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# Learning to read and learning to comprehend

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This paper reviews recent experimental findings that inform our understanding of the development of reading comprehension. Studies investigating children who have specific difficulties with reading comprehension provide considerable information concerning the process involved in successful reading comprehension. This literature highlights aspects of reading comprehension skill that cannot be readily accommodated by the 'searchlights' model—the theoretical model framework adopted by the National Literacy Strategy. We conclude that comprehension depends on a very complex set of processes, many of which are shared with language comprehension more generally. Finally, implications for the teaching of reading comprehension are discussed.

## Introduction

Learning to read should equip children with the skills needed to decode and recognize words. The ultimate goal of reading, however, is not to read isolated words, but to understand what has been read. While the National Literacy Strategy must be applauded for having focused attention on reading, some of its core principles are at odds with what we know about reading development. There is still much to learn about how children learn to extract meaning from text but, nevertheless, research has made excellent progress towards understanding how reading develops. The aim of this paper is to highlight some important findings from research, with a particular focus on reading comprehension and its development.

## What is reading comprehension?

There is no doubt that reading comprehension is a complex process. To understand text, words need to be recognized and their meanings accessed, relevant background knowledge needs to be activated, and inferences must be generated as information is

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integrated during the course of reading. In addition, control processes are needed to monitor both ongoing comprehension and the internal consistency of text, allowing the reader to initiate repair strategies (for example, re-reading) if comprehension breakdown is detected.

Despite these complexities, the task of learning to comprehend text can be described in large part quite simply as learning to understand writing as well as one understands spoken language (Perfetti *et al.*, 2005). Two conclusions follow from this premise. First, reading comprehension is served by spoken language comprehension and, ultimately, an individual's spoken language comprehension limits how much he or she can understand written language. However, a feature of reading comprehension not shared with spoken language comprehension is the ability to decipher and recognize printed words. This is a unique component of reading comprehension and without the ability to identify words, reading comprehension cannot succeed. With these observations in mind, we turn to consider how reading comprehension is characterized by the National Literacy Strategy (NLS) in its Framework document (DfES, 1998). This describes how literacy should be taught in England and Wales and it therefore plays a central role in teacher education and professional development.

The NLS introduced the searchlights model, shown in Figure 1, as a characterization of the reading process. It is considered to encapsulate both reading accuracy and reading comprehension. In brief, four strategies ('searchlights') are involved in reading text. Successful readers are thought to use as many of these searchlights as possible. The fewer searchlights the reader can use, the more dependent s/he is on a single one :

● Phonics (sound and spelling): fast and automatic phonic decoding.
● Word recognition and graphic knowledge: the recognition of whole words and word parts, particularly morphemes, to make sense of and complete phonic blending.
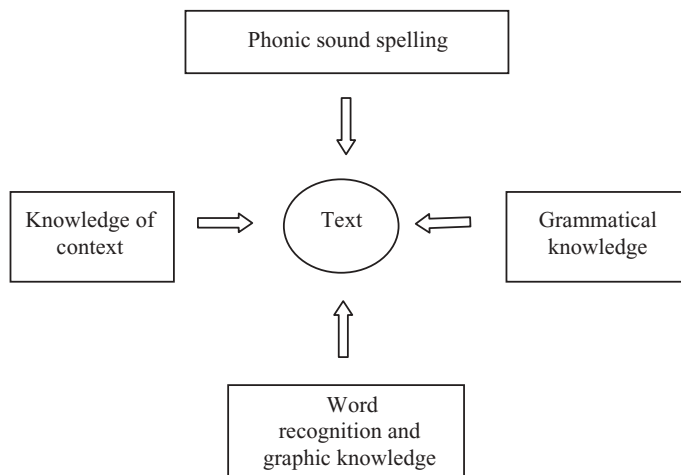


Figure 1.   The searchlights model of text reading (DfES, 1988)

- Grammatical knowledge: predictions from knowledge of syntax to make sense of strings of words, identify sense-making, syntactic boundaries in sentences and read with fluency and expression appropriate to the text.
- Knowledge of context: predictions from context to aid comprehension.

The searchlights framework appreciates that the reading process is complex. It also makes clear that a range of strategies need to be acquired, if children are to develop adequate reading skill. However, there are a number of problems with the approach. First, and as pointed out by Stuart (2003), it reinforces the seriously misguided opinion that phonic decoding and knowledge of printed words are optional searchlights. This is not the case. Both phonic knowledge and orthographic knowledge are fundamental: no amount of grammatical knowledge or sensitivity to context can compensate for inadequate word-level skills. This issue is developed elsewhere in this special issue and so we do not discuss it further here.

### The independence and interdependence of word-level reading and comprehension

By attempting to account for both word reading and comprehension, the searchlights approach inevitably confounds the two. Yet, there is considerable empirical support for an important distinction between those processes concerned with decoding or recognizing printed words, and those processes that enable the reader to understand the message (Oakhill *et al.*, 2003). Imagine yourself a fluent speaker of a foreign language but with no knowledge of its written representation. Reading comprehension would fail as you would have no ability to access meaning from orthography. If the text was read to you, however, understanding would follow, via listening comprehension. Similarly, a child learning to read English who is unable to decipher or recognize print will be unable to understand it, no matter how sophisticated their understanding in the oral domain may be. The alternative scenario is equally easy to imagine. It would be quite possible for you to learn how to decode a foreign language (i.e., 'sound out' printed words). Although an impressive feat, this would not mean that you were able to comprehend text written in that language. Likewise, a child who has learned sight words or knows how to blend graphemes and phonemes to decode new words will not necessarily be able to understand what it is they have recognized or deciphered.

As these hypothetical examples illustrate, successful reading demands both word-level reading and the ability to comprehend what has been read. This is neatly formalized by Hoover and Gough's (1990) *Simple view of reading*. This states that both word-level reading and listening comprehension are necessary, that neither skill on its own is sufficient and that text comprehension is a product of word-level reading and language comprehension. A schematic of the *Simple view* is depicted in the left hand panel of Figure 2. Skills in each domain vary from poor (–) to good (+), thus making explicit the idea that individuals may vary in skill-level across the two domains. The centre panel of Figure 2 illustrates this variability, using data from one
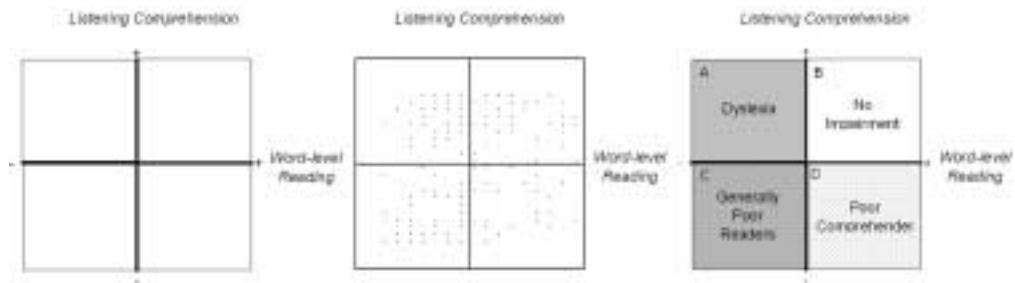
Figure 2.    The simple view of reading

of our own studies of typically-developing 7-year-old children. Variations in word-level reading (as indexed by non-word reading) and variations in listening comprehension are shown on the x- and the y-axis respectively. The correlation between children's performance on the two tasks is statistically significant (but rather modest, $r = .35$) and as is clear from the scatterplot, there is plenty of individual variation. It is possible to capture this variance by categorizing individual children into one of four patterns of reading behaviour, as shown in the right hand panel of Figure 2.

## Difficulties with reading comprehension

Poor reading, that is, poor reading of text, may follow from difficulties with either word-level reading (quadrant A), listening comprehension (quadrant D), or both (quadrant C). The most obvious cause of reading comprehension difficulty stems from word-level reading problems, shown in quadrants A and C. As noted above, if a child cannot read words accurately and fluently, his or her comprehension will be compromised (see Perfetti, 1985). For some children, decoding difficulties are relatively specific. For example, approximately 4–10% of children show developmental dyslexia, that is poor word-level reading despite adequate intelligence and opportunity to learn. Such children often show poor decoding despite adequate levels of linguistic comprehension (see Bishop & Snowling, 2004; see also Snowling & Hulme, this issue). Other children, referred to as generally poor readers in Figure 2 and shown in quadrant C, have deficits in both word-level reading and comprehension.

Although an important cause of reading comprehension failure, word-level difficulties are not the only source of reading comprehension impairment. Children falling in quadrant D have adequate word-level reading skills, but nevertheless have difficulty understanding what they have read. These children have been described using various terms including children with specific reading comprehension impairment, less-skilled comprehenders and poor comprehenders. Throughout the remainder of this review we use the term poor comprehender to describe children who show word-level reading skills that are in the normal range expected for their age, but whose comprehension is substantially below average. Studies find that

approximately 10% of primary school-age children are poor comprehenders (Yuill & Oakhill, 1991; Nation & Snowling, 1997). However, poor comprehenders' difficulties often go unnoticed in the classroom and they seldom come to the attention of specialist professionals. Yet, they are an important and interesting group of children to study for a number reasons. The existence of poor comprehenders demonstrates that a substantial minority of children have 'undiagnosed' comprehension impairments and therefore the development of early identification and intervention programmes should be on both research and education agendas. Turning to more theoretical concerns, by studying such children and attempting to work out why comprehension fails, researchers have been able to identify a number of cognitive and linguistic processes that may be particularly important for successful reading comprehension, over and above the processes that are needed to develop phonic and word-level reading.

**Why do poor comprehenders fail to understand text?**

Attempts to address this question can be split into three broad categories: research investigating text-level processing, research exploring underlying language weaknesses and research concerned with poor comprehenders' memory skills. These three research efforts are complementary, and all provide insights into the nature of poor comprehenders' difficulties (for a more detailed review, see Nation, 2005)

*(a) Text-level processes*

Studies by Oakhill, Cain and colleagues have identified a number of text-level weaknesses in children identified as poor comprehenders, including difficulties with making inferences, difficulty with monitoring comprehension, and a poor appreciation of story structure.

   Oakhill (1984) asked poor comprehenders and control children to read short stories and then to answer questions about what they had read. The questions were split into two types, those that could be answered by literal reference to the text and those that required an inference. Poor comprehenders were worse than typically-developing readers at answering both types of question. In a second condition, the text remained in full view, allowing the children to look back at the story. In this condition, poor comprehenders' performance on the literal questions increased, but they still had marked difficulty making inferences.

   One explanation for these difficulties could be that poor comprehenders lack the knowledge needed on which to base an inference. Cain *et al.* (2001) addressed this possibility by teaching a group of poor comprehenders (and controls) a novel knowledge base about life on an imaginary planet called Gan. The children then read a story about an event on Gan. Story comprehension was assessed by asking the children questions about its content, some of which required an inference to be made. Poor comprehenders struggled to make inferences, even though they were familiar with the knowledge base. These findings provide clear evidence that poor comprehenders have

difficulty drawing inferences when reading. It has been suggested that such difficulties are causally implicated in children's poor reading comprehension (Cain & Oakhill, 1999; Cain *et al.*, 2001).

In addition to problems with making inferences, poor comprehenders tend to read quite superficially and they are less likely to engage in constructive processes when reading. For example, they are less likely to monitor their comprehension in order to detect when comprehension has failed (Oakhill & Yuill, 1996). Poor comprehenders also show weaknesses in aspects of both spoken narrative (Cain, 2003) and written narrative (Cragg & Nation, 2006). In both modalities, poor comprehenders produced narratives that captured less of the story content, and they tended to use a less sophisticated story structure.

Taken together, these studies reveal that poor comprehenders show a variety of weaknesses at the level of understanding and processing text and discourse. These findings are important as they highlight those aspects of reading comprehension that need to be emphasized when teaching reading. We return to this issue later.

## (b) Oral language weaknesses

An important question is whether poor comprehenders' difficulties are specific to the domain of reading comprehension, or whether they reflect difficulties with oral language more generally. The answer to this question is clear as considerable evidence points to a variety of oral language weaknesses. For example, poor comprehenders are poor at making inferences when listening to language, and more generally, they show impaired listening comprehension. A number of studies have revealed relative weaknesses in oral vocabulary (Stothard & Hulme, 1992; Nation & Snowling, 1998) and in learning new vocabulary from context (Cain *et al.*, 2003) in some, but not all, children with poor reading comprehension.

Nation *et al.* (2004) reported a thorough assessment of poor comprehenders' spoken language skills. They administered a battery of tests that are routinely used to assess children's speech and language to a group of poor comprehenders and control children. All children had normal-range non-verbal ability. The tasks sampled a range of skills tapping four domains of language, namely phonology (sound structure aspects of spoken language), semantics, morphosyntax and broader language skills. The term broader language skills refers to the more pragmatic aspects of language (e.g., non-literal language, ambiguity, sensitivity to context). Poor comprehenders were less skilled than control children on tasks tapping semantics (e.g., vocabulary and word knowledge), morphosyntax (e.g., past tense inflection, sentence comprehension) and aspects of language use (e.g., understanding figurative language). In line with previous experimental findings however (see Cain *et al.*, 2000; Nation & Snowling, 1998), poor comprehenders performed well on the tasks tapping phonological processing and phonological awareness.

Reflecting on the relationship between oral language skills and the development of written language, Nation *et al.* speculated that strengths in the phonological domain enable poor comprehenders to develop strong decoding and visual word recognition

skills (in contrast to children falling in quadrants A and C of Figure 2). However, given their relative weaknesses in dealing with the non-phonological aspects of language (ranging from lexical-level weaknesses (vocabulary) through to difficulties with morphosyntax and the interpretation of non-literal language), it is not surprising that poor comprehenders have difficulty extracting meaning from text.

*(c) Memory*

Research with poor comprehenders has also highlighted another component that is important to the reading comprehension process. To make sense of a text, readers often need to keep information in mind so they can integrate it with information yet to be read. This places heavy demands on working memory and thus it is reasonable to ask whether poor comprehenders' difficulties with reading and language comprehension may be a consequence of poor memory. A number of studies have found that poor comprehenders have poor working memory for verbal information (see Yuill & Oakhill, 1991; Nation *et al.*, 1999). We do not know whether difficulties with memory cause difficulties with comprehension, or whether difficulties with comprehension mean that verbal information is more difficult to remember. Regardless of the nature of the relationship however, it is clear that poor comprehenders have difficulty encoding and retrieving verbal information which will be likely to impact negatively upon reading comprehension.

## What do studies of poor comprehenders tell us about reading comprehension?

Perhaps the most important lesson from research with children with reading comprehension difficulties is that comprehension is a very complex process, and one that may fail for many reasons. The corollary of this is that many different skills are important to the development of successful reading comprehension system (Oakhill *et al.*, 2003; Perfetti *et al.*, 2005). The searchlights model described in Figure 1 does not capture this complexity, nor does it capture the important distinction between the processes involved in word-level reading, and those that are necessary for reading comprehension.

The framework introduced in Figure 2 separates the two domains, although of course, if skilled reading is to develop, both domains need to work in concert. Our review of the poor comprehender literature also highlights a number of important omissions from the searchlights model. There is no mention of higher-level processes such as inference making, more basic language skills such as vocabulary knowledge, or cognitive abilities such as working memory capacity. Yet, all of these factors are known to be related to reading comprehension. More generally, the searchlights framework fails to capture the importance of underlying language skills to the development of reading. Reading develops from a foundation of oral language. Evidence suggests that children with low levels of language ability have difficulty learning to read. For example, children from impoverished environments

tend to enter school with low levels of oral language skill and often experience problems with learning to read (Whitehurst & Fischel, 2000; NICHD Early Child-care Research Network, 2005). Similarly, children with specific language impairment (a term applied when speech and language skills fall substantially below non-verbal intelligence for no obvious reason— lack of socio-educational opportunity, sensory impairment, gross neurological impairment and pervasive developmental disorder are all exclusionary criteria) are at great risk for literacy failure (Snowling, 2000). While it is generally accepted that oral language skills are important for the development of both components of the reading system shown in Figure 2, different aspects of oral language may be more or less important to each component. Phonological skills in the oral domain are critical for the development of decoding and word-level reading (Stuart, this volume) whereas non-phonological language skills may be more closely related to reading comprehension (Nation & Norbury, 2005). Models of reading development and reading instruction need to be sensitive to this complex interplay between spoken and written language, and most critically, to emphasize that reading skills develop from a firm foundation of oral language proficiency, an emphasis that is lacking in the searchlights model.

## Teaching reading comprehension

The Department for Education and Skills recently published a series of three leaflets entitled 'Understanding reading comprehension' (DfES, 2005), designed to be read by primary head teachers, literacy coordinators and Key Stage 1 and 2 teachers. Given the drawbacks of the searchlights framework discussed earlier in this review, it is pleasing to note that the overview of reading comprehension provided by this series fits well with what has been learned about reading comprehension from psychological research. The first leaflet comprises a general yet informative description of the capabilities and skills underlying skilled reading comprehension. It emphasizes the need for children to develop and use multiple strategies including the activation of prior knowledge (including vocabulary) and the use of inference and deduction. It also notes the vital role played by metacognitive awareness in reading comprehension. The second and third leaflets in the series describe how teachers can foster these different skills. Broadly, their recommendations are in line with the findings of the National Institute of Child Health and Human Development (2000) review of reading research. This identified a number of instruction strategies that foster children's reading comprehension development in mainstream classroom settings. As well as enhancing vocabulary knowledge, strategies emphasizing active understanding and engagement with meaning were found to beneficial. In particular, there was good evidence for the efficacy of strategies including comprehension monitoring, question answering, question generation, and the use of semantic organization to summarize and represent story ideas, all of which are addressed by these leaflets. However, it is important to note a limitation to the recommendations summarized by the DfES (2005): no distinction is made between those strategies that are vital and fundamental to the comprehension process, and those strategies

that may be best described as literary criticism—that is, evaluation and reflection on a text *after* comprehension has happened. In our view, this distinction between comprehension and the product of comprehension is an important one. Clearly, the ability to reflect critically on a text is an end goal of literacy teaching, but if a child has failed to understand a text, strategies based on literary reflection are not going to help.

It is an understatement to say that reading comprehension is a complex process (Perfetti *et al.*, 2005). Consequently, the reasons why a child may fail to comprehend are likely to be complex as well. Understanding which aspect of reading comprehension a particular child finds difficult is necessary if appropriate and well-targeted interventions are to be put in place. Research by Yuill and Oakhill (1988) demonstrates the utility of this approach very nicely. Having observed that many poor comprehenders are poor at making inferences, Yuill and Oakhill reasoned that significant and sustained improvements in comprehension would only come about if an intervention programme focused beyond the single-word level. They contrasted an intervention specifically designed to improve inferencing ability with training using standard comprehension exercises and rapid decoding. The inference training sessions involved making lexical inferences for each item in a sentence and then linking them together to derive implicit meanings. For example, in a sentence such as 'Debbie was late for school because she missed the bus' one can infer that Debbie is likely to be a female pupil who lives too far from school to walk or ride a bike. Further activities involved question generation ('who was late for school?' and 'why was she late?') and text prediction, where sentences were covered and children had to guess what the hidden sentence was using contextual cues. At the end of a four-week intervention, the inference-trained group had made significantly more progress in reading comprehension than the control groups. This sort of teaching is thought to encourage children to adopt a 'high standard of coherence' (Perfetti *et al.*, 2005, p. 247)—that is, children need to learn to actively engage with text, and to care whether or not it makes sense. Without this, even children who appear to be fluent and accurate readers are unlikely to extract meaning from text.

## Summary and conclusions

Over the last 20 years, psychological research has made considerable progress in understanding the nature of reading comprehension and its development. From informal discussions with newly qualified teachers, we are surprised by how little trainee teachers are taught about this evidence-based literature. This is unfortunate as although many questions remain, some clear conclusions can be drawn, many of which have important lessons for the classroom. We highlight three issues in closing. First, a substantial proportion of children experience difficulties with reading comprehension that remain relatively hidden in the classroom. Teachers need to be aware that the possession of age-appropriate (or even advanced) word reading skill is no guarantee that adequate comprehension will follow. Second, comprehension is a complex process that requires a number of skills from recognizing individual words

through to forming a coherent and cohesive mental model of a text. In turn, these skills place demands on a variety of linguistic and cognitive processes. A greater appreciation of these complexities would be helpful to teachers as they highlight the need to assess and monitor a range of skills, rather than rely on the results of an omnibus reading test. And, for those children identified as having difficulty under-standing text, appropriate intervention needs to be put in place, properly tuned to the aspect of the comprehension process that most needs it. A third and equally important conclusion that also has implications for the classroom is that although the word recognition component (the x-axis of Figure 2) of reading comprehension is unique to reading, a large portion of the skills needed to comprehend text are shared with (or perhaps even parasitic upon) our spoken language skills—as depicted in the y-axis of Figure 2. Thus, strategies to foster reading comprehension can be usefully grounded in interventions designed to improve oral language.

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## Notes on contributors

Kate Nation is a University Lecturer in Experimental Psychology at the University of Oxford and a Fellow of St John's College, Oxford. Her research interests include the development of language and literacy, both in typical and atypical development and she has a particular interest in children's language comprehension difficulties.

Philip Angell is a Research Assistant to Dr Nation at the University of Oxford. He is interested in reading and language development, and is currently working on a longitudinal study of reading comprehension difficulty. He has, in the past, studied development of precocious reading ability.

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