

How do writing systems shape reading and reading acquisition?

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Abstract

Writing is a relatively recent cultural invention, and reading is a skill that requires years of instruction, dedication, and practice. My talk will consider how the nature of a writing system influences reading acquisition and skilled reading. I consider the nature of statistical regularities that characterize English orthography and show across several experiments that knowledge encoded in the skilled reading system mirrors these regularities. This analysis reveals that weaknesses in the relationship between spelling and sound give rise to powerful regularities between spelling and meaning that are critical for text comprehension. I conclude by thinking about how written language differs from spoken language and argue that these differences may be at the heart of human capacity for rapid, skilled reading.

Keywords: writing systems, reading acquisition, language analysis, English

Introduction

By the time that most children leave school, the act of reading seems effortless. Text is all around us and we cannot help but understand what it means. Yet, our experience of reading belies the fact that unlike walking or talking, humans are not born to read. Instead, writing is a relatively recent cultural invention, and reading is a skill whose mastery requires years of instruction, dedication and practice.

When children come to the problem of learning to read, most have already developed substantial knowledge of spoken language. The critical challenge is therefore to map the visual symbols of writing onto this spoken language knowledge, using neural machinery built for other functions. In this talk, I describe how the nature of a writing system shapes this process, and I ask how the evolution of writing may have supported our capacity for skilled reading.

Writing systems

Writing systems always represent spoken language, but they do so in different ways. Visual symbols can represent sounds, syllables, morphemes, or whole words. Much of the research on reading has focused on alphabetic writing systems, in which visual symbols represent sounds. These writing systems can

be categorised further in terms of their orthographic depth, or the consistency with which visual symbols represent sounds.

Research on reading has been dominated by the notion that writing systems that faithfully represent the sounds of language are preferred. If reading is the act of translating visual symbols back to spoken language, then writing systems that offer a direct line back to the phonological forms of words would indeed appear superior. Yet, we accept some deviations between written and spoken language, such as spacing to mark word boundaries, uncritically as a good thing. Do deviations between written and spoken language ever support reading?

English spelling has a bad reputation

Much has been made of the high degree of inconsistency in English spelling: for example, have (cf. gave, wave, save); one (cf. zone, lone, phone); chef (cf. church, chess, chat). Research shows that it takes longer to learn to read aloud in English than it does in other European languages; and learning to spell in English presents an enormous challenge, with many possible spellings for each sound.

Yet, a deeper look suggests that these weaknesses in the English spelling-sound mapping mask another form of regularity. If English were a perfect transcription of spoken language, then words like herded, snored, and kicked might be spelled herdid, snord, and kict. These spellings remove the inconsistency associated with the -ed spelling in the original examples; however, they also remove a powerful morphological cue to the meanings of those words. That is, the letters -ed are almost always associated with the past tense. Other spellings are used in order to prevent incorrect interpretations of words that are not past tense (e.g. evict, not evicked).

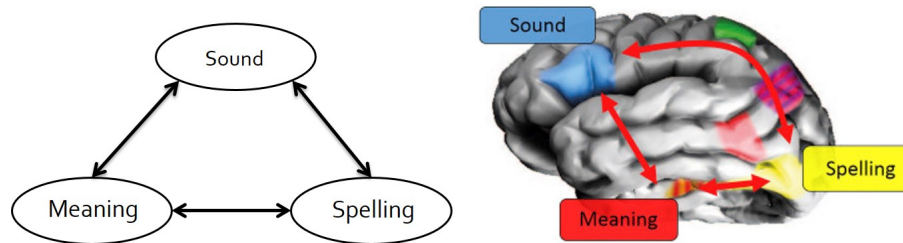
It turns out that this tight relationship between English spelling and meaning is ubiquitous. The many possible spellings for English sound sequences permit some spellings (affixes) to become reserved to communicate particular meanings with a high degree of fidelity. This phenomenon makes it possible to determine rapidly with just a cursory analysis whether a suffixed word is an entity, property, or act. Crucially, this information is only available in the spelling; for example, the spoken forms of evict and kicked both sound like they might be in the past.

This discussion suggests that English spelling might not deserve its bad reputation. The property that makes English spelling hard to learn allows it to communicate meaning with a high degree of precision. This state of affairs turns out to have important consequences for skilled reading.

The reading system is the writing system

Most of the research on reading acquisition in English and in other alphabetic writing systems has focused on how children acquire understanding of the relationship between spellings and sounds. English-speaking children encounter

around 5,000 printed words in the first year of reading instruction, most of which are monosyllabic and have a single morpheme. It is unfeasible to memorize these one-by-one, so instruction is focused on helping children to decode printed words to a phonological code, thus enabling them to make use of their spoken language knowledge to gain access to meaning.



There is ample research to suggest that learning the spelling-sound relationship is a necessary part of reading acquisition. However, several lines of evidence suggest that phonological decoding is not by itself a viable means of driving rapid, skilled reading. The weak relationship between spelling and sound presents a particular challenge in English, as studies of adult readers reveal that the inconsistency that characterises this mapping is mirrored in their linguistic knowledge. Ultimately, skilled reading requires a more efficient, direct mapping between spellings and meanings.

Acquiring this direct mapping presents a challenge because for most short words encountered in the initial stages of reading acquisition, this mapping is arbitrary. However, morphemes provide islands of regularity in this mapping; stems reoccur in words with similar meanings, and affixes alter the meanings of words in highly-predictable ways. Further, because of the trade-off between spelling-sound and spelling-meaning regularity described above, morphology is highly visible in English spelling (much more than in spoken language).

There is substantial evidence to suggest that readers take advantage of this information in building a direct mapping from spelling to meaning. Skilled readers segment morphologically-structured letter strings in the first 200 ms of recognition, in brain regions that underpin the reading pathway linking spelling to meaning. They also show a high degree of sensitivity to the relationship between affixes and aspects of meaning. Adults are more likely to spell the spoken word /dəʊməs/ using -ous if it occurs in an adjective context than in a noun context. Similarly, adults' eye movements are more likely to regress back to the word domous if it occurs in a noun context than in an adjective context. The strength of these effects for different suffixes mirrors the strength of the relationship between those suffixes and grammatical category in English words.

Why do spoken and written language differ?

Writing systems vary in the extent to which they facilitate translation back to a phonological representation. We have seen that the English spelling-sound relationship is relatively opaque. Yet, even those writing systems that offer a faithful transcription of spoken language diverge in important ways: for example, Korean Hangul physically demarcates syllable boundaries; and most writing systems use spacing to denote word boundaries. Why have writing systems evolved or been designed in these ways?

One possibility is that while a transparent spelling-sound relationship facilitates the initial stages of learning to read, phonological decoding by itself is an inefficient means of accessing meaning. It is also important to recognize that translation back to a phonological representation is not the same thing as spoken language: for example, it lacks prosody, gesture, and audio-visual cues to meaning. Rapid computation of meaning may require the orthography to offer information that is not available in the spoken language. This insight becomes very important in thinking about spelling reform or the development of new writing systems.

I've focused on the information available in printed single words, but it is also critically important to recognize that text is very different to spoken language, using richer vocabulary and more complex syntax. Our ability to engage with this weight and complexity of information requires a precision-tuned system for accessing language through vision. Understanding how different forms of writing support the acquisition of that system will provide broader insights into interactions between biology and culture in human cognition.

Further reading

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