

Learning to read

In view of the existing differences in the orthographic systems and their classification as *deep* or *shallow* orthographies, it could be assumed that the degree to which a writing system represents phonology (by which a system is classified as *deep* or *shallow* orthography) is highly likely to be related to the way in which word recognition process takes place. This is in fact what Katz & Frost (1992) have suggested in their *orthographic depth hypothesis*. According to this hypothesis a reader of a deep orthography is likely to be led (by the nature of the orthography) to process word recognition by using *morphological* information from the visual-orthographic structure of the written word. However, the reader of a shallow orthography is likely to be encouraged by the high degree of transparency in the representation of phonology to process word recognition by using the *phonological*

information. If this hypothesis is true, then there should be evidence from literacy acquisition in deep and shallow orthographic systems, like the English and Greek respectively.

The extensive studying of reading acquisition in the English language has resulted in the formulation of various theoretical accounts (for a brief review see Seymour & Duncan, 2001). The common characteristic of the early developed *cognitive developmental stage models* (Marsh, Friedman, Welch, & Desberg, 1981; Frith, 1985) was the idea that the young children's acquisition of reading passes through three different stages. The first is the *logographic* stage in which reading is performed on the basis of a whole word strategy, by associating the whole visual patterns of the words with their pronunciation. At this stage the child is expected to read successfully only a set of frequently encountered words. The unfamiliar words either can not be read or can be approached by guessing on the basis of contextual cues. The logographic strategy is regarded as a natural and necessary first step in the learning to read process until the child reaches 7 years of age when, under the Piagetian framework, the transition of the child's cognitive development from the preoperational stage to the stage of concrete operations occurs. As a result of this and on the basis of the development of phonological awareness of speech structure, the young reader enters the *alphabetic* stage, during which s/he develops a decoding strategy (phonological recoding) on a sequential basis. At this stage the child recognizes the constituent letters of the word, uses his/her knowledge of the associations between different letters and their sounds, blends together the constituent sounds and forms the pronunciation of the word. Finally the child reaches the *orthographic* stage, during which s/he can read words by using letter groups.

The stage model of reading acquisition was supported by subsequent research on the English language (Byrne, 1991; Harris & Coltheart, 1986; Seymour & Elder, 1986). The outcome of all this research was the underlining of the hypothesis that the young reader of English is bound to use the logographic strategy as the first step in the learning to read process.

However, other studies on literacy acquisition in a number of languages have cast doubts on the hypothesis of the importance of this logographic process and the consequent underestimation of the role of alphabetic strategy in the acquisition of reading skills. Even in learning to read English, Seymour and Evans (1992), based on a longitudinal study, concluded that the logographic strategy could be a result of the teaching method employed in the school and not a natural and necessary first step in literacy acquisition. Stuart and Coltheart (1988) suggested that if children have acquired the phonological skills then their reading process is alphabetical from the beginning. Similarly Ehri (1992) pointed out the importance of phonological cues in the first stages of reading and supported the notion of phonological recoding (based on phonemic and alphabetic knowledge) for reading acquisition.

In more *regular orthographies*, the doubtful role of the logographic stage and, consequently the decisive importance of the alphabetic strategy, has been more evidently shown. In the German language, Wimmer's extensive work with Austrian children has demonstrated that in learning to read and spell German the children mainly apply a phonological recoding and not a logographic strategy (Wimmer & Hummer, 1990; Wimmer, Landerl, Linortner, & Hummer, 1991). Similarly Mannhaupt, Jansen, and Marx (1997), found that ten weeks after beginning school the German first graders did not rely on logographic reading. They concluded that in learning to read German the German speaking children do not seem to use any other

reading strategy prior to the alphabetic process. Sprenger-Charolles and Bonnet (1996), in a longitudinal study aimed at evaluating the reading strategies used by French children, found that first graders did not use logographic strategies in learning to read French. In the Greek language Porpodas (in press) evaluated the reading strategies used by first graders after 16 weeks of schooling and literacy instruction and found that good as well as weak readers were relying widely on the alphabetic process. This was interpreted as indicating that the logographic strategy is unlikely to play an important role or to emerge naturally in the process of learning to read Greek.

In view of the shortcomings of the *stage models* of literacy acquisition Philip Seymour of the University of Dundee (Scotland), based on his many, extensive and detailed studies, developed the “**dual foundation model**” of reading acquisition (Seymour, 1997, 1999). The model is developed in terms of phases which are not necessarily sequential but which can overlap in a cumulative mode. Seymour proposes four main phases:

Phase 0: Pre-literacy. This phase refers to the pre-reading period. Due to the nature of their language (and especially the poorly defined structure of the syllable), in this phase English pre-readers normally lack explicit linguistic awareness. In Greek, however, which is characterized by a well articulated and open syllabic structure, pre-readers are expected to approach the task of learning to read with a satisfactory level of explicit phonological awareness at the syllable level (Porpodas, 1989a, 1990).

Phase 1: Foundation literacy. The basic hypothesis is that literacy acquisition requires the knowledge of the visual forms of the letters and their association with the corresponding sounds of speech. Based on that knowledge, two foundation processes are developed: a **logographic foundation** and an **alphabetic**

foundation. The *logographic foundation* is thought to be a process for the representation and recognition of words, on the basis of their partial representation. The *alphabetic foundation* involves “.. a simple decoding procedure by which individual letters are converted to sounds and the sounds are synthesized to form a pronunciation. ...The establishment of an alphabetic decoding mechanism creates a demand for an explicit meta-awareness of the *phonemic* segments out of which speech is constructed. (Seymour & Duncan, 2001, p. 292). The degree of development and use of the logographic or the alphabetic foundation process depends on the nature of the language under process and the teaching methods used. For these reasons the development of a distinct logographic foundation seems unlikely in learning to read Greek (Porpodas, in press) and, therefore, Greek children are assumed to approach reading by using an alphabetic process.

Phases 2 and 3: Orthographic and Morphographic literacy: In Seymour’s model “these frameworks are envisaged as abstract structures in which elements of orthography are organised in a manner which reflects their relationship with sound and meaning. At the *orthographic* level the elements consist of the vowel and consonant graphemes organised into a structure which reflects the subdivision of the syllable into a three-part onset-peak-coda format or a two part onset-rime format. At the *morphographic* level, the elements are likely to consist of whole syllables, or, more obviously, free and bound morphemes” (Seymour & Duncan, 2001). Since Greek is a consistent orthography the focus of the reading process on rime-level spelling sound parts will not give any advantage in processing Greek (Goswami, Porpodas, & Wheelwright, 1997). In addition, since Greek contains polysyllabic words in which most syllables have an open CV or CCV structure, the morphographic phase (where syllabic units can be combined) seems to be more important for the

development of reading. Therefore, according to Seymour, Greek children can progress rapidly through Phases 1 and 2 and approach Phase 3 with an inventory of well defined syllabic units in place. This was confirmed by Porpodas (2001) in a study on first grade reading of Greek.

In summing up, it could be argued that the most decisive step in the process of learning to read seems to be the acquisition of *phonological recoding*, that is, “*the ability to translate printed words independently into their spoken equivalents*” (Share,1995, p.156). Following the above account it could be assumed that Greek children should not face many difficulties in acquiring phonological recoding as a procedure for accurate word recognition. Based on the consistency of orthography, the grapheme-phoneme recoding is expected to be reliable, provided that the lexical item presented conforms to the code (as is normally the case) or that the basics for the rule-read words have been learned. Success in phonological recoding is enhanced by the fact that Greek children are normally taught using an analytico-synthetic phonics method that directly facilitates phonological recoding as a means of word recognition.

In the Greek language this hypothesis is supported by Porpodas (2001, in press). In those studies he evaluated the reading strategies used by first graders after a period of schooling and literacy instruction and found that good as well as weak readers were relying widely on the alphabetic process.

Learning to spell

As in the case of reading, most of the existing research on spelling has been conducted on the English language. On the basis of that research it could be argued

that learning to spell involves the employment of visual, phonological, semantic, grammatical and orthographic rules knowledge and skills (Bruck & Treiman, 1990; Gough, Juel, & Griffith, 1992; Henderson & Beers, 1980; Marsh, Friedman, Welch, & Desberg, 1981; Waters, Bruck, & Malus-Abramowitz, 1988).

The theoretical accounts concerning the learning of spelling in English have taken the form of developmental stage models. Such models have been proposed by Brown (1990), Frith (1980, 1985), Marsh et al. (1981). A close comparison of these models reveals that they share two common characteristics. The first characteristic is that all these models postulate that spelling develops in a series of stages or periods. The second characteristic is that spelling development postulates a period in which spelling is based on a coding strategy of phonological analysis which is called a *phonetic* stage by Brown (1990), an *alphabetic* stage by Frith (1985) and *sequential and hierarchical encoding* by Marsh et al. (1981). The phonological analysis strategy of spelling development is followed by a period in which the spelling strategy is based on lexical analogies, during which visual memory plays a primary role. At this period spelling of a word is produced because it “looks right” (Brown, 1990), it is “independent of sound” (Frith, 1985), or because there is a shift from the phonemic encoding strategy to a strategy based on analogy (Marsh et al., 1981). The most widely used methodology in order to determine the strategies used by children in their effort to spell, has been the analysis of spelling errors. As Read (1986) has pointed out, children’s misspellings “provide a window on their spelling processes, their notions of writing and their judgments of speech sounds” (p. 2). Such an analysis shows to what extent children apply information about grapheme-phoneme conversion. The way to distinguish that, is by classifying spelling errors into two main categories. The first is the phonetic or phonological or legal misspelling, in

which the misspelled word is phonetically accurate and “sounds like” the target word. In this case the child is assumed to have employed the phonological rules successfully, and consequently s/he has correctly analyzed the spoken word into phonemes and has represented each phoneme with a grapheme. The second category is the non-phonetic or non-phonological or illegal misspelling which is thought to indicate the use of a rote memorization of the word or unsuccessful use of the phonological rules (see Cook, 1981, for a review).

The investigation of spelling in consistent orthographic systems has shown that in German, spelling performance of primary first grade children was strongly based on the knowledge of phonological information (Wimmer & Hummer, 1990). In the Greek language there is also some evidence indicating that the Greek children are highly likely to process spelling not by “reading out” the word’s orthographic form from memory but by deriving it on the basis of their knowledge about spelling-sound correspondences (Porpodas, 1989a, 1989b, 1989c, 2001).

3. Research review into the role of phonological awareness, speech perception and working memory in literacy acquisition in Greek

The role of phonological awareness

The relationship between phonological awareness and success in literacy acquisition in Greek was first investigated by Porpodas in 1980’s. (Porpodas, 1989b, 1990, 1991, 1995a, 1999). The main findings of those investigations could be summarised as follows: First, syllabic awareness is much easier than phonemic awareness at the

prereading stage. Second, children, who at the prereading stage had acquired phonological awareness at a satisfactory level, had achieved a better level of literacy development at the end of the first primary year, as compared to their class mates whose level of phonological awareness was low at the prereading stage. However, another interesting observation was that by the end of primary year two, the difference in literacy development between those two groups of children was smaller.

The last point was also observed in the only systematic training study on phonological awareness that has been conducted so far in Greek. More particularly, in that training study Porpodas & Palaiothodorou (1999a, 1999b) not only provided evidence for a causal relationship between phonological awareness and literacy acquisition but, in addition, found that the advantage in literacy acquisition gained in the primary first grade had disappeared by the end of the primary third grade. (A similar finding has also been reported in the Finnish language by Niemi, Poskiparta & Vauras, 2001). In addition, in the above mentioned training study in Greek it was shown that the effect of phonology was specific to literacy acquisition, since there was no evidence of any effect on the learning of mathematics.

The issue of the relationship between phonological awareness and literacy acquisition of Greek has recently become the focus of interest by more researchers. More particularly, the prereaders' greater capability in acquiring syllabic than phonemic awareness of Greek was also reported by Aidinis & Nunes (2001). Those researchers also found that the children were experiencing less difficulty in the phonemic analysis of the initial than the final phonemes of each word. Along the same lines Nikolopoulos & Porpodas (2001), Chitiri & Porpodas (2003), Tafa (1997) and Papoulia-Tzelepi (1997) have found a strong relationship between phonological awareness and literacy acquisition in Greek.

Finally, the strong role of phonological awareness deficit (and especially at the phonemic level) in dyslexia in the Greek language has been reported by Porpodas, 1995b, 1996, 1997 and Porpodas & Dimakos, 2003).

The phonological representations hypothesis and the role of speech perception

The *phonological representations hypothesis* (adopted by Goswami, 2000) was used for further investigating the causal role of developmental deficit hypothesis in developmental dyslexia. According to this hypothesis, the quality of segmental organisation of representations supporting spoken word recognition and production should be related to speech perception parameters (Joanisse et al, 2000) and phonological memory skills (Porpodas, 1999). In addition, it should be reflected in the level of difficulty encountered in retrieving the phonological codes of representations from the mental lexicon as well as the ability to manipulate and be aware of the phonological structure of those representations (Swan & Goswami, 1997a, 1997b). It is therefore expected that this skill is likely to determine the level of reading and spelling ability.

This hypothesis was investigated in Greek by Panteli (in preparation) and Panteli & Porpodas (in preparation). In that research a battery of tasks was used for assessing auditory perception of non-speech stimuli, auditory discrimination, perception of rhythm in acoustic signals, phonological short-term memory, word-finding ability and phonological awareness skills. The results obtained so far seem to indicate that the dyslexic children's deficit in phonological processing arises from a lack of distinctness of phonological representations. This difficulty in forming precise

representations of words' phonological structure seems to be partly explained in terms of difficulties in the perception of the rhythm of acoustic signals.

The role Working Memory

The decisive role of working memory in reading acquisition has been well documented in the literature (e.g. Baddeley, 1986, Baddeley et al., 1981, Hulme, 1981). In the case of reading Greek, Porpodas (1991) has found a direct relationship between the level of phonetic representation in short term memory at the preschool level and the reading level achieved at the end of primary first grade. In addition, Porpodas (1993) investigated the role of short term memory storage of linguistic information in the process of reading. The main finding of that research was that the functional difficulties of the articulatory loop of working memory seem to inhibit the learning of reading.

4. Learning to read and spell Greek: Concluding remarks

On the basis of the existing data derived from empirical research and in view of the nature of the Greek spelling system, it could be argued that the Greek children (with or without learning difficulties) tend to find learning to read easier than learning to spell. However, this does not mean that all children acquire the reading skill easily. On the contrary, some have to struggle to complete phonological recoding in word reading. This is reflected in the beginning readers and the dyslexics' reading

performance where, contrary to what happens in the English language, the most important index of their reading performance seems to be the reading processing time rather than the reading accuracy (Porpodas, 1995a, 1995b, 1996, 1997, Porpodas & Karantzis, 1995). This means that decoding of almost every word can finally be achieved but at the expense of reading time.

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