Educational Psychology in Practice,
Vol. 21, No. 4, December 2005, pp. 273–282

Synthetic Phonics and Learning to Read: A Cross-language Perspective

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Arguments about how to teach initial reading are once more in the news. Proponents of "synthetic phonics" argue that there is only one effective way to teach a child to read. In this anniversary issue, it is worth taking a step back from the polarisation of the "synthetic" versus "analytic" phonics debate, to consider the evidence base for reading acquisition across languages. Most children will eventually become competent, indeed skilled, readers of their languages, but in some languages this happens much faster than in others. There appear to be two key factors. One is the phonological complexity of the spoken language, and the other is the spelling consistency of the written language. A thorough understanding of cross-language similarities and differences in the key developmental processes for literacy acquisition is required if teaching strategies are to be optimised in different languages.

Introduction

In order to become a reader, a child needs to be able to gain access to meaning from printed symbols. Reading is essentially understanding speech written down. A child can be excellent at decoding the symbols (perhaps the child is autistic and hyperlexic), yet can have problems in comprehending what is read. A child can be poor at decoding (perhaps the child is dyslexic), yet can have excellent comprehension. To access meaning from print, the first step is to learn the code used by the culture for representing speech as a visual code. The child needs to acquire the system for mapping distinctive visual symbols to units of sound (phonology). In English, this system is the alphabet. Proponents of synthetic phonics argue that there is only one way to teach the alphabetic system, and that the failure of schools to adhere to this (and only this) teaching method is the direct cause of the slow pace at which many English children learn to read. How plausible is this argument developmentally? One way to contextualise this debate is to study the acquisition of reading across the world's languages.

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ISSN 0266-7363 (print)/ISSN 1469-5839 (online)/05/040273–10

DOI: 10.1080/02667360500344823

The efficient and automatic mapping of print to sound (sometimes called "phonological recoding"; see Share, 1995) is a critical component of reading development. Visual or holistic learning does not represent a viable alternative to phonological recoding. This is made clear in Share's (1995) paper. He compares visual learning to memorising large sections of a telephone directory:

> Like printed letter strings, telephone numbers contain a small set of symbols … Unless all numbers are dialed correctly and in the right order the connection will fail … Unfortunately, there are no systematic or predictable relationships between these strings and their corresponding entries; so each of the many thousands of such associations must be painstakingly committed to memory. There may exist a few rare individuals who are capable of memorizing entire telephone directories, but for the average child about to learn to read, the absurdity of this task should be obvious. (Share, 1995, p. 159)

Indeed, studies of learning to read in Chinese, which requires approximately 3000 characters to be memorised by rote, show that phonological awareness plays a critical role in acquisition here, too. It also takes Chinese children approximately five years to memorise these 3000 characters, but individual differences in this feat of learning are predicted by phonological awareness, not by visual memory (e.g. Siok & Fletcher, 2001).

The study of reading acquisition across different languages illustrates that there are two major constraints on the acquisition of efficient phonological recoding skills (Ziegler & Goswami, 2005). One is the phonological complexity of the language. Children acquire phonological recoding skills much faster when the phonological structure of their language follows a simple consonant–vowel (CV) structure. Languages with a simple CV syllable structure include Italian, Spanish and Chinese. The second constraint is the consistency of the symbol-to-sound mapping (Ziegler, Stone, & Jacobs, 1997). In some alphabetic orthographies, one letter or letter cluster can have multiple pronunciations (e.g. English, Danish). In others, it is always pronounced in the same way (e.g. Greek, Italian, Spanish). In some alphabetic orthographies, a single speech sound (phoneme) can have multiple spellings (e.g. English, French, Hebrew). In others, it is almost always spelled the same way (e.g. Italian). In Chinese, there may be as many as eight choices of Kanji character to represent one sound. English is an exceptionally inconsistent alphabetic language because it suffers from a large amount of inconsistency in both reading and spelling. It is relatively easy to learn about phonemes if one letter consistently maps onto one and the same phoneme, or if one phoneme consistently maps to one and the same letter. It is relatively difficult to learn about phonemes if a letter can be pronounced in multiple ways (e.g. the letter "A" in English maps onto a different phoneme in the highly familiar words "cat", "was", "saw", "made", and "car").

Comparing Reading Development Across Languages

A large-scale and carefully controlled cross-language reading comparison was conducted by the "European Concerted Action on Learning Disorders as a Barrier to Human Development". As part of this action, participating scientists from 14

European Community countries developed a matched set of items of simple real words ("ball", "boy") and non-words ("dem", "fip"). These items were then given to children from each country during their first year of reading instruction (for details, see Seymour, Aro, & Erskine, 2003). The idea was to equate the children for the degree of reading instruction received across orthography. This meant that the children varied in age; for example, the children learning to read English were aged 5 at the time of testing, whereas the children learning to read Finnish were aged 7. Although method of reading instruction itself could not be equated exactly, schools were chosen so that all children were experiencing phoneme-level "phonics" teaching (the participating schools contributing the English data were in Scotland). The results of this cross-language study are summarised in Table 1.

The data were striking. Children who were acquiring reading in languages with consistent spelling systems (Greek, Finnish, German, Italian, Spanish) were close to ceiling in both word and non-word reading by the middle of first grade, irrespective of age. English-speaking children performed extremely poorly (34% correct for words, 29% correct for non-words), and even after two years of instruction were poorer in accuracy than children learning to read consistent spelling systems (Scottish children in second grade scored 76% correct for words and 64% correct for non-words). Danish (71% correct), Portuguese (73% correct) and French (79% correct) children also showed poorer levels of accuracy than Greek and Finnish children during the first year of acquisition. This is entirely in line with the reduced orthographic consistency of these languages. Although not all experimental factors could be stringently controlled in this large study, smaller experimental studies have compared fewer languages, and have been able to match for factors like reading age and vocabulary. Such studies obtain analogous results. For example, when French, Spanish and English are

Table 1. Data (% correct) from the large-scale study of reading skills at the end of grade 1 in 14 European languages (adapted from Seymour, Aro, & Erskine, 2003)

Language	Familiar real words	Pseudo-words
Greek	98	92
Finnish	98	95
German	98	94
Austrian German	97	92
Italian	95	89
Spanish	95	89
Swedish	95	88
Dutch	95	82
Icelandic	94	86
Norwegian	92	91
French	79	85
Portuguese	73	77
Danish	71	54
Scottish English	34	29

compared, the Spanish children reach ceiling performance much faster than the French children, who in turn are faster than the English children (Goswami, Gombert, & de Barrera, 1998). When English and German are compared, the German children outperform the English children (Frith, Wimmer, & Landerl, 1998).

The evidence from these studies is that learning to read English is a more difficult learning task than learning to read Finnish, Spanish or Italian. This makes it inherently unlikely that one method of teaching phonics will suddenly cause English children to perform like Finnish children. However, it might be objected that there are many sociocultural differences across languages that are not taken into account by purely experimental studies. For example, there may be differences in school systems, curricula, teaching methods and demographic distributions. Some research designs take advantage of naturally occurring controls for some of these factors.

For example, Bruck, Genesee and Caravolas (1997) followed groups of English- and French-speaking children who were living in the same area of Canada but attending different schools. They investigated word and non-word reading at the end of grade 1, using high-frequency regular monosyllabic words and non-words. The results showed that the English-speaking children lagged behind the French-speaking children by about 27% on non-word reading and 24% on word reading, despite being in the same school system and following the same curricula. Similar findings have been obtained when comparing beginning reading in English and Welsh. In parts of North Wales, English and Welsh are spoken and read side by side. In contrast to English, however, the writing system of Welsh is highly consistent. Parents choose whether they want their child to attend English or Welsh schooling. The schools serve the same geographical catchment area, are administered by the same local educational authorities, and follow similar curricula and teaching approaches. The only real difference is in the language of instruction. Again, the data show that the Welsh-speaking children read well over twice as many words as the English-speaking children accurately, after the same amount of reading instruction (Hanley, Masterson, Spencer, & Evans, 2004; Spencer & Hanley, 2003; see also Ellis & Hooper, 2001).

Why is Reading English so much more Difficult?

The reduced consistency of the English writing system in both reading and spelling is a key factor in explaining the dramatic differences in reading acquisition across languages. The second is the phonological complexity of the syllable structure of English. English has relatively few words based on CV syllables (e.g. “cocoa”, “baby”). The most frequent syllable type is the CVC (e.g. “dog”, “cat”; see De Cara & Goswami, 2002). Many syllables have consonant clusters either before (e.g. “stop”, “straw”) or after (e.g. “hand”, “felt”) the vowel. Interestingly, English is particularly inconsistent with respect to the small reading units emphasised by synthetic phonics (letters or letter clusters corresponding to single phonemes). English is less inconsistent with respect to larger reading units, such as rimes or syllables (Treiman, Mullennix, Bijeljac-Babic, & Richmond-Welty, 1995). The rime of a syllable comprises the vowel and any consonant phonemes. Thus the rime of

"light" is "ight", and the rime of "field" is "ield". If a word has two syllables, it has two rimes. For example, "captain" and "fountain" share the rime of the final syllable, but they do not rhyme with each other.

Often, spelling patterns for rimes are consistent in pronunciation across many words. For example, there are 90 words in English with the rime spelling "ight", and pronunciation is consistent across all of them. This makes it likely that English children need to develop phonological recoding strategies at more than one "grain size" in order to become competent readers. Nevertheless, it is important to point out that there are more orthographic units to learn when the grain size is big than when the grain size is small. For example, in order to decode the most frequent 3,000 monosyllabic English words at the level of the rime, a child needs to learn mappings between approximately 600 different orthographic patterns and 400 phonological rimes. In contrast, if the child could simply learn how to map 26 letters onto 26 phonemes, the learning task would be much smaller.

Unfortunately, however, relying solely on grapheme–phoneme correspondences leads to inefficient recoding of English. There are so many irregular words that it may be difficult or impossible to access meaning by recoding letters into phonemes. The solution offered by synthetic phonics instruction is to restrict the child's access to real books, and to create special texts based solely on regular words. In contrast, young learners of relatively consistent languages can read any book that they choose by focusing exclusively on the "small" psycholinguistic grain size of the phoneme. Reading will be more rewarding, as the child will be able to read the books of their choice. Also, they will be more likely to practise reading in their free time, as the strong likelihood of achieving correct pronunciations will further reinforce the acquisition process.

Psycholinguistic Grain Size Theory

Recently, a theoretical framework has been offered for thinking about reading acquisition in different languages called "psycholinguistic grain size theory" (Ziegler & Goswami, 2005). The authors suggest that the dramatic differences in reading accuracy and reading speed found across orthographies reflect fundamental differences in the nature of the phonological recoding and reading strategies that are developing in response to the orthography. Children who are learning to read more orthographically consistent languages, such as Greek, German, Spanish or Italian, rely heavily on the type of grapheme–phoneme recoding strategies encapsulated in synthetic phonics. These strategies are highly effective, because grapheme–phoneme correspondences are relatively consistent. Children who are learning to read less orthographically consistent languages, such as English, French and Danish cannot use smaller grain sizes as easily. This is especially true for English, because inconsistency is much higher for smaller grapheme units than for larger units like rimes. As a consequence, English-speaking children develop a variety of recoding strategies, supplementing grapheme–phoneme conversion strategies with the recognition of letter patterns for rimes (rhyme analogies, see Goswami, 1986) and attempts at whole-word recognition (unique spelling patterns such as "choir" and "people" must be learned as whole

words). If children are not directly taught to use rhyme analogies, they will develop the strategy naturally (but slowly) for themselves. This is an inescapable consequence of the structure of the spelling system that they are learning to read.

There is considerable recent evidence that supports this theoretical framework. For example, studies have shown that learning to read English appears to push children into developing both "small unit" and "large unit" recoding strategies in parallel (e.g. Brown & Deavers, 1999). In one of the authors' own studies, German and English children were asked to read aloud several lists of non-words (Goswami, Ziegler, Dalton, & Schneider, 2003). One list contained familiar orthographic patterns at a large grain size ("large unit" or rhyme analogy non-words, such as "dake" ("cake", "make") and "murn" ("burn", "turn")). Another list contained only unfamiliar large unit patterns ("small unit" non-words, like "daik" and "mirn"). Notice that the intended pronunciation for both types of non-word was identical. The experimental prediction was that if a list contained only "large unit" non-words, then the exclusive application of a rhyme analogy strategy should be very successful. In contrast, if the list contained only "small unit" non-words, then recoding should be most successful if an exclusively small grain size strategy was applied. The critical prediction was for a third "mixed" list. If both types of non-word were mixed within a particular list (e.g. "daik", "murn"), continual switching between "small unit" and "large unit" processing would be required, incurring a switching cost. The data indeed revealed switching costs for the English children but not for the German children. Blocking word lists by grain size seemed to help the English readers to focus at a single grain size. This increased recoding accuracy, particularly for large-unit items such as dake (here the child can use rhyme analogies to "make", "cake", "bake", etc.). German readers did not show these "blocking" effects. The absence of a blocking effect for the German readers was taken as evidence that they already relied exclusively on processing at the small grain size level.

Similar conclusions come from studies on children's ability to read aloud "sound-alike" non-words, so-called pseudo-homophones (e.g. "faik"). It has been shown that English children show much stronger influences from whole-word phonology than German children of the same reading age (Goswami, Ziegler, Dalton, & Schneider, 2001). That is, English children show a significant advantage in naming pseudo-homophones in comparison to orthographic control non-words (e.g. "faik" is read better than "daik"). German children do not. This result suggests that English children are more affected by whole-word phonology when reading non-words than German children. German children decode non-words that do not sound like real words as efficiently as non-words that do sound like real words. English children are better with non-words like "faik", which do sound like real words. This shows the influence of whole-word phonology in reading efficiency in English.

Assessing the role of teaching

Interestingly, there is little debate about how to teach initial reading in alphabetic orthographies with consistent spelling systems. Typically, the teacher begins to teach

reading from the single letter. The child is taught letter–sound correspondences, and hence learns about phonemes. The child rapidly becomes a highly accurate reader. However, this teaching sequence is not ubiquitous. In Turkish, literacy instruction does not capitalise on the high degree of orthographic transparency. In first grade, children are given sentences to memorise. They only receive instruction on individual components such as words, syllables or letters following successful rote memorisation. Despite this "large to small" grain size method, children usually receive their "red ribbons" symbolising good decoding skills by December or January of the first school year (see Durgunoglu & Oney, 1999). The teaching methods characteristic of early literacy instruction in Turkish suggest that the impact of different teaching regimes is relatively minor for highly consistent orthographies (at least, for children with normal phonological skills; see Ziegler & Goswami, 2005).

Small grain size teaching methods work less well in languages with less consistent letter–sound correspondences, such as English. One approach to this teaching problem has been to begin the teaching of reading at younger and younger ages, and to focus more and more at the phoneme level. In England itself, this approach is formalised in the *National Literacy Strategy* (DfEE, 1998), which requires the direct teaching of reading from the age of 5, beginning with a phoneme-based strategy. This is later supplemented with rime-based tuition, but the emphasis on phoneme-level phonics remains strong. Nevertheless, the proponents of synthetic phonics claim that this is not enough. England does not do well in many international comparisons. Indeed, as documented above, English children learn to read more slowly than children from other countries. For example, Finnish children begin school at 7, and are reading with 90% accuracy by approximately the tenth week in school (Seymour et al., 2003). English children who begin school at 4 or 5 years of age are still struggling to reach 90% accuracy (e.g. for non-word recoding) by age 9 or 10 (Goswami et al., 1998).

Could the slower average rate of learning to read in English be due to the fact that many schools do not rely exclusively on synthetic phonics? This seems unlikely. It is more plausible to conclude that the slower rate of acquisition arises from the relatively low orthographic consistency of English. This is shown, for example, by the English/Welsh comparison described earlier (Ellis & Hooper, 2001). Converging data comes from Landerl (2000)[1]. She compared English children who were being taught to read by a "standard" mixed method of phonics and whole-word recognition with English children following a synthetic phonics programme (this was a between-school comparison conducted before the advent of the National Literacy Strategy). She reported that the first-grade English phonics children made almost as many errors on a non-word reading task (43%) as the first-grade English standard children (50%, a non-significant difference). This was compared to 12% errors for a matched German sample. At second grade, a similar pattern was found (English standard = 29% errors, English phonics = 23% errors, German children = 13% errors). It was only by third grade that the English phonics children (7% errors) were comparable to the German children (14% errors), and by fourth grade that the English standard children reached a "German" level of grapheme–phoneme recoding skill (12% errors compared to 11% for the Germans).

A different approach to exploring the optimal grain sizes for teaching reading in English has been to begin instruction with correspondences for the "large" units that are readily available in the phonological domain, such as rimes or syllables. As noted above, this approach requires the child to learn a relatively large number of fairly complex letter combinations. Nevertheless, such a "large unit" approach to teaching appears to lead to broadly similar progress in reading English as "small unit" approaches. Recently, Walton and his colleagues (Walton, Bowden, Kurtz, & Angus, 2001a; Walton & Walton, 2002; Walton, Walton, & Felton, 2001b) compared the effectiveness of "large unit" and "small unit" approaches to the initial teaching of reading to children in Canada. In these studies, they compared the effects of teaching beginning readers to read by using a "rhyme analogy" strategy ("beak" – "peak"; see Goswami, 1986) with the effects of teaching beginners to read by using a grapheme–phoneme recoding strategy. All the children were pre-readers. Reading ability was assessed following three months of training, and four different kinds of word were used to assess different skills (analogy – irregular patterns ("fight–sight"), analogy – regular patterns ("bed–ted"), letter recoding ("bat–bet") and non-words ("hib")). Walton et al. (2001b) found that both training groups showed broadly equal reading acquisition gains immediately following training. When reading acquisition was followed up longitudinally, both treatment groups maintained their gains over an unseen control group, but the rhyme analogy group scored significantly above this group on all four of the reading outcome measures, whereas the letter recoding group only scored significantly above this group on two of the four outcome measures.

A third approach has been whole-word teaching (the so-called "look and say" methods of reading in and out of vogue since the 1950s). In whole-word teaching, children are taught to recognise words as holistic units, for example via the use of flash cards (the whole word is "flashed" at the child, who must learn a pattern–sound correspondence). "Look and say" methods were shown to result in slower learning than any phonics-based methods (irrespective of grain size) by the work of Chall and others in the 1970s (e.g. Chall, 1967). Exactly the same conclusion was reached recently by the National Reading Panel (2000) study of early reading in the USA. The National Reading Panel also compared the effect sizes reported for "large unit" versus "small unit" phonics teaching using a meta-analysis of relevant studies. The meta-analysis showed that the impact of early "large unit" teaching versus early "small unit" teaching was statistically indistinguishable. Both methods worked equally well. Each type of phonics teaching had a significant impact on reading development (see Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001). This meta-analysis supports the experimental findings obtained by Walton and his colleagues.

Conclusion

Given the weight of the available evidence, scientists agree that all three approaches to teaching reading discussed above have a role to play in developing efficient word recognition for children learning to read relatively inconsistent orthographies like English (see Rayner et al., 2001). For English, some words have to be learned as

distinct patterns (e.g. "choir", "people", "yacht"), because they have no orthographic neighbours at all. Other words, such as "light", contain rime spellings that are common to many other words. Still other words are quite consistent for letter–phoneme recoding ("cat", "dog", "pen"), and are easily recoded by synthetic phonics. Nevertheless, small grain size teaching works especially well in languages with consistent letter–sound correspondences. English is not such a language.

Rather, English is the most inconsistent language in the world in terms of the consistency of letter–sound correspondences. This makes it likely that the approach to successful tuition for reading in English will be different from the approach required for a consistent spelling system such as German, even though English and German have a very similar phonological structure (both have complex syllables that permit multiphoneme onsets and codas, e.g. "string", "Pflaum"). It also raises the interesting possibility that the prominent dual route architecture (i.e. two separate routes to pronunciation in the skilled reading system, one going directly from print to meaning, and one going from print via sound to meaning; see Coltheart, 1978) may in fact only develop for English. Readers in other languages may always use the "indirect" route (from print to sound to meaning). This is a particularly striking idea given the large number of studies of reading conducted in English, and the influence that theoretical models of reading in English have had on models in other languages. It is time to turn the spotlight away from the endless debate about which type of phonics is optimal. Rather, it is necessary to recognise that English, unlike many other world languages, has orthographic consistencies that can be exploited either at the phoneme level or at the rime level, and that these levels are complementary. It is time for a balanced approach to phonics (Cook, 2002).

Note

1. See Study 2. The data reported in Study 1 was not collected by Landerl herself, but by the school.

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