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Research on bilingualism and writing systems is a recent enterprise, as shown by the appearance of a chapter devoted to the topic in this new edition of the *Handbook*. Interest in the topic is due to various reasons, from the theoretical interests of psychologists working on the universality of models of reading, to the practical concerns of educators dealing with bilingual children acquiring literacy in a second language.

Users of different writing systems differ in reading, writing, literacy acquisition, metalinguistic awareness and non-linguistic cognition. This leads to the question of how knowledge of more than one writing system affects biliterate bilinguals, that is, speakers of more than one language who are literate in more than one languages. This chapter will introduce some basic concepts and will then overview two topics: first, bilinguals' reading, writing and learning of writing systems; second, the metalinguistic and cognitive consequences of biliteracy. The main idea behind the chapter is that knowledge of two writing systems changes bilinguals' minds, and that biliterates differ from monoliterates.

BASIC CONCEPTS AND TERMINOLOGY

Writing systems

Each language is written with its own writing system, e.g. the French writing system or the English writing system (for a more detailed treatment of the issues that are going to be described in this section, see Coulmas, 2003). In different writing systems *graphemes* (smallest units of a writing system) represent different units of language: in general, English graphemes represent phonemes (e.g., the grapheme <sh> represents the phoneme /ʃ/), Chinese graphemes represent monosyllabic morphemes (e.g., 冬 represents the morpheme 'winter', pronounced /tuŋ/); Arabic graphemes represent consonants (e.g. ك represents /k/). Writing systems can then broadly be morphemic, syllabic, consonantal or alphabetic. The set of graphemes used to represent a language is a script, e.g. the roman alphabet is the set of roman alphabet *letters*, the Chinese script is the set of all *hanzi* ('Chinese characters'). The same script can be used to represent different languages, for instance the roman alphabet is used to represent both the English and Italian languages, but with different correspondences between orthography and phonology, e.g. <ch> represents /k/ in the Italian writing system (e.g., <china> = /kina/), but in English it represents /tʃ/ (<china>), /ʃ/ (<machine>) and /k/ (<chaos>) among others. In alphabetic writing systems these are called *grapheme-phoneme correspondences* (GPCs), and in the opposite direction *phoneme-grapheme correspondences* (PGCs).

Apart from differences in the language units represented by their graphemes, writing systems also differ in levels of *phonological transparency* (also called 'orthographic depth') and *morphological transparency*, as they provide more or less phonological and morphological information. Across different types of writing systems, alphabetic writing systems are more phonologically transparent than consonantal ones (because the latter do not represent vowels whereas the former do), but less morphologically transparent than morphemic writing systems. Within alphabetic writing systems, Italian and Spanish are more phonologically transparent

than English, but English is more morphologically transparent; for instance, in English /sam/ is spelled as <sign> with a <g> to represent the common morpheme with <signature>, whereas Italian spells <segno> with <e> and <significato> with <i>, representing their pronunciations /'sep:o/ and /sɪ:ɪfi'kato/ and ignoring their morphology.

Different writing systems are read, written and learnt differently (e.g., see Joshi & Aaron, 2005). For instance, child learners of alphabetic writing systems need the ability to segment spoken language into phonemes, whereas Chinese children need the ability to identify morphemes. The level of phonological transparency of an alphabetic writing system affects reading and spelling: according to the Orthographic Depth Hypothesis (Coltheart, Curtis, Atkins, & Haller, 1993), users of phonologically opaque alphabetic writing systems rely more on whole-word units for reading and spelling (the 'lexical route' in the 'dual route model' of reading and writing), and readers of transparent alphabetic writing systems rely more on grapheme-phoneme conversions for reading and phoneme-grapheme conversions for spelling ('sublexical route'). According to the 'grain size' theory (Ziegler & Goswami, 2005), phonologically transparent alphabetic writing systems are read by decoding graphemes into phonemes, whereas opaque ones require reliance on longer units of orthography or language. For instance, reading and spelling English involves decoding and encoding graphemes (<cat> = /kæt/), rimes (<ought> = /ɔ:t/), morphemes (/t/ = <ed>) and words (/sʌn/ = <sun>, <son>). Given the abundant evidence that users of different writing systems read and write differently, the question then is how biliterates read and write.

Research on bilingualism and writing systems

Book chapters and journal articles devoted to the topic of bilingualism and writing systems have been increasing dramatically since the pioneering work of the 90s: the past decade saw the appearance of dedicated edited volumes (Cook & Bassetti, 2005b; Koda & Zehler, 2007), journal special issues (Geva & Verhoeven, 2000) and meta-analyses (August, 2008); the first two years of this decade saw the publication of one journal special issue a year (Cook, Vaid, & Bassetti, to appear in 2012; Deacon & Cain, 2011).

Research on bilingualism and writing systems is rapidly emerging, thanks to recent changes in various disciplines and in the composition of school populations. Among linguists there is new interest in writing systems, as the discipline moves beyond the supremacy of spoken language advocated ever since De Saussure. Psychologists have embraced cross-orthographic research to supplement previous English-based studies of reading and writing processes. Educators have moved beyond the holistic view of reading promoted by Kenneth Goodman that dominated the field into the 90s. The important presence of an interdisciplinary research community is testified to by the launch of the dedicated interdisciplinary journal *Writing Systems Research* in 2009. Researchers are interested in bilingualism and writing systems due in large part to the practical considerations of teaching literacy to bilingual children for whom the school language is not the first language, most notably in the US with its large number of Hispanic speakers. According to a poll of experts, 50% of children around the world are first acquiring literacy in a language other than their L1 (McBride-Chang, 2004). Then there is the large number of people who learn to read more than one language later, as part of their education or in adult life. All these biliterates need good knowledge of their writing systems. It is now

accepted that fast and efficient encoding and decoding is crucial to reading and writing. In the currently fashionable ‘simple model of reading’ (Gough & Tunmer, 1986), for example, poor readers are often those with inadequate language comprehension or with inadequate word reading skills, meaning that sufficient language knowledge is not enough to be a good reader in the absence of solid decoding skills. Indeed, research shows that L2 decoding skills account for part of L2 reading variance (e.g., Nassaji & Geva, 1999). Although reading and writing partly involve the same processes in all languages, and good readers in one language tend to be good readers in another, bilinguals’ reading and writing processes are partly writing-system-specific (the ‘script-dependent hypothesis’, Geva & Siegel, 2000).

Terminology and definitions

Bilinguals who know one writing system are *monoliterate bilinguals*; those who know more than one are *biliterate bilinguals*. Since each language has its own writing system, a biliterate knows more than one writing system: e.g., a French-Spanish biliterate knows the French and Spanish writing systems. More detailed distinctions are possible. A *biscriptal* knows more than one script: e.g., both a Chinese-English biliterate and an English-Greek biliterate are biscriptal since both know two writing systems with different scripts, whereas an English-Italian biliterate is not biscriptal but monoscriptal because both the English and the Italian writing systems use the roman alphabet. A writing system that represents a chronologically second language is called a ‘second language writing system’ (Cook & Bassetti, 2005a); literacy in a chronological second language is ‘second language literacy’ or ‘sequential biliteracy’ (the antonym being ‘simultaneous biliteracy’). The term ‘biliteracy’ also includes ‘triliteracy’, ‘quadriliteracy’ and ‘multiliteracy’. These more specific terms can be used instead of the generic ‘biliteracy’ when the distinction is relevant. However, one should bear in mind that the general field of writing systems research still does not have a unified terminology, so that different terms are used by different investigators for the same phenomenon, or the same terms are used with different meanings (most notably, what is here called a ‘writing system’ is often called an ‘orthography’), and this confusion is carried over to the field of biliteracy.

Research on bilingualism and writing systems can contribute to the wider debate about the definition of ‘bilingual’, by adding the written dimension to it. Laypersons’ definitions of ‘bilingual’ often focus exclusively or primarily on spoken language, as in the online Oxford English Dictionary definition: ‘speaking two languages fluently’. Bilingualism researchers can also fall prey to the same preconception: in a recent Google Books search for ‘definition of bilingualism’, the second book listed stated: ‘Bilingualism is the ability to speak two languages’ (Teipelke, 2008, p. 2), a definition that might suit the book’s target audience of educators but is not suitable for bilingualism researchers. If someone can only speak English but can read French novels, they can hardly be considered monolinguals. The secondary role attributed to reading and writing is largely a consequence of the widespread idea of the primacy of spoken language, whose basic tenet is that spoken language is innate in all human beings, whereas written language is only learnt through instruction and is not universal. However, this tenet does not apply to instructed sequential bilinguals, who rarely acquire a native-like pronunciation in their second language but can acquire native-level spelling skills, who are often instructed in L2 pronunciation but not in L2 orthography, and whose L2 input and output are often written from the very beginning and in large amounts. Attrition also differs across modalities: the ability to write L1 graphemes may attrite very quickly (see Sun, Morita, & Stark, 1985, for

Chinese-English bilinguals), while such a fast attrition is unlikely to affect L1 phonemes. Finally, once the written dimension is added to the picture, measurement of bilingualism should also include additional skills. Just as bilingualism researchers should consider not only the 'four skills' that monolinguals have, but also those skills that only bilinguals have -- such as interpreting and code-switching -- biliteracy researchers should consider the use of writing systems in the bilingual-specific skills of translation and written code-switching, for instance looking at the use of punctuation in translation. Research on bilingualism and writing systems then can contribute to current theories of bilingualism, including the very definition of 'bilingual'.

Methods

The methods used to investigate bilingualism and writing systems include various quasi-experimental comparisons of biliterates with different writing-system combinations (e.g. Chinese-English vs. Spanish-English) or of biliterates and monoliterates, performing tasks such as reading or spelling words or pseudowords (made-up words that conform to orthotactic rules) and lexical-decision tasks (deciding whether a string of graphemes is an existing word in one or the other writing system of the biliterate). Researchers also use standard reading and spelling tests, analyses of naturally-occurring or elicited errors, self-paced reading tasks, computer simulations, eye-tracking, brain-imaging, qualitative methods and metalinguistic awareness tasks (for an overview of methods, see Cook & Bassetti, 2005a). Reflecting trends in psychological research, reading is studied far more extensively than writing. The most studied L2 writing system is English; among L1 writing systems, Spanish and Chinese are increasingly widely studied, and researchers have also looked at Arabic, Hebrew and Japanese among others.

READING AND WRITING MORE THAN ONE WRITING SYSTEM

This section discusses bilinguals' reading and writing of more than one writing system. It introduces the issues facing bilinguals learning more than one writing system (whether simultaneously or sequentially), and shows that a first language writing system affects the reading and spelling of a later-learned one.

The acquisition of biliteracy

In some respects, learning one writing system after another, or simultaneously with another, is not different from learning it as a first or only writing system, because the characteristics of the writing system affect all learners. For instance, learning to read Chinese involves learning thousands of hanzi, whether it is an L1 or an L2; learning to read is faster with a phonologically transparent writing system than with an opaque one (Geva, 1999); both L1 and L2 readers of English have difficulties if spacing between words is removed (Kohsom & Gobet, 1997). On the other hand, biliteracy acquisition also *differs* from monoliteracy acquisition. Those learning more than one writing system may only need to understand how writing systems work once for all their writing systems; and skills acquired through one writing system can be used to read and write another. Importantly, the positive effects of biliteracy depend on the relationship between the writing systems involved.

Learners of a second language writing system may be facilitated in 'breaking the code', i.e. in understanding how the new writing system works. Acquiring literacy involves learning to relate a writing system and a language. Therefore, those who are already literate are facilitated: they need not learn that writing systems represent

language; and, if their new writing system is similar to their first one, they may already know which units their new writing system represents and how. Research shows that it is easier to learn a new writing system that works according to the same principles as a previously-known one: for instance a morphemic artificial writing system is learnt more easily by native users of a morphemic writing system than by native users of an alphabetic one (Ehrich & Meuter, 2009).

If the two writing systems involved differ, those acquiring biliteracy, whether simultaneously or sequentially, may need to learn different things, depending on the characteristics of the writing systems: the principles of different types of writing systems (e.g. a morphemic and a phonemic one in the case of Chinese and English); different scripts (e.g. the Cyrillic and Roman alphabets in the case of Russian and English); different levels of phonological or morphological transparency (e.g. an English literate needs to learn that Spanish is more phonologically transparent than English; a Spanish literate needs to learn that English can represent morphemes rather than their pronunciation).

With regards to bilingual children, some (mostly monolingual) schoolteachers fear that learning to read more than one writing system may negatively affect literacy acquisition, as children may get confused (Kenner, Kress, Al-Khatib, Kam, & Tsai, 2004). Findings reveal that the opposite is true: very young children can differentiate their writing systems and describe how they work (Kenner, 2004). This debate about biliteracy reflects the debate about whether bilingualism can harm children. Currently most researchers agree that bilingualism does not confuse children, and some even believe that monolingualism harms children as it prevents them from developing their full potential (Meisel, 2008); similarly, biliteracy researchers have also argued for 'the importance of enabling early access to biliteracy' (Kenner et al., 2004, p. 125).

A crucial and solid finding is that reading skills developed in one writing system can be used to read and spell another one (Koda & Zehler, 2007). This is a central issue in debates about the best way to teach literacy to bilingual children. On the other hand, the positive effects of biliteracy depend on the similarity of the writing systems, especially the language units they represent and their respective levels of transparency. A recent meta-analysis revealed that children's L1 and L2 decoding skills correlate particularly if both writing systems are alphabetic (Melby-Lervåg & Lervåg, 2011). Knowing a more phonologically transparent phonemic writing system improves children's English pseudoword reading and word spelling, but literacy in a different type of writing system such as the morphemic system of Cantonese does not help (Bialystok, Luk, & Kwan, 2005; Lau & Liow Rickard, 2005). Learning a writing system that is more transparent than that of English for one hour a week improves English children's word reading (Yelland, Pollard, & Mercuri, 1993), and the positive effects are still present at age 13 (D'Angiulli, Siegel, & Serra, 2001). These are important findings with regards to the education of minority children, which especially in the US is a political as much as an educational issue. On the other hand, these findings may not generalise across children acquiring biliteracy in other languages, as it may be that biliteracy involving a more transparent writing system only facilitates English literacy due to the peculiar nature of the English writing system.

Cross-orthographic influences in biliterates

Once biliteracy has been acquired, the next question is how biliterates read and write. The most widely studied aspect of bilingualism and writing systems are the effects of using one writing system on the reading and writing processes of another

one. In the field this phenomenon is often called ‘transfer’ or ‘cross-linguistic influence’. In this chapter the term ‘cross-orthographic influences’ is preferred, to distinguish effects of writing systems from effects of language. For instance, an Italian-English biliterate may spell <thermometer> as <termometer> because the L1 phonology does not have the phoneme /θ/, but may spell <injury> as <ingiury> because in Italian /dʒ/ is spelled <gi>; the former is an effect of spoken language, the second of written language. Sometimes both factors are involved: if Japanese ESL learners add a <u> after the closed syllable in <animal> (<animaru>), this could be due to the addition of epenthetic /u/ in the spoken language, to the addition of the letter <u> in English loanwords in romanised Japanese (e.g., <gasu> for ‘gas’), or to both (Okada, 2005).

It is now well-known that the reading and writing processes of an L1 writing system affect reading and writing in a later-learned writing system. This arguably obvious phenomenon has attracted much attention and has been studied intensively across a number of language pairs, of which English is usually one, typically by comparing English word reading across groups of ESL readers with different types of L1 writing systems. There is now abundant evidence that L2 readers are affected by their L1 writing system, so that for instance Spanish and Chinese ESL learners read English words differently (for a review, see Koda, 2005). Results show: first, that biliterates are facilitated when their two writing systems are similar; and second, that the reading and writing processes of the L1 writing system affect L2 reading and writing.

Biliterates are facilitated when their writing systems are of the same type, for instance both alphabetic (Haynes & Carr, 1990) or both morphemic (Yang, 2000), compared with those with a combination of different types of writing systems, and much research shows that alphabetic native readers outperform morphemic native readers in English word reading (e.g., Koda, 1988). There is even evidence that the same person can read the same L2 faster if it is written with a writing system similar to that of their L1 than if it has a different type of writing system, as in Chinese readers of Japanese who are faster with syllabic kana than with alphabetic romaji (Tamaoka & Menzel, 1994) because Chinese represents monosyllabic morphemes; native readers of English and French were faster with romaji.

L1 reading and spelling processes affect L2 reading and spelling also when the biliterate’s two writing systems are different. In terms of the Orthographic Depth Hypothesis, how much people rely on the lexical or sublexical route for reading or writing an L2 writing system depends on which route is mostly used for their L1. For instance, Spanish-English readers are more disrupted by the task of reading letter sequences that would be unpronounceable in English (Koda, 1987) and are more adept at reading English pseudowords than Japanese-English readers (Haynes & Carr, 1990); Korean-English readers rely more on phonological processing for reading English words than Chinese-English readers do (Wang, Koda, & Perfetti, 2003). While most research has looked at readers of L2 English, the L1 writing system also affects readers of non-alphabetic L2 writing systems: native users of alphabets such as English readers are facilitated when a phonetic radical provides information about the pronunciation of morphemic graphemes such as those of Chinese (Mori, 1998); consonantal native readers tend to ignore vowels in English words (Ryan & Meara, 1991).

The evidence shows that L1 literacy affects reading and writing in an L2 writing system. However, biliterates are not the passive victims of transfer from their L1 to their L2 writing system, but can use their L1 as a strategy. Much research shows that

ESL learners use L1 phoneme-grapheme conversion rules and orthotactic rules to spell L2 words, e.g. spelling <ship> as <sip> because in L1 Welsh /ʃ/ is spelled as <si>; the use of L1 orthographic rules to spell L2 English is widely documented (Luelsdorff, 1986; van Berkel, 2005).

It then appears that characteristics of writing systems affect biliterates – in particular, affecting how easy L2 literacy acquisition is, and how a later learnt writing systems is read. At the same time, biliterates are not passive victims of their writing systems, but can use them for their own purposes. There is more to biliteracy than first language writing system transfer.

BEYOND CROSS-ORTHOGRAPHIC EFFECTS: HOW BILITERATES DIFFER FROM MONOLITERATES

A biliterate is not two monoliterates in one person, just like a bilingual is not two monolinguals in one person. The notion of multi-competence, originally proposed twenty years ago by Vivian Cook for second language acquisition, has recently been extended to research on bilingualism and writing systems (Cook & Bassetti, 2005a). Multi-competence proposes that biliterates have different uses and knowledge of their languages and writing systems from monoliterates, and have an integrated system in which their writing systems coexist. This section reviews some differences between biliterates and monoliterates.

Positive effects on the use of writing systems

Biliterates can use their writing systems differently from, and even better than, monoliterate native users. They can outperform monoliterate native users of a weak second language, for instance English learners of Chinese can read faster than native readers when Chinese is romanised and therefore provides no morphemic information (Bassetti, 2009); ESL learners can be more accurate than English native readers in deleting word-final silent letters <e> (Cook, 2004). While the usefulness of such abilities is debatable, there is evidence that biliteracy may have useful effects, for instance it may improve literacy in a first language. Those who learnt a second language writing system as a school subject for one hour a week can outperform monoliterate peers in L1 reading and spelling, in the early stages of literacy acquisition (Yelland, Pollard, & Mercuri, 1993) and up to secondary school (D'Angiulli et al., 2001). Although this effect may be limited to native readers of English who learnt a more transparent writing system, it shows that cross-orthographic effects can be positive, and can occur from the L2 to the L1 writing system, as well as vice versa.

Creative uses of writing systems

Biliterates can use their writing systems differently from monoliterates, whether for practical reasons, for fun, to assert identity and so on. For instance, a Japanese-English biliterate can use *furigana*, moraic graphemes that are written above a kanji to represent its pronunciation, to note the pronunciation of English words (Okada, 2005); a German-Italian bilingual child can use L1 German phoneme-grapheme correspondences to spell unknown L2 Italian words (Schmid, 2005). Knowledge of more than one writing system can be used to solve practical problems. With the emergence of Computer-Mediated Communication at a time when computers could only cope with the roman alphabet, computer users had to romanise languages that were written with other scripts. This resulted in creative uses of the roman alphabet by biliterates who used a variety of ways of representing their own language, for

example using L2 English GPCs to spell their first language (e.g., using <th> to replace theta in Greek, Androutsopoulos, 2009); this also applies to unwritten languages, e.g. using (English) <j> to represent a post-alveolar affricate in Cypriot Greek (Themistocleous, 2010).

Bilinguals can use their knowledge of more than one writing system not only for practical issues, but also for humorous purposes, or to affirm identity. For instance, Italian-Sardinian bilinguals can affirm their identity by avoiding Italian GPCs in spelling Sardinian, and instead borrowing GPCs from L3 English (Depau, under review); young Germans can use English graphemes and GPCs in German as a mark of subcultural identity (Androutsopoulos, 2000). Bilinguals can play with writing systems, for instance using Chinese characters to represent the phonology of English or other languages (Su, 2003); Russian immigrants in the US can use lettered phone numbers with both cyrillic and English GPCs to advertise their services (e.g., 1-800-DOKTOP, where <P> corresponds to /r/ in cyrillic, Angermeyer, 2005; for more on written code-switching, see Sebba, Mahootian and Jonsson, to appear). The ultimate form of creative use of writing systems is probably the creation of new writing systems. New writing systems are often created by bilinguals, who often adapt the roman alphabet and the orthographic conventions of their L1 to represent previously unwritten languages: L1 GPCs determines whether in new writing systems /j/ is spelled <j> or <y> (Sebba, 2009); and L1 orthographic conventions help determine word boundaries when devising writing systems for previously unwritten languages (Van Dyken & Kutsch Lojenga, 1993).

Learning an additional writing system

Biliteracy can facilitate the learning of an additional writing system. Although the term ‘biliteracy’ includes literacy in more than two writing systems, trilateracy may differ from biliteracy, and L3 writing system acquisition from L2 writing system acquisition. Research on the effects of biliteracy on third language literacy is recent and limited, but there is evidence that, just like bilingualism facilitates L3 learning, so biliteracy facilitates L3 writing system learning (this is different from the generic positive effects of biliteracy versus monoliteracy in bilinguals’ learning of a third language). This is an important issue, because learning more than two writing systems is common, as many children learn English as an L3 writing system (e.g., Catalan-Spanish children in Spain, Arab-Hebrew children in Israel), and many adults continue learning written languages throughout their lives. Studies that aimed at disentangling the contributions of bilingualism and biliteracy to L3 literacy found that biliterate children outperform monoliterate bilinguals in L3 English word and pseudoword reading and spelling; although this may be a consequence not of biliteracy but of similarities between the two writing systems involved (Errasti, 2003; Schwartz, Geva, Leikin, & Share, 2007).

The simultaneous activation of two writing systems

In the mind of a biliterate, two or more writing systems coexist. This means that when a biliterate is reading or writing one language, the writing system of another language may also be activated. There is evidence that the grapheme-phoneme correspondences and the orthotactic rules of both writing systems are simultaneously active in biliterates: biliterates are slower at lexical decision tasks with words that are legal (conforming to phonotactic constraints) in both their writing systems than with words that are only legal in one (Altenberg & Cairns, 1983); the legality of a word in one writing system speeds up lexical decision tasks with words of the other language

(Muljani, Koda, & Moates, 1998); biliterates' lexical decisions are more difficult with words containing rimes that are pronounced differently in their two writing systems (Jared & Kroll, 2001); although the level of activation, or indeed whether both writing systems or only one are activated, may depend on various factors (Goetry, Kolinsky, & Mousty, 2009).

The biliterate brain

More evidence for differences between biliterates and monoliterates comes from neuroimaging studies, which show that the reading networks in biliterates' brains adapt to the needs of reading more than one writing system. Sequential biliterates differ from native readers of their later-learned writing system because they show the same activation patterns for reading their L2 as for their L1 (Tan, Spinks, Feng, Siok, Perfetti, Xiong, Fox, & Gao, 2003). This may depend on age of onset of biliteracy (Tham et al., 2005), reading proficiency (Das, Padakannaya, Pugh, & Singh, 2011), and characteristics of the writing systems involved (Perfetti & Liu, 2005); the interesting thing is that biliteracy can result in changes to the neural structures that support reading (the 'system accommodation hypothesis', Perfetti & Liu, 2005), and that effects appear after relatively short periods of exposure to a second language writing system (Perfetti, Liu, Fiez, Nelson, Bolger, & Tan, 2007).

Conclusion

In conclusion, biliterates differ from monoliterates in their use of writing systems. The next section explores how biliterates differ from monoliterates in their knowledge of writing systems and languages.

WRITING SYSTEMS AND METALINGUISTIC AWARENESS IN BILINGUALS

This section explores aspects of bilinguals' metalinguistic awareness that are related to their knowledge of one or more writing systems. Literacy in different writing systems is linked to awareness of different units of language. This means that people literate in different writing systems analyse the spoken language in different units, depending on what their writing system(s) represent. Biliterates can then develop metalinguistic awareness of different language units from monoliterates, depending on which writing systems they know.

Literacy affects how people analyse and manipulate those language units that are represented in their writing system(s). A written language provides a permanent visual description of a language, by segmenting language into units (e.g., written English segments the stream of spoken language into phonemes), representing some aspects of language but not others (e.g., written English marks word boundaries but not morpheme boundaries), or representing aspects of a language that are not represented in its spoken modality (e.g., written English represents the past tense morpheme as <ed>). Users of different writing systems then require awareness of different language units: phonemes for alphabets, syllables for syllabic writing systems, and morphemes for morphemic writing systems.

Metalinguistic awareness differs from the ability to use the language. Children need to distinguish two lexical items that differ in one phoneme from a very early age, but they only need to segment words into phonemes when they start to acquire alphabetic literacy. Phonemic awareness (the ability to identify and manipulate phonemes) co-occurs with the onset of alphabetic literacy, although researchers debate whether it is a prerequisite, a correlate, or a consequence of alphabetic literacy

acquisition. Literacy in different writing systems then requires awareness of those units of language that are represented in the writing system, and at the same time fosters such awareness. For instance, children acquiring an alphabetic writing system need to be able to segment speech into phonemes, but phonemic awareness is not needed to read non-alphabetic writing systems, and it does not develop in illiterates or non-alphabetic readers. The orthographic representation of a language can then affect monolinguals' performance on metalinguistic awareness tasks. This effect of literacy on metalinguistic awareness, together with the effects on thinking and perception discussed in the next section, can be called 'orthographic relativity', in analogy with linguistic relativity, except that the origin of the effects are specifically in written language, rather than in language (in any modality).

Biliterates then have two permanent visual representations of two languages, and monoliterate bilinguals have one visual representation of one of their languages that they can use to analyse their other language. Research findings reveal some general characteristics of metalinguistic awareness in biliterate and monoliterate bilinguals. First, bilingualism does not facilitate the development of those aspects of metalinguistic awareness that only emerge concurrently with literacy in a specific writing system, such as phoneme or word awareness. Second, once an aspect of metalinguistic awareness is developed through exposure to the orthographic representation of one language, this awareness can then be applied to another language, even in the absence of literacy in that language. Finally, the facilitative effects of biliteracy are modulated by how transparently the specific units of language involved are represented in the bilinguals' writing systems. Much research on bilinguals' metalinguistic awareness has concentrated on those aspects that are relevant to the acquisition of literacy in English; therefore much research investigates phonemic awareness, although there is also research on other aspects of phonological awareness, word awareness and morphemic awareness.

Phonemic awareness

Much research looked at phonemic awareness in bilingual children, for a number of reasons: it is crucial for literacy acquisition in English, it is more difficult to acquire than other aspects of phonological awareness, it does not develop in the absence of alphabetic literacy. Phonemic awareness is tested with a variety of tasks, such as phoneme deletion (say 'smack' without /s/) and phoneme counting (how many sounds in 'pitch'; see Cook & Bassetti, 2005a).

Preliterate bilingual children are not better than preliterate monolinguals in phonemic awareness tasks (Bialystok, Majumder, & Martin, 2003; Navas, 2004). Studies that tried to establish the respective effects of bilingualism, literacy and biliteracy found that phonemic awareness only develops with alphabetic literacy (e.g., Bruck & Genesee, 1995). However, after the onset of alphabetic literacy bilinguals may have an advantage over monolinguals. Loizou and Stuart (2003) compared phonemic awareness in monoliterate and preliterate bilingual and monolingual children: the monoliterate bilinguals outperformed the literate monolinguals, but the preliterate bilinguals did not outperform preliterate monolinguals. Also, biliteracy facilitates phonemic awareness in native users of a phonologically opaque writing system who learn a more transparent one, but has no effects on native users of transparent writing systems who must learn an opaque one: Greek-English biliteracy facilitates phonemic awareness in English but not in Greek (Loizou & Stuart, 2003). Biliterate children with a phonologically transparent phonemic writing system outperform English monolingual children, but Cantonese-literate bilinguals do not

(Bialystok et al., 2005), confirming that phonemic awareness does not improve with bilingualism, and that biliterates only outperform monoliterates if their other writing system is more phonologically transparent. Biliterates who learnt an alphabetic L2 writing system can also outperform non-alphabetic monoliterates in L1 phonemic awareness tasks. For instance, Kannada children who are literate in alphabetic L2 English outperform Kannada children who are only literate in Kannada (which has a syllabic writing system) in phonemic awareness tasks, but not in other aspects of phonological awareness (Padakannaya, Rekha, Nigam, & Karanth, 1993). Bilinguality with an alphabetic writing system improves phonemic awareness not only in children, but also in adults: adult L2 readers with an alphabetic L1 writing system can outperform native users of their second language who are not alphabetic readers (e.g., L1-English learners of L2 Hebrew outperform Hebrew native speakers, Ben-Dror, Frost, & Bentin, 1995).

Word awareness and morphological awareness

Word awareness includes both the ability to distinguish word from referent and the ability to identify and manipulate ‘words’ in the spoken language (in this line of research, a ‘word’ is the spoken equivalent of a string of letters that is preceded and followed by spacing in writing). Bilingual children develop an awareness of the arbitrariness of the sound-meaning relationship in words earlier than monolinguals (Bialystok, 2004): they can evaluate the length of a word such as ‘caterpillar’ ignoring the length of its referent (Yelland et al., 1993), and learn earlier to produce and comprehend sentences where one word is substituted for another (e.g. ‘spaghetti are good children’, from ‘we are good children’, Ricciardelli, 1992). On the other hand, bilingualism does not improve children’s ability to count or segment words (Nicoladis & Genesee, 1996; Ricciardelli, 1992), as only literacy in a word-spaced writing system can develop the ability to identify and manipulate those units of language that are represented as orthographic words in writing. However, once word awareness has been established in one written language, bilinguals can use the orthographic conventions of this writing system to segment another language into ‘words’, and indeed literate bilingual children outperform monolinguals at word-segmentation or word-counting tasks (Edwards & Christophersen, 1988; Hsia, 1992). Once bilinguals become literate in one word-spaced writing system, they can segment another language, for instance in one study (Bialystok, 1986) French-English bilingual children who were only literate in French word-segmented English as well as literate English children, and outperformed the monolinguals in the segmentation of bimorphemic compound words. In a study that looked at adults’ word segmentation of a language that does not mark word boundaries in writing (Bassetti, 2005), English-Chinese biliterates segmented Chinese differently from Chinese natives and with higher levels of intragroup agreement on word segmentation.

While research on phonological awareness in bilinguals is well established, research on morphological awareness is less extensive. Part of this research relates specifically to writing systems, as some aspects of morphological awareness are specifically needed to read and write: in French grammatical gender and number are represented in written morphemes but not in spoken language (e.g., /pɔm/ is spelled <pomme> if singular and <pommes> if plural); in English, different spoken forms of the past tense marker are all spelled <ed>, and the morphological relationship between words such as /sain/ and /'sɪgnətʃə/ may be more evident in written than spoken language (<sign> and <signature>); for an introduction, see Bryant & Nunes, 2004); in Chinese, the same spoken syllable can correspond to many morphemes,

which are written with different hanzi (e.g., /i1/ corresponds to the morpheme ‘medicine’, written with the hanzi 医, to the morpheme ‘clothes’, written with the hanzi 衣, etc.). Therefore, across writing systems morphological awareness is more or less important and is needed earlier or later in the process of literacy development: Chinese children need it early (Nagy, Kuo-Kealoha, Wu, Li, Anderson, & Chen, 2002), whereas English children need it at a later age, with different aspects (inflectional, derivational, compound awareness) emerging at different ages (Mann, 2000). Bilinguals’ morphological awareness has not been widely studied, but it appears that morphological awareness in the two languages of a bilingual may be related, including compound awareness (Wang, Cheng, & Chen, 2006), inflectional awareness (Deacon, Wade Woolley, & Kirby, 2007), and derivational awareness (Ramirez, Chen, Geva, & Kiefer, 2010), although the importance of morphological awareness for literacy may vary across the bilingual’s writing systems (Tong & McBride-Chang, 2010).

Metalinguistic awareness and second language pronunciation

Bilinguals’ knowledge of one or more writing system can affect performance on metalinguistic awareness tasks and reading and writing, but it can also affect spoken language production. Bassetti (2008) argued that in instructed sequential bilinguals the orthographic representation of the second language, partly reinterpreted in terms of L1 grapheme-phoneme correspondences, may interact with the spoken input in shaping L2 phonological representations, and that these representations would be reflected not only in phonological awareness tasks, but also in pronunciation.

From the early studies in the 90s (e.g., Young-Scholten, 1998) to the first overview published in 2008 (Bassetti, 2008), evidence has accumulated that L2 orthography affects L2 pronunciation. This is not surprising: instructed sequential bilinguals often receive orthographic second language input before L2 phonology is established and often in large amounts. For this reason, spelling pronunciations, which also occur in monolingual speakers, may be more frequent in sequential bilinguals. Furthermore, L2 learners can reinterpret the L2 orthographic input on the basis of their L1 orthography-phonology correspondences, producing spelling pronunciations that would never occur in native speakers.

L2 written representations can then affect L2 pronunciation, leading to phoneme addition, deletion and substitution: Italian children add a /l/ to /wɔ:k/ in line with the spelling <walk> (Browning, 2004), Italian learners of Chinese delete the main vowel /o/ from the syllable /liou/ because in romanised Chinese it is spelled as <liu> (Bassetti, 2007), and English learners of Spanish substitute /b/ with /v/, a phoneme that does not exist in Spanish, in Spanish words spelled with <v> (Zampini & Green, 2001). While some spelling pronunciations can be found in both monolinguals and bilinguals, some are specifically due to biliteracy: for instance, Spanish <v> (/b/) pronounced as /v/; romanised Chinese <iu> (/iou/) reinterpreted as L1 Italian <iu> (/iu/; for a more detailed treatment of the topic, see Bassetti, 2008).

Conclusion

In conclusion, biliterates differ from monoliterates in their ability to analyse and manipulate units of language, and bilinguals who have developed an aspect of metalinguistic awareness through biliteracy can outperform native speakers of one or both their languages, including a weak second language. This is not necessarily useful. Indeed, the fact that L2-English-literate Kannada children outperform

monolingual peers in phonemic awareness in Kannada is important for the debate on the relationship between phonemic awareness and literacy, but does not constitute evidence that learning English is useful for Kannada children, because they do not need phonemic awareness, apart from the odd phonemic awareness task. Equally, users of non-word-spaced writing systems do not need to be able to segment speech into words in order to write, just as users of English do not need to be able to segment speech into phrases in order to write in English. Furthermore, biliteracy can also have negative effects, as second language pronunciation. At any rate, these findings show that biliterates have different knowledge of writing systems and languages compared with monoliterates. The next section will show that the effects of biliteracy can even extend beyond language.

NON-LINGUISTIC COGNITIVE CONSEQUENCES OF BILITERACY

Knowing more than one writing system can positively affect performance in non-linguistic cognitive tasks, reducing the effect of literacy-induced biases in thinking and perception. Research inspired by the resurgence of linguistic relativity shows that speakers of different languages perform differently on some non-linguistic cognitive tasks because of differences in how their language represents a specific aspect of reality, and recent research shows that bilingualism affects non-linguistic cognition (Bassetti & Cook, 2011). The written representations of languages can also bias the way their readers see reality. As seen before, this can be called 'orthographic relativity', to distinguish effects of written language from effects of language or spoken language. If one written language introduces a bias in thinking, then knowledge of two written languages could eliminate this bias. This has been repeatedly demonstrated by research on the directionality of writing systems.

Writing systems that are written horizontally can run from left to right (e.g., English) or from right to left (e.g., Arabic and Hebrew): this affects cognition in monoliterates, but such writing-system-induced biases disappear or are reduced by biliteracy in a rightward and a leftward writing system. The directionality of writing systems affects the mental representation of the directionality of time: English children arrange images of temporal events (e.g. images of breakfast, lunch and dinner) in left-to-right arrays, while Hebrew and Arabic children choose right-to-left arrays; shortly after the onset of literacy in L2 English, Hebrew children start arranging pictures in both directions and this effect, which peaks shortly after the onset of biliteracy, remains also afterwards (Tversky, Kugelmass, & Winter, 1991). Bidirectional biliteracy affects the order of naming or drawing objects in a set: English literates start from the left and move towards the right, Hebrew literates move in the opposite direction, Hebrew-English biliterates move in both directions (Kugelmass & Lieblich, 1979). There are effects on the mental number line, which is the sequence in which numbers are represented in the mind, as rightward readers prefer small numbers to be on the left and large numbers on the right, and vice versa for leftward readers, but this effect is reduced in bidirectional biliterates (Dehaene, Bossini, & Giraux, 1993). Bidirectional biliterates also learn faster than monoliterates to reject mirror images in a part-whole similarity task (Pederson, 2003) and, when looking at images of objects that appear to be rotating, perceive rotation in both directions, whereas English literates perceive a right-to-left rotation and Arabic readers the opposite (Morikawa & McBeath, 1992). Bidirectional biliteracy affects how people scan faces to detect emotional displays. When looking at photographs of faces that have been manipulated so that the left and right halves display different emotions -- for instance, where the left side is happy and the right side is sad --

rightward readers are more affected by the emotion shown in the left side, revealing that they scan faces from left to right; the opposite was found with leftward readers; bidirectional biliterates are equally affected by both sides (Vaid & Singh, 1989). Bidirectional biliteracy also affects aesthetic preferences, as rightward readers prefer geometric compositions showing a left-to-right directionality, but bidirectional biliterates do not (Heath, Mahmasannia, Rouhanaa, & Nassifa, 2005).

In conclusion, research so far shows that biliteracy can positively affect non-linguistic cognition. Although this line of research focusses on directionality, a minor and non-linguistic aspect of writing systems, results consistently show that biliteracy can eliminate biases in thinking and perception created by monoliteracy. Bidirectional biliterates are better placed than monoliterates for realising that time does not necessarily fly from left to right.

CONCLUSIONS

The above review shows that knowledge of more than one writing system affects bilinguals' reading, writing, literacy acquisition, metalinguistic awareness, spoken language production and non-linguistic cognition. Biliteracy has many positive effects, from facilitating the acquisition of an additional written language to allowing creative uses of writing systems. While it is noticeable that biliterates can outperform monoliterate native speakers of their first language in L1 reading and writing, it is even more interesting that biliteracy's effects extend beyond written language, to include analyses of the spoken language and non-linguistic cognition. Sometimes things can go wrong, for instance when the L2 orthographic input is misinterpreted and affects L2 pronunciation, but generally effects are positive. Biliterates are also qualitatively different from monoliterates. This difference is evident in metalinguistic awareness, but perhaps the most dramatic evidence comes from brain-imaging studies that show different activation patterns in biliterates and monoliterates reading the same language, and from evidence that biliteracy reduces biases in thinking and perception.

There are two important caveats here. First, many positive consequences of biliteracy are not due to biliteracy per se, but to knowledge of specific writing systems. Bidirectional biliteracy eliminated biases in thinking, but literacy in two rightward writing systems probably has no effects. A second, related caveat is that too much research has involved English, as studies not involving English, mostly as a second language, are rare. Claims that biliteracy facilitates L1 literacy require evidence from native users of writing systems other than English. The fact that such an idiosyncratic writing system has been over-researched means that many findings may not generalise to biliteracy not involving English. Researchers should then look at biliterates with other language combinations. This would also lead to a widening of the research agenda, which has tended to focus on issues that are important to English literacy acquisition. The research agenda should here strike a balance between the needs of researchers, who need less Anglocentric research in order to get an objective and general picture of biliteracy, and the needs of educators and people in the real world, where many need to learn and use English.

In general, more research is needed, and it is important that all disciplines involved contribute to the wider picture. The field of bilingualism and writing systems already benefits from research done by applied linguists, linguists, psycholinguists, sociolinguists, neurolinguists and so on. This interdisciplinarity has the potential to correct biases from specific disciplines, for instance the emphasis on reading and the little interest in spelling within psychology. In terms of research methods, the field's

interdisciplinarity and its current popularity mean that it already benefits from a wide variety of methods. On the other hand, there are still few meta-analyses, longitudinal studies, or truly experimental studies (for instance with the use of artificial writing systems). Specific tools are needed to deal with biliterates, such as written word frequency norms specifically created for them. The theoretical background has to be clarified, and the field would benefit from establishing a common terminology based on sound and non-Anglocentric linguistic analyses of writing systems. In terms of research topics, the field probably does not need more research on L1 transfer, given the number and variety of exciting topics awaiting investigation. In the conclusion to their overview of the field a few years ago, Cook and Bassetti (2005a) listed a series of questions that they considered worthy of investigation. Many of these have not been seriously addressed, including ultimate attainment in sequential biliterates, attrition of reading and writing skills, multi- versus bi-literacy, individual differences and effects of literacy instruction. In general, research should look at the biliterate bilingual as an independent entity, rather than as the sum of two literate individuals.

In conclusion, the study of the relationship between bilingualism and writing systems is an exciting field, it is rapidly growing, and it has much to offer to both researchers and teaching practitioners.

REFERENCES

- Altenberg, Evelyn P., & Helen S. Cairns. 1983. The effects of phonotactic constraints in lexical processing in bilingual and monolingual subjects. *Journal of Verbal Learning and Verbal Behavior*, 22, 174-188.
- Androutsopoulos, Jannis K. 2000. Non-standard spellings in media texts: The case of German fanzines. *Journal of Sociolinguistics*, 4(4), 514-533.
- Androutsopoulos, Jannis K. 2009. 'Greeklish': Transliteration practice and discourse in the context of computer-mediated digraphia. In Alexandra Georgakopoulou & Michael Silk (Eds.), *Standard languages and language standards: Greek, past and present* (pp. 221-249). London: Centre for Hellenic Studies, King's College London.
- Angermeyer, Philipp S. 2005. Spelling bilingualism: Script choice in Russian American classified ads and signage. *Language in Society* 34(4), 493-531.
- August, Diane. 2008. *Developing reading and writing in second-language learners: Lessons from the report of the National Literacy Panel on Language-Minority Children and Youth*. Oxford: Routledge.
- Bassetti, Benedetta. 2005. Effects of writing systems on second language awareness: Word awareness in English learners of Chinese as a Foreign Language. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Second language writing systems* (pp. 335-356). Clevedon, UK: Multilingual Matters.
- Bassetti, Benedetta. 2007. Effects of hanyu pinyin on pronunciation in learners of Chinese as a Foreign Language. In Andreas Guder, Xin Jiang & Yexin Wan (Eds.), *The cognition, learning and teaching of Chinese characters* (pp. 155-179). Beijing, China: Beijing Language and Culture University Press.
- Bassetti, Benedetta. 2008. Orthographic input and second language phonology. In Thorsten Piske & Martha Young-Scholten (Eds.), *Input matters in SLA* (pp. 191-206). Clevedon, UK: Multilingual Matters.
- Bassetti, Benedetta. 2009. Effects of adding interword spacing on Chinese reading: A comparison of Chinese native readers and English readers of Chinese as a Second Language. *Applied Psycholinguistics*, 30(4), 757-775.

- Bassetti, B. (2012) Bilingualism and writing systems. In T. K. Bhatia & W. C. Ritchie (Eds.) *Handbook of bilingualism and multilingualism*, second edition (pp. 649-670). Oxford, UK: Wiley-Blackwell.
- Bassetti, Benedetta, & Vivian J. Cook. 2011. Language and cognition: The second language user. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Language and bilingual cognition* (pp. 143-190). Oxford: Psychology Press.
- Ben-Dror, Ilana, Ram Frost, & Shlomo Bentin. 1995. Orthographic representation and phonemic segmentation in skilled readers: A cross-language comparison. *Psychological Science*, 6(3), 176-181.
- Bialystok, Ellen. 1986. Children's concept of word. *Journal of Psycholinguistic Research*, 15, 13-32.
- Bialystok, Ellen. 2004. The impact of bilingualism on language and literacy development. In Tej K. Bhatia & William C. Ritchie (Eds.), *The handbook of bilingualism* (pp. 577-601). Oxford: Blackwell Publishing.
- Bialystok, Ellen, Gigi Luk, & Ernest Kwan. 2005. Bilingualism, biliteracy, and learning to read: Interactions among languages and writing systems. *Scientific Studies of Reading*, 9(1), 43-61.
- Bialystok, Ellen, Shilpi Majumder, & Michelle M. Martin. 2003. Developing phonological awareness: Is there a bilingual advantage? *Applied Psycholinguistics*, 24, 27-44.
- Browning, Sue R. 2004. Analysis of Italian children's English pronunciation. Report contributed to the EU FP5 PF STAR Project. Available at http://www.eee.bham.ac.uk/russellm/ItalianEnglishReport%5CItalianEnglish_report_v2.htm, last accessed 20 August 2011.
- Bruck, M., & Fred Genesee. 1995. Phonological awareness in young second language learners. *Journal of Child Language*, 22, 307-324.
- Bryant, Peter, & Terezinha Nunes. 2004. Morphology and spelling. In Terezinha Nunes & Peter Bryant (Eds.), *Handbook of children's literacy* (pp. 91-118): Kluwer Academic Publishers.
- Coltheart, Max, Brent Curtis, Paul Atkins, & Michael Haller. 1993. Models of reading aloud: Dual-route and parallel-distributed-processing approaches. *Psychological Review*, 100, 589-608.
- Cook, Vivian J. 2004. *The English writing system*. London: Arnold.
- Cook, Vivian J., & Benedetta Bassetti. 2005a. Introduction to researching Second Language Writing Systems. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Second language writing systems* (pp. 1-67). Clevedon, UK: Multilingual Matters.
- Cook, Vivian J., & Benedetta Bassetti (Eds.). 2005b. *Second language writing systems*. Clevedon, UK: Multilingual Matters.
- Cook, Vivian J., Jyotsna Vaid, & Benedetta Bassetti. (to appear in 2012). Special issue on 'Second language writing systems'. *Writing Systems Research*, 4:2.
- Coulmas, Florian. 2003. *Writing systems: An introduction to their linguistic analysis*. Cambridge: Cambridge University Press.
- D'Angiulli, Amedeo, Linda S. Siegel, & Emily Serra. 2001. The development of reading in English and Italian bilingual children. *Applied Psycholinguistics*, 22(4), 479-507.
- Das, Tanusree, Prakash Padakannaya, Kau R. Pugh, & Nandini C. Singh. 2011. Neuroimaging reveals dual routes to reading in simultaneous proficient readers of two orthographies. *NeuroImage*, 54(2), 1476-1487.
- Deacon, Hélène, & Kate Cain (Eds.). 2011. Special issue on 'Learning to read in more than one language'. *Journal of Research in Reading*, 34(1).

- Bassetti, B. (2012) Bilingualism and writing systems. In T. K. Bhatia & W. C. Ritchie (Eds.) *Handbook of bilingualism and multilingualism*, second edition (pp. 649-670). Oxford, UK: Wiley-Blackwell.
- Deacon, Hélène, Lesly Wade Woolley, & John Kirby. 2007. Cross-over: The role of morphological awareness in French immersion children's reading. *Developmental Psychology*, 43(3), 732-746.
- Dehaene, Stanislas, Serge Bossini, & Pascal Giraux. 1993. The mental representation of parity and number magnitude. *Journal of Experimental Psychology: General*, 122, 371-396.
- Depau, Giovanni. Under review. How graffiti provide evidence on the relationship between writing, orality and identity. *Writing Systems Research*.
- Edwards, Derek, & Hilde Christophersen. 1988. Bilingualism, literacy and meta-linguistic awareness in preschool children. *British Journal of Developmental Psychology*, 6, 235-244.
- Ehrich, John F., & Renata F. I. Meuter. 2009. Acquiring an artificial logographic orthography: The beneficial effects of a logographic L1 background and bilinguality. *Journal of Cross-Cultural Psychology*, 40(5), 711-745.
- Errasti, Maria P. S. 2003. Acquiring writing skills in a third language: The positive effects of bilingualism. *International Journal of Bilingualism*, 7, 27-52.
- Geva, Esther. 1999. Issues in the development of second language reading: Implications for instruction and assessment. In Terezinha Nunes (Ed.), *Learning to read: An integrated view from research and practice* (pp. 343-367). Dordrecht, The Netherlands: Kluwer.
- Geva, Esther, & Linda S. Siegel. 2000. Orthographic and cognitive factors in the concurrent development of basic reading skills in two languages. *Reading and Writing*, 12(1-2), 1-30.
- Geva, Esther, & Ludo Verhoeven (Eds.). 2000. Basic processes in early second language reading. Special issue. *Scientific Studies of Reading*, 4(4).
- Goetry, Vincent, Régine Kolinsky, & Philippe Mousty. 2009. Do bilingual beginning readers activate the grapheme-phoneme correspondences of their two languages when reading in one language? In Clare Wood & Vincent Connelly (Eds.), *Contemporary perspectives on reading and spelling* (pp. 168-188). London: Routledge.
- Gough, Philip B., & William E. Tunmer. 1986. Decoding, reading and reading disability. *Remedial and Special Education*, 7, 6-10.
- Haynes, Margot, & Thomas H. Carr. 1990. Writing system background and second language reading: A component skills analysis of English reading by native speaker-readers of Chinese. In Thomas H. Carr & Betty Ann Levy (Eds.), *Reading and its development: Component skills approaches* (pp. 375-421). San Diego, California: Academic Press.
- Heath, Robin, Oula Mahmasannia, Aida Rouhanaa, & Nader Nassifa. 2005. Comparison of aesthetic preferences among Roman and Arabic script readers. *Laterality*, 10(5), 399-411.
- Hsia, Sophie. 1992. Developmental knowledge of inter- and intraword boundaries: Evidence from American and Mandarin Chinese speaking beginning readers. *Applied Psycholinguistics*, 13(3), 341-372.
- Jared, Debra, & Judith F. Kroll. 2001. Do bilinguals activate phonological representations in one or both of their languages when naming words? *Journal of Memory and Language*, 44, 2-31.
- Joshi, Malatesha, & P. G. Aaron (Eds.). 2005. *Handbook of orthography and literacy*. Hove: Erlbaum.
- Kenner, Charmian. 2004. *Becoming biliterate: Young children learning different writing systems*. Stoke-on-Trent, UK: Trentham Books.

- Kenner, Charmian, Gunther Kress, Hayat Al-Khatib, Roy Kam, & Kuan-Chun Tsai. 2004. Finding the keys to biliteracy: How young children interpret different writing systems. *Language and Education*, 18(2), 124-144.
- Koda, Keiko. 1987. Cognitive strategy transfer in second language reading. In Joanne Devine, Patricia L. Carrell & David E. Eskey (Eds.), *Research in reading in English as a Second Language* (pp. 127-144). Washington, DC: TESOL.
- Koda, Keiko. 1988. Cognitive process in second language reading: Transfer of L1 reading skills and strategies. *Second Language Research*, 4, 135-156.
- Koda, Keiko. 2005. *Insights into second language reading: A cross-linguistic approach*. Cambridge: Cambridge University Press.
- Koda, Keiko, & Annette M. Zehler (Eds.). 2007. *Learning to read across languages: Cross-linguistic relationships in first- and second-language literacy*. New York: Routledge.
- Kohsom, Chananda, & Fernand Gobet. 1997. Adding spaces to Thai and English: Effects on reading. In Michael G. Shafto & Pat Langley (Eds.), *Proceedings of the nineteenth annual conference of the Cognitive Science Society* (pp. 388-393). Mahwah, NJ: Lawrence-Erlbaum Associates.
- Kugelmass, S., & A. Lieblich. 1979. The impact of learning to read on directionality in perception: A further cross-cultural analysis. *Human Development*, 22, 406-415.
- Lau, Lily, & Susan J. Liow Rickard. 2005. Phonological awareness and spelling skill development in bilingual biscriptal children. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Second language writing systems* (pp. 357-371). Clevedon, UK: Multilingual Matters.
- Loizou, Maria, & Morag Stuart. 2003. Phonological awareness in monolingual and bilingual English and Greek five-year-olds. *Journal of Research in Reading*, 26(1), 3-18.
- Luelsdorff, Philip A. 1986. *Constraints on error variables in grammar: Bilingual misspelling orthographies*. Amsterdam/Philadelphia: John Benjamins.
- Mann, Virginia A. 2000. Introduction to special issue on morphology and the acquisition of alphabetic writing systems. *Reading and Writing*, 12, 143-147.
- McBride-Chang, Catherine. 2004. *Children's literacy development*. London: Arnold.
- Meisel, Jürgen M. 2008. The bilingual child. In Tej K. Bhatia & William C. Ritchie (Eds.), *The handbook of bilingualism* (pp. 91-113). Oxford: Blackwell Publishing.
- Melby-Lervåg, Monica, & Arne Lervåg. 2011. Cross-linguistic transfer of oral language, decoding, phonological awareness and reading comprehension: A meta-analysis of the correlational evidence. *Journal of Research in Reading*, 34(1), 114-135.
- Mori, Yoshiko. 1998. Effects of first language and phonological accessibility on kanji recognition. *Modern Language Journal*, 82(1), 69-82.
- Morikawa, Kazunori, & Michael K. McBeath. 1992. Lateral motion bias associated with reading direction. *Vision Research*, 32(6), 1137-1141.
- Muljani, Djojomihardjo, Keiko Koda, & Danny R. Moates. 1998. The development of word recognition in a second language. *Applied Psycholinguistics*, 19, 99-113.
- Nagy, William E., Amy Kuo-Kealoha, Xinchun Wu, Wenling Li, Richard C. Anderson, & Xi Chen. 2002. The role of morphological awareness in learning to read Chinese. In Wenling Li, Janet S. Gaffney & Jerome L. Packard (Eds.), *Chinese children's reading acquisition: Theoretical and pedagogical issues* (pp. 59-83). Dordrecht: Kluwer.

- Bassetti, B. (2012) Bilingualism and writing systems. In T. K. Bhatia & W. C. Ritchie (Eds.) *Handbook of bilingualism and multilingualism*, second edition (pp. 649-670). Oxford, UK: Wiley-Blackwell.
- Nassaji, Hossein, & Esther Geva. 1999. The contribution of phonological and orthographic processing skills to adult ESL reading: Evidence from native speakers of Farsi. *Applied Psycholinguistics*, 20(2), 241-267.
- Navas, Ana Luiza G. P. 2004. Implications of alphabetic instruction in the conscious and unconscious manipulations of phonological representations in Portuguese-Japanese bilinguals. *Written Language and Literacy*, 7(1), 119-131.
- Nicoladis, Elena, & Fred Genesee. 1996. Word awareness in second language learners and bilingual children. *Language Awareness*, 5(2), 80-90.
- Okada, Takeshi. 2005. Spelling errors made by Japanese EFL writers: With reference to errors occurring at the word-initial and the word-final position. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Second language writing systems* (pp. 164-183). Clevedon, UK: Multilingual Matters.
- Padakannaya, Prakash, D. Rekha, R. Nigam, & Prathibha Karanth. 1993. Phonological awareness, orthography, and literacy. In Robert J. Scholes (Ed.), *Literacy and language analysis* (pp. 55-70). Hillsdale, NJ: Lawrence Erlbaum.
- Pederson, Eric. 2003. Mirror-image discrimination among nonliterate, monoliterate, and biliterate Tamil subjects. *Written Language and Literacy*, 6(1), 71-92.
- Perfetti, Charles A., & Ying Liu. 2005. Orthography to phonology and meaning: comparisons across and within writing systems. *Reading and Writing*, 18, 193-210.
- Perfetti, Charles A., Ying Liu, Julie Fiez, Jessica Nelson, Donald J. Bolger, & Li Hai Tan. 2007. Reading in two writing systems: Accommodation and assimilation of the brain's reading network. *Bilingualism: Language and Cognition*, 10, 131-146.
- Ramírez, Gloria, Xi Chen, Esther Geva, & Heidi Kiefer. 2010. Morphological awareness in Spanish-speaking English language learners: Within- and cross-language effects on word reading. *Reading and Writing*, 23, 337-358.
- Ricciardelli, Lina A. 1992. Bilingualism and cognitive development in relation to threshold theory. *Journal of Psycholinguistic Research*, 21(4), 301-316.
- Ryan, A., & Paul Meara. 1991. The case of the invisible vowels: Arabic speakers reading English words. *Reading in a Foreign Language*, 7(2), 531-540.
- Schmid, Stephan. 2005. Spelling and pronunciation in migrant children: The case of Italian-Swiss German bilinguals. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Second language writing systems*. Clevedon, UK: Multilingual Matters.
- Schwartz, Mila, Esther Geva, M. Leikin, & D. L. Share. 2007. Learning to read in English as L3: The cross-linguistic transfer of phonological processing skills. *Written Language and Literacy*, 10, 25-52.
- Sebba, Mark. 2009. Sociolinguistic approaches to writing systems research. *Writing Systems Research*, 1, 35-49.
- Sebba, Mark, Shahrzad Mahootian, & Carla Jonsson (eds.). Forthcoming. *Language mixing and code-switching in writing: Approaches to mixed-language written discourse*. London: Routledge
- Su, Hsi-Yao. 2003. The multilingual and multi-orthographic Taiwan-based internet: Creative uses of writing systems on college-affiliated BBSs. *Journal of Computer-Mediated Communication*, 9(1).
- Sun, Fuchuan, Michon Morita, & Lawrence W. Stark. 1985. Comparative patterns of reading eye movement in Chinese and English. *Perception and Psychophysics*, 37, 502-506.
- Tamaoka, Katsuo, & Barbara Menzel. 1994. To use or not to use Romaji: A psycholinguistic evaluation of the arguments against the use of Romaji for

- teaching Japanese with learners of alphabetic mother tongues [in Japanese]. *Dokusho Kagaku*, 38, 104-116.
- Tan, Li Hai, John A. Spinks, Ching-Mei Feng, Wai Ting Siok, Charles A. Perfetti, Jinhu Xiong, Peter T. Fox, & Jia-Hong Gao. 2003. Neural systems of second language reading are shaped by native language. *Human Brain Mapping*, 18, 158-166.
- Teipelke, Renard. 2008. *Bilingual education in the US: English as a Second Language for Hispanic children in school*. Munich: Grin Verlag.
- Tham, Wendy W. P., Susan J. Rickard Liow, Jagath C. Rajapakse, Tan Choong Leong, Samuel E. S. Ng, Winston E. H. Lim, & Lynn G. Hoc. 2005. Phonological processing in Chinese-English bilingual biscriptals: An fMRI study. *NeuroImage*, 28(3), 579-587.
- Themistocleous, Christiana. 2010. Writing in a non-standard Greek variety: Romanized Cypriot Greek in online chat. *Writing Systems Research*, 2(2), 155-168.
- Tong, Xiuli, & Catherine McBride-Chang. 2010. Chinese-English biscriptal reading: Cognitive component skills across orthographies. *Reading and Writing*, 23, 293-310.
- Tversky, Barbara, Sol, Kugelmass, & Atalia, Winter. 1991. Cross-cultural and developmental trends in graphic productions. *Cognitive Psychology*, 23(4), 515-557.
- Vaid, Jyotsna, & Maharaj, Singh. 1989. Asymmetries in the perception of facial affect: Is there an influence of reading habits? *Neuropsychologia*, 27(10), 1277-1287.
- van Berkel, Ans. 2005. The role of the phonological strategy in learning to spell in English as a second language. In Vivian J. Cook & Benedetta Bassetti (Eds.), *Second language writing systems* (pp. 97-121). Clevedon, UK: Multilingual Matters.
- Van Dyken, Julia R., & Constance, Kutsch Lojenga. 1993. Word boundaries: key factors in orthography development. In Rhonda L. Hartell (Ed.), *Alphabets of Africa* (pp. 3-20). Dakar: UNESCO-Dakar Regional Office.
- Wang, Min, Chenxi Cheng, & Shi-Wei Chen. 2006. Contribution of morphological awareness to Chinese-English biliteracy acquisition. *Journal of Educational Psychology*, 98(3), 542-553.
- Wang, Min, Keiko Koda, & Charles A. Perfetti. 2003. Alphabetic and nonalphabetic L1 effects in English word identification: Lexical and visual-orthographic processes. *Cognition*, 87(2), 129-149.
- Yang, Jun. 2000. Orthographic effect on word recognition by learners of Chinese as a Foreign Language. *Journal of the Chinese Language Teachers Association*, 35(2), 1-18.
- Yelland, Gregory W., Jacinta Pollard, & Anthony Mercuri. 1993. The metalinguistic benefits of limited contact with a second language. *Applied Psycholinguistics*, 14(4), 423-444.
- Young-Scholten, Martha. 1998. Second language syllable simplification: Deviant development or deviant input? In James Allan & Jonathan Leather (Eds.), *New sounds '97* (pp. 351-360). Amsterdam: University of Amsterdam.
- Zampini, Mary L., & Kerry P. Green. 2001. The voicing contrast in English and Spanish: The relationship between perception and production. In Janet Nicol (Ed.), *One mind, two languages* (pp. 23-48). Oxford: Blackwell Publishers.

Bassetti, B. (2012) Bilingualism and writing systems. In T. K. Bhatia & W. C. Ritchie (Eds.) *Handbook of bilingualism and multilingualism*, second edition (pp. 649-670). Oxford, UK: Wiley-Blackwell.

Ziegler, Johannes C., & Usha Goswami. 2005. Reading acquisition, developmental dyslexia, and skilled reading across languages. *Psychological Bulletin*, 131, 3-29.