



Introduction

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For a number of years, a group of researchers has regularly met to discuss factors contributing to reading disability, with the ultimate goal of finding ways to break down the barriers that reading disability places in front of human development. These meetings were organized through a European network funded by the European Union under the COST A8 Action on “Learning disorders as a barrier to human development.” After having explored such classical issues as dyslexia, phonological awareness, remediation strategies and others, general agreement arose that it would be useful to step back and examine the link between language problems and speech. This special issue was first conceived of at the conference “Speaking and listening: Its role in learning how to read and spell” held in Lisbon in December 1998 and was then developed into a series of papers.

Speech perception and production have not traditionally been central to the study of language. Saussure (1985/1915: 155) intuited that thought remained an amorphous, indistinct mass until captured into words. An analogous intuition would require spoken language to be captured into the durable form of writing to become real language. Indeed, George Miller (1991: 26–30) considered words the units of analysis of the science of language, defining words as concepts, strings of letters, and morphemes. Words as sequences of phonemes, words as coarticulated sets of vocal gestures, were secondary characterizations (Miller, 1991: 65).

For decades the communities of speech science and of the psychology of reading have hardly communicated with each other. But, just as we sometimes need to read aloud a passage in order to fully understand its meaning, sooner or later the dialogue between reading and speech researchers is bound to happen. How do speech perception and production skills impact on the acquisition of reading and spelling? While this question raises important theoretical issues of how speech and language interrelate (cf. Liberman & Whalen, 2000), it is also in clear need of empirical study. This special issue of *Reading and Writing* brings together contributions on this problem from a number of diverse perspectives including cognitive psychology, speech science, neuropsychology, neuroimaging, psycholinguistics, and modelling.

The first three papers focus on speaking and listening from a developmental perspective. They address how phonemic representations arise, how their emergence relates to spoken vocabulary growth, to the production of speech gestures, and to the interactions of memory and sensory input.

Walley, Metsala and Garlock review their Lexical Restructuring Model and the empirical evidence that supports it. The authors argue that spoken vocabulary growth elicits the development of fine-grained segmental representations of words which help differentiate similar sounding words. This differentiation would, in turn, prompt phoneme awareness even before explicit instruction on alphabetic literacy. Spoken vocabulary growth thus impacts on early reading acquisition.

Mody reviews behavioral and neuroimaging evidence for a phonological basis of reading disability and proposes a gestural account as the source of the phonological problem. She argues that well-defined phonological representations arise through a mapping between acoustic patterns and speech gestures. That mapping integrates gestural patterns into segmental control structures. Drawing on the link between speech perception and production, Mody uses empirical studies examining speech production in poor readers to suggest remediation strategies that include an articulatory component.

Lacerda presents a theoretical model of early phonological development in which phonemic representations arise through a self-organizing process. The interaction of infants' vocalic gestures with the reinforcement from their environment structures the stimulus representations into phonological units that are sensitive to linguistic input and to the memory constraints of the developing infant. The model therefore makes explicit the notion that linguistic structure develops through the interaction of multiple sources of information, and not through any single driving factor.

The next four papers examine the processes underlying reading and spelling. Kaminska presents an elegant experimental study on the interaction between phonology and orthography in spelling. Using priming tasks, she shows that even in a transparent orthography like that of the Polish language, spelling is influenced by orthographic representations, rather than being assembled via a purely non-lexical route using one-to-one phoneme to grapheme conversions. Kaminska's results strengthen the hypothesis that phonological representations are not just concatenated sets of sounds, but sequences of more abstract segments whose identity and nature depend on the characteristics of the lexicon.

A complementary approach to the question of the interaction between phonology and orthography is the study of illiterate subjects: what happens to skills in spoken language when the brain does not know how to read and how to spell? Castro-Caldas and Reis provide a first-person review of their recent

behavioral and neuroimaging studies in which adult illiterates participated. In spite of the notorious difficulty of disentangling the effects of schooling from those of literacy, Castro-Caldas and Reis succeed in extracting evidence for differences in the functional organization of the adult brain related to literacy.

Cossu provides a fascinating case study of a neuropsychological patient who suffers from a congenital lack of speech production, while able to perceive speech and aware of phonemes. The author presents longitudinal data of this patient spanning 10 years that provide evidence for a selective dissociation between speech production and orthographic skills. Cossu speculates that this patient might have developed orthographic capabilities based on an abstract mirroring process (analogous to the “mirror neurons” in pre-motor cortex).

Morais closes this special issue by drawing together a vast range of empirical evidence relevant to the very notion of phonological representation, and to its role in reading and learning how to read. He distinguishes between unconscious phonological representations involved in speech perception and conscious phonological representations involved in making judgements about speech segments. These two representations contribute to a multi-component grapho-phonological system that is the basis of literacy skills.

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