Reading and spelling development in transparent alphabetic orthographies: points of convergence, divergence and arising issues

1. General Introduction

Research in different writing systems has established beyond doubt that alongside many similarities, there are also important differences in the way in which reading and spelling develop across the languages (Joshi & Aaron, 2006). Different languages and orthographies can make differential demands on the cognitive-linguistic systems that underlie literacy development, thereby giving rise to different patterns of relationships (Perfetti & Bolger, 2004). It is primarily for this reason that research on different writing systems is important to clarify the complex triad of relationships between language, orthography, and literacy.

Orthographic transparency, broadly defined as the level of consistency in grapheme-phoneme relationships, and its effect on literacy development has attracted much research attention. English is one of the most opaque writing systems with many inconsistent and complex grapheme-phoneme relationships. Therefore, it provides a benchmark for comparison with transparent orthographies characterised by simple and consistent grapheme-phoneme relationships, such as Finnish and Turkish.
The primary aim of this chapter is to pull together the diverse research evidence from studies conducted in English and transparent alphabetic orthographies in relation to reading and spelling development and highlight the common as well as divergent points. The chapter also addresses the long standing debate about the role of phonological awareness in transparent writing systems. Phonological awareness is broadly defined as the ability to analyse the sound structure of speech, and is found to be central for literacy development in English. However, the research evidence from transparent orthographies tends to be highly inconsistent. In this review, I highlight a number of methodological and conceptual issues that need to be considered for a coherent evaluation of the role of phonological awareness in transparent orthographies.

Theories of reading and spelling have developed based mainly on evidence from studies in English. I begin, therefore, with an overview of the theories of reading and spelling development in English. The subsequent sections build upon this background knowledge and evaluate the research evidence from transparent orthographies.

2. Learning to read and spell in English: in a nutshell

It is not sufficient to learn the grapheme-phoneme associations of the alphabet in order to read and spell accurately in English. The same phoneme can be represented by different letter (s) (e.g., /k/ is written as <ck> in <back> but as <c> in <cash>) and the same grapheme can be pronounced differently in different words (e.g., <c> in <car> and <city>). The English orthography is more consistent at the level of onset-rime than at the level of grapheme and children seem to capitalise on this statistical regularity of the language, and process words at onset-rime levels as well (Goswami, Ziegler, Dalton, & Schneider, 2003). Furthermore, due to morphophonemic nature of the English orthography, learner needs to develop an understanding of the morphology and learn the instances when morphology overrides phonology. For instance, some words that share the same base are in
some cases pronounced differently (e.g., nature-natural) but not in others (e.g., care versus careless). Similarly, grammatical suffixes, such as past tense -ed can be pronounced differently, yet remain the same in writing (e.g., waited, walked, warned) (Nunes, Bryant, & Bindman, 1997).

Hence, learning to read and spell in English requires learning multiple rules and statistical regularities of the orthography at multiple linguistic levels, as well as idiosyncratic cases that have to be learnt by rote. This means that the development of literacy skills in English can only be accomplished by learning to apply these different rules, strategies and knowledge appropriately, flexibly, and efficiently. The next question is how children develop this wide repertoire of processes and knowledge base that is the hallmark of skilled literacy.

3. Reading and spelling development in English

Ehri’s phase theory of reading and spelling development provides a clear outline of the major facets of reading and spelling processes (Ehri, 1992, 2002). In the absence of any knowledge of letter-sound correspondences, word recognition is based on making arbitrary connections between the salient visual features of a word and its pronunciation. For instance, the recognition of the logo sign ‘STOP’, based on its colours and patterns. This is referred to as pre-alphabetic reading, which is an optional and transient reading process and seems to play little or no role for future reading attainment (Share, 1995).

As soon as children start to acquire some letter knowledge and develop phonological sensitivity, they use this knowledge to identify words. This is phonetic-cue reading, which can contribute to real word errors and confusions with similarly spelled words such as reading ‘<house>’ as ‘<horse>’ (Ehri, 2002, p.13). As alphabet knowledge increases, it becomes possible to process serially all the graphemes of a written word and build up its pronunciation. This is called
Reading and spelling in transparent orthographies

phonological recoding, which enables accurate decoding of regular words but leads to errors when reading words that do not conform to the default phoneme-grapheme correspondence rules (e.g., reading <have> as /həv/).

Once the connections between the letter strings and their pronunciations are consolidated, it becomes possible to recognise a word rapidly as a whole unit or larger spelling units without the need for serial processing of all the individual graphemes. At the same time, acquisition of morphosyntactic knowledge, the knowledge of higher-order letter-sound relationships, and word-specific pronunciations enables accurate decoding of irregular or complex words. This is called orthographic reading characterised by accurate, effortless and fast word recognition, which is the hallmark of skilled reading (Ehri, 1992).

Similar processes have been proposed for spelling. Initially, children understand that writing is different from drawing. Their writings may include scribbles or letter like shapes, but lack any alphabet knowledge. As children start to learn that speech is represented by the letters of the alphabet through exposure to print and/or reading instruction, they may start to use partial alphabetic knowledge or the letter-name strategy to represent words (e.g., writing <r> to represent <are>) (Treiman, 2006). This is called semi-phonetic spelling, which lacks complete representations of the sounds. Increase in alphabet knowledge enables full alphabetic spelling, where all the sounds of the dictated words are represented in writing (Ehri, 1986). However, full alphabetic processing can lead to errors when spelling complex words (e.g., spelling of <their> as <there>). This problem is gradually resolved through the acquisition of the knowledge of higher-order grapheme-phoneme relationships, morphosyntactic or word-specific spelling knowledge (i.e., orthographic spelling).

There is now substantial support for the multi-process account of literacy development, which states that children may utilise one or more of these reading and spelling processes from the very onset of
literacy development depending on their alphabet knowledge, print experience, and word characteristics (e.g., Rittle-Johnson & Siegler, 1999; Share, 1995). Nonetheless, broadly children's early reading and spelling processes tend to be phonological, and the orthographic (e.g., morphological) processing skills tend to be more rudimentary (Kemp, 2006; Treiman & Cassar, 1997). What seems to develop is the depth and breath of their phonological and orthographic knowledge and efficiency to employ different reading and spelling processes.

3.1 Questions that remain...

Orthographic processing constitutes one of the most contentious issues in the reading literature. There is a large gap in our understanding of the nature of orthographic representations; the specific mechanism underlying the acquisition of orthographic representations and its component processes; and finally, the relationship between orthographic processing with other processing skills including phonological processing, print exposure, general language skills (e.g., vocabulary, morphosyntactic skills), visual processing, and cognitive skills (Burt, 2006; Cunningham, 2006; Hagiliassis, Pratt, & Micheal, 2006).

Operationalisation of orthographic processing independent of phonological processing tends to be problematic (Wagner & Barker, 1994). For instance, exception word reading is considered to be an index of orthographic reading skills but as the notion of quasi-regularity states even parts of the so-called exception words in English such as <yacht> can be partly read phonologically, as the letter Y is regular in this instance (Plaut, McClelland, & Seidenberg, 1996). Similarly, studies often found that it is very difficult to delineate morphological processes that are considered to reflect orthographic processes, from phonological processes when children are spelling inflected or derived words (Carlisle & Stone, 2003).
Reading and spelling in transparent orthographies

There seems to be consensus that phonological recoding is central to but not sufficient for orthographic reading (Cunningham, 2006; Nation, Angell, & Castles, 2007; Share, 1995). It is not clear what the other possible component processes of orthographic processing might be. A number of processing skills have been cited including visual processes (Martens & de Jong, 2006), paired-associate learning (Manis et al., 1987; Windfuhr & Snowling, 2001), sensitivity to letter patterns (Share, 2004), attentional control processes (Breznitz & Berman, 2003), and semantic and grammatical knowledge (Laing & Hulme, 1999; Snowling, Nation, & Muter, 1999). It is primarily the multidimensional nature of orthographic processing that complicates the research in this area.

Finally, with the exception of a few studies (e.g., Duncan & Seymour, 2003), empirical research into the development of reading and spelling almost exclusively focused on monosyllabic words. It remains to be seen to what extent these findings can be extended to the processing of complex polysyllabic and polymorphemic words. This is particularly relevant for highly inflected or agglutinative languages, such as Turkish and Finnish where long words with a series of attached affixes are the characteristic feature of the language.

Before we turn to the question of to what extent these developmental patterns and processes observed in English also apply to transparent writing systems, it is important to highlight several points about orthographic transparency, which have implications for evaluation of the research evidence from cross-linguistic studies.

4. Operationalisation of orthographic transparency

Opaque orthographies not only have complex grapheme-phoneme relationships but also complex syllable structures composed of a string of consonant clusters such as CCVCCC (C: consonant; V: vowel). In contrast, the syllable structures in transparent systems tend to be simple and mainly CV-
Reading and spelling in transparent orthographies

It is also important to highlight that transparency is a multidimensional construct and writing systems can be more consistent at different linguistic levels (e.g., body-rime levels) and the degree of transparency can be different for reading and spelling (Ziegler, Jacobs, & Stone, 1996). For instance, 84% of German monosyllabic words have been reported to be consistent for reading but only 47% for spelling (Ziegler, 2001, cited in Wimmer & Mayringer 2002). Hence, German is asymmetrically transparent. In contrast, Turkish and Finnish are relatively symmetrically transparent.

So far, the statistical information for quantification of transparency at different linguistic segments, with representative samples of words (e.g., multisyllabic words) and for both spelling and reading is highly limited (Aro & Wimmer, 2003). In fact, this is a major issue that complicates a systematic comparison of languages and needs to be borne in mind when evaluating cross-linguistic studies.

5. Reading and spelling development in transparent orthographies

5.1 Reading and spelling develop faster in transparent orthographies: Why?

Studies consistently report that irrespective of variations in the age of onset of formal literacy instruction, preschool literacy activities and method of reading instruction, children learning transparent systems make faster progress in their reading and spelling development (Aro & Wimmer, 2003; Ellis & Hooper, 2001; Seymour et al., 2003). Seymour and colleagues found that it took about two and a half years to achieve >90% level of accuracy in English that has been
achieved within the first year of formal literacy instruction in the transparent systems (e.g., Italian, Finnish, Spanish, and Greek). Similar results came from other cross-linguistic studies comparing English with transparent orthographies, such as Albanian (Hoxhallari, van Daal, & Ellis, 2004), Welsh (Ellis & Hooper, 2001; Spencer & Hanley, 2003), and Turkish (Durgunoğlu & Öney, 1999).

A child learning to read in English from the very start is faced with many idiosyncratic pronunciations such as <have>. This means that the English orthography demands acquisition of phoneme-grapheme correspondence rules as well as orthographic knowledge for accurate reading right from the onset of formal reading instruction. This is clearly an extra cognitive burden, which along with the resultant inconsistent feedback from the orthography seem to slow down the acquisition of accurate and fluent reading skills (Ellis & Hooper, 2001). Whereas a child learning to read a transparent system can rely on one strategy (i.e., phonological recoding) that gives accurate results, hence positive feedback almost all the time with the results of accurate and fast reading.

The flexible-unit hypothesis states that it is the need to develop as well as switch between different unit sizes, such as grapheme-phoneme, larger units of rimes, or whole words, that underlie the observed developmental lag of children learning English (Brown & Deavers, 1999). Indeed, in a direct test of flexible-unit hypothesis, English speaking children showed switching cost when presented with a mixed list of nonwords that could be read either through phonological recoding or orthographic reading (i.e., reading through analogy to a real word). However, their German counterparts did not show any switching cost, further confirming that children were using only phonological recoding, hence a single strategy when reading in German (Goswami et al., 2003).

The complexity of grapheme-phoneme relationships in opaque systems seems to be further compounded by the complex syllable structures and ambiguous syllable boundaries that arguably make it harder to develop fine-grained phoneme levels of lexical representations. In fact, several
cross-linguistic studies have found that children learning transparent systems outperform their English-speaking peers on a range of phonological awareness measures (Caravolas & Bruck, 1993; Durgunoğlu & Öney, 1999; Spencer & Hanley, 2003). Hence, a simple orthography not only facilitates the development of reading and phonological awareness, but seems to further fuel their mutual facilitative relationship with the result of accurate and fast reading within a year of formal reading instruction.

So far, cross-linguistic research on spelling development is relatively limited. However, based on the available research evidence from several studies comparing English with German, Greek, Czech, French, and Italian, it can be concluded that despite the fact that the spelling systems of these orthographies are less transparent in comparison with reading, it was still possible to find significant advantage in spelling development (Caravolas, Bruck, & Genesee, 2003; Cossu, 1999; Harris & Giannouli, 1999; Wimmer & Landerl, 1997).

It is not clear whether or how asymmetrical and symmetrical transparency influence reading and spelling development (Rahbari, Senechal, & Arab-Moghaddam, 2007). Studies tend to examine reading and spelling development separately. Given that reading and spelling development are highly interactive processes (Bosman & van Orden, 1997; Perfetti, 1997), understanding of reading and spelling development as a function of orthographic transparency calls for a more integrated approach (Fletcher-Flinn, Shankweiler, & Frost, 2004). Furthermore, with the exception of a few (e.g., Hanley, Masterson, Spencer, & Evans, 2004), cross-linguistic studies have focused on early stages of literacy development. Therefore, we do not know how these developmental profiles take shape during the later stages of literacy development when children need to process more complex words and sentences (Patel, Snowling, & de Jong, 2004).
Finally, all these findings should be evaluated with the acknowledgement that any cross-linguistic study is inherently limited due to sparse information on the statistical properties of the languages/orthographies as noted before, and the difficulty of constructing comparable, yet at the same time ecologically valid experimental measures of reading and spelling (Seymour et al, 2003).

5.2 In what ways may reading and spelling development differ in transparent orthographies?

There is no convincing evidence, as yet, to suggest that at a fundamental level, reading or spelling development in a transparent orthography is qualitatively different from English. The overall consensus states that the difference is one of quantitative and the observed divergence in the developmental profiles of children can be largely explained in terms of the faster rate of literacy development in transparent systems.

The proposed processes of reading in English (i.e., pre-alphabetic, phonetic-cue, full alphabetic and orthographic reading) have been also observed in transparent systems albeit with some differences. For instance, studies in Greek, Spanish, German, and Dutch found little or no evidence for pre-alphabetic reading (Harris & Giannouli, 1999; Valle-Arroyo, 1989; Valtin, 1997; Wimmer & Hummer, 1990). It seems that the observed optional and highly transitory nature of pre-alphabetic reading in English is even more pronounced in transparent systems. There are, however, clear differences in children's early reading errors in transparent systems.

When children attempt to read words in English, they sometimes refuse to read or produce utterances that bear little phonological resemblance to the target word and can be random guesses such as reading 'sun' as 'doggie' and their errors also do not tend to be plausible nonwords (Caravolas, Hulme, & Snowling, 2001, p.770). Numerous studies, however, have reported that the reading errors in transparent systems tend to be predominantly nonwords that share a salient
common letter sound with the target word and there are seldom if any random guesses or refusals to read (Ellis et al., 2004; Seymour et al., 2003). Clearly, certain features of phonetic-cue reading are not observed to the same degree in a consistent writing system where phonological recoding seems to be the dominant reading process.

With regards to spelling development, just as in English, phonological spelling dominates the early spelling processes in transparent systems (for reviews, see Caravolas, 2006; Treiman & Kessler, 2005). However, once again as with reading, depending on the characteristics of the orthography, children's spelling errors can be different.

The vowel sounds and letters are very complex in English and children often make more vowel errors than consonant errors (Treiman, 1993). In contrast, in transparent systems with simple vowels, like Portuguese, children make more errors with consonants than vowels. In Portuguese, a vowel letter name corresponds to its sound and acts as a discrete single unit of utterance and this seems to facilitate the acquisition of accurate vowel spellings (Pollo, Kessler, & Treiman, 2005).

Likewise, phoneme length seems to pose a challenge for young spellers in Finnish (Lehtonen & Bryant, 2004). Phoneme length is indicated by double letters in Finnish and can change the meaning of words. The discrimination of phoneme length seems to complicate this otherwise simple spelling system, and misspellings often involve representing double letters with a single letter (Lehtonen & Bryant, 2004).

Although Turkish has a very simple spelling system, the phoneme /ğ/, which is denoted by the letter <ğ> (‘soft g’) can cause ambiguity during spelling. This is a ‘voiced soft palatal velar fricative’ and during articulation ‘the back of the tongue is raised to the velum’ (Çapan, 1989, p. 193). Depending on its phonemic context, /ğ/ can loose its phonemic salience and serves to lengthen
the preceding vowel or can sound as weak /v/ or /j/ (Alderson & Iz, 1984; Demircan, 2001). The ‘soft g’, however, does not seem to cause any problem for reading. Among a group of first graders, we found the mean error rate of spelling ‘soft g’ to be much higher (61%) than that of reading (27 %) (Babayiğit, 1999). These findings were further confirmed in our recent study, which also showed that spelling of ‘soft g’ is particularly difficult for young children in Turkish (manuscript in preparation).

With respect to the overall developmental pattern of phonological and orthographic reading and spelling processes, the evidence from transparent systems such as French, Dutch, and Spanish, also supports the multi-process accounts of reading and spelling development (Coenen, Bon, & Schreuder, 1997; de Manrique & Signorini, 1998; Sprenger-Charrolles, Siegel, Bechennec, & Serniclaes, 2003). Depending on the demands of the task, the levels of alphabet knowledge, phonological awareness skills, and print experience, children seem to utilise both phonological and orthographic reading and spelling processes from the very early stages of literacy development.

What seems to constitute an important point of divergence in transparent systems is the relative balance between orthographic and phonological processes in reading. In comparison to English, orthographic reading tends to emerge more slowly and phonological reading seems to play a more dominant role in transparent systems. For instance, in a cross-linguistic study, Oney, Peter, and Katz (1997) compared reading responses of children at grades 2 and 5 to phonological priming in English and Turkish. Phonological priming was stronger in Turkish than English for both age groups suggesting that there is more reliance on phonological processing in Turkish. Seymour et al. (2003) also found that orthographic reading declined as transparency increased. These reports also link with the findings that children learning English rely more on semantic knowledge than children learning a transparent orthography during the early stages of reading development (Kang & Simpson, 1996).
Clearly, as transparency increases reliance on phonological processing also increases ('The orthographic depth hypothesis' Frost, Katz, & Bentin, 1987). This is because, phonological recoding yields accurate results in transparent systems and during the early stages of reading development, the writing system does not make any demands to focus on the information beyond the grapheme-phoneme levels (Goswami et al., 2003).

The observed developmental lag in orthographic strategies in transparent orthographies fits well with the dynamic systems theory, which states that change can only proceed after the system becomes unstable (Siegler, 2007). As phonological processing provides consistent positive feedback, the system is kept at equilibrium and there is little or no push for learning higher-order graphemic patterns in transparent orthographies during the early stages of literacy acquisition. Conversely, in opaque orthographies, phonological processing elicits inconsistent feedback, which weakens the dominance of phonological processing causing instability and thereby, paving the way for change in strategies and lexical representations (i.e., development of orthographic processes).

What about the role of morphosyntactic processing, which is an important dimension of orthographic processing? Even highly transparent systems require knowledge of some higher-order orthographic conventions, especially in the case of spelling. A study in Spanish found that children make use of morphosyntactic knowledge only when they are spelling the word-final <s> which is not reflected in its spoken form (i.e., ‘silent s’) (Titos, Defior, Alegria, & Martos, 2003). The use of morphosyntactic knowledge in this study emerged after grade 3, and as in English there was a tendency for more complex morphological strategies to develop later during the course of literacy development. Similar findings came from Greek (Nunes, Aidinis, & Bryant, 2006), French (Senechal, Basque, & Leclaire, 2006), and Dutch (Notenboom & Reitsma, 2007). Hence, when the phonology fails to provide information about accurate spelling, as in the case of silent morphemes,
children draw upon orthographic knowledge just as in English (for a review, see Notenboom & Reitsma, 2007).

It is notable that the observed u-shaped developmental function of the spelling of silent morphemes in English (Critten, Pine, & Steffler, 2007; Nunes et al., 1997; Steffler, 2001) has been also reported in Dutch (Notenboom & Reitsma, 2007), and pointed Hebrew (Share, 2004). This suggests that very similar processes seem to underlie the development of orthographic representations across different orthographies and links with the developmental theories of mental representations of knowledge and language (see Karmiloff-Smith, 1992; Vihman, 1996).

At this point, two important questions arise in relation to highly transparent but agglutinative systems, such as Finnish and Turkish. i) What is the role of morphosyntactic skills in agglutinative writing systems with perfectly transparent morphology? ii) How does orthographic processing take shape in an agglutinative system where the same word base can appear in hundreds of different forms [e.g., <ev-ler> (homes); <ev-ler-imiz> (our homes); <ev-ler-imiz-den> (from our homes)].

Arguably, in Finnish and Turkish there is no need for morphosyntactic knowledge for accurate reading or spelling during the early stages of literacy development. However, morphosyntactic knowledge is likely to become more important during the later stages of literacy development when the emphasis is on reading comprehension and children are increasingly faced with more complex words and sentence structures. Our preliminary findings provided some support for this hypothesis: the strength of the relationship of morphosyntactic skills with reading comprehension tended to increase with increasing age in Turkish (Babayiğit, 2007).

It is not clear how polymorphemic words are processed in agglutinative systems (see Dunabeitia, Perea, & Carreiras, 2007). It seems that in the context of agglutinated words, the differentiation
between phonological, morphological, and syntactic processes becomes even more complicated, as these are tightly intertwined within the context of a single word. It is conceivable that multiple processes are involved in the processing of complex words in agglutinative systems. Hence, orthographic and phonological processing and their distinction as conceptualised mainly in the context of monosyllabic words in English, might take a different form in the context of complex polymorphemic words.

In summary, research evidence suggests that orthographic processing tends to play a more central role during the early stages of literacy development in English than in transparent orthographies. The problems of operationalising orthographic processing and understanding the development and processing of polysyllabic and polymorphemic words outlined in relation to English, naturally extends to transparent orthographies. It is essentially for this reason that the developmental theories of reading and spelling in English with a primary focus on monosyllabic words are particularly limited in explaining the literacy acquisition in highly inflected systems, such as Turkish, Finnish, and Hungarian (see Csepe, 2006).

5.4 The role of phonological awareness in transparent orthographies

The overall research evidence into the role of phonological awareness in transparent orthographies tends to be highly contradictory. This is in sharp contrast to the findings of the studies conducted in English. Longitudinal studies, training studies, and studies on children with literacy problems have consistently reported that phonological processing skills are central for literacy development in English (Brady & Shankweiler, 1991; Snowling, 2000). Delineating two important factors, the nature of the relationship (longitudinal or cross-sectional) and literacy outcome measure, is essential for a coherent evaluation of the role of phonological awareness in transparent systems.
5.4.1 Longitudinal versus cross-sectional relationships

The ability to analyse speech sounds facilitates reading and spelling and vice versa. Cross-sectional designs allow us to evaluate whether this mutual relationship can be detected even after controlling for other important cognitive and linguistic correlates of literacy skills, such as letter knowledge, vocabulary, and verbal STM. Numerous studies based on typical populations have consistently reported reliable concurrent relationships between phonological awareness and literacy skills in transparent systems among younger as well as older children (Turkish: Babayiğit & Stainthorp, 2005; Babayiğit & Stainthorp, 2007; Czech: Caravolas, Volin, & Hulme, 2005; Finnish: Müller & Brady, 2001; Greek: Nikolopoulos, Goulandris, Hulme, & Snowling, 2006; Dutch: Patel et al., 2004).

The most striking difference between transparent systems and English emerges in the longitudinal analysis of the data. Studies, which systematically controlled for pre-existing reading skills (autoregressor) and letter knowledge in transparent systems failed to find reliable longitudinal relationships between phonological awareness and subsequent reading skills or the observed effects tended to be very small and highly volatile confined to the very early stages of reading development (de Jong & van der Leij, 1999; Holopainen, Ahonen, & Lyytinen, 2001; Wimmer, Landerl, Linortner, & Hummer, 1991).

In a series of studies, we explored the concurrent and longitudinal relationships of phonological awareness with reading and spelling from preschool through the end of primary grades in Turkish (Babayiğit, 2006). First, we conducted a 2-year longitudinal study and followed 55 children from preschool (before the onset of reading instruction) (mean age= 5.6) into grade 2. Children's reading accuracy was at ceiling level by the end of grade 1. Therefore, reading speed was used as an index of reading skills. After making adjustments for nonverbal IQ, vocabulary, STM, and letter
knowledge, the preschool phonological awareness measures failed to explain any reliable variance in later reading speed. It is notable that, in this study preschool phonological awareness emerged as the strongest and most consistent longitudinal predictor of spelling skills at both grades 1 and 2 (Babayiğit, 2006; Babayiğit & Stainthorp, 2007). We, then, conducted a cross-sectional analysis of the data. After making adjustments for vocabulary and STM, phonological awareness made unique contributions to concurrent measures of both reading and spelling at each of the five primary grade levels (mean age ranged between 6.6 - 10.3 years) (Babayiğit, 2006; Babayiğit & Stainthorp, 2005).

Hence, the overall results from this study in Turkish have clearly suggested that irrespective of the level of transparency, there is a mutual facilitating relationship between phonological awareness and literacy skills, but as the findings from longitudinal analysis suggested the possible causal nature of this relationship seems to be evident only in the case of spelling and not reading in a highly transparent orthography. This brings the discussion to the role of the nature of literacy outcome measure in the observed pattern of results.

5.4.2 The nature of literacy outcome measure

Due to ceiling levels of performance on the reading accuracy measures, studies in transparent systems often have to rely on reading speed as an index of individual differences in reading skills. Although, reading accuracy and speed are related, they also tap different component skills (Compton & Carlisle, 1994). Even in English there seems to be a tendency of phonological awareness to be more strongly related to reading accuracy than reading speed (Lovett, 1987; Savage & Frederickson, 2005). Hence, it is highly conceivable that the observed unreliable relationships between phonological awareness and reading speed in transparent systems might be further exaggerated due to this methodological artifact.
Nonetheless, clearly the facilitating effect of a simple orthography seems to override the role of phonological awareness skills in reading. In fact, it is possible to find good readers with very poor phonological awareness skills in transparent systems, such as Finnish, Spanish, and German (Carrillo, 1994; Holopainen et al., 2001; Wimmer et al., 1991). At this point, it is important to underline the word reading, as in our study, preliterate phonological awareness emerged as a strong and consistent predictor of spelling skills in Turkish. Similar findings have been also reported in Dutch, German, and Greek (Harris & Giannouli, 1999; van Bon & van Leeuwe, 2003; Wimmer & Mayringer, 2002). For example, in a study in German, Wimmer and Mayringer (2002) found that preschool phonological awareness was the best index of spelling performance assessed three years later. In this study, children with impaired phonological awareness skills turned out to have spelling problems, but not reading problems.

Spelling is considered a more sensitive index of phonological processing skills and the quality of phonological representations (Perfetti, 1997; Treiman, 1993). These findings from the transparent orthographies further corroborate this view and suggest that irrespective of orthographic transparency phonological processing skills seem to play a more central role in spelling development.

6. Conclusions

In conclusion, literacy draws upon existing cognitive-linguistic processing skills (Hulme, Snowling, Caravolas, & Carroll, 2005). Viewed in this way, the underlying basic processes are necessarily the same across the writing systems. Indeed, the research evidence from the neuroimaging studies of different languages also corroborates this view (Perfetti & Liu, 2005). However, the specific features of the orthography-language complex can make different demands on these basic processing systems and shape the functional architecture of the brain (Perfetti & Bolger, 2004).
hence the observed patterns of relationships. Without doubt, orthographic transparency is one of the central distinguishing features of a writing system that can have profound effects on the nature of print processing and literacy development.

References


