

Making Sense of Text: Skills That Support Text Comprehension and Its Development

by Kate Cain

Successful reading involves the acquisition of two broad sets of skills and knowledge: those that enable accurate and efficient word recognition and those that support comprehension. In this article, I focus on the skills and knowledge that support the latter. I consider how research on the development of reading comprehension and on children with specific reading comprehension difficulties can inform the teaching of reading and interventions for struggling readers.

Reading is a complex activity. Huey (1968) stated: "To completely analyze what we do when we read would almost be the acme of the psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind." The challenge to understand how children learn to read and comprehend text may be great, but the potential benefits for young and struggling readers are far greater. Learning to read is not an end in itself. It is a skill that opens doors and provides opportunities throughout one's lifetime. Successful comprehension of written text enables the reader to acquire and apply new knowledge, to experience other (fictional) worlds, to communicate successfully, and to attain academic success.

What Is Comprehension?

It is worth considering exactly what we mean by *comprehension* before examining some of the problems experienced by young readers and the skills that support the development of reading comprehension. Let us start with a short text:

James went to the beach for a picnic with his friends.
He trod on some broken glass.
His friends took him to hospital.

To understand this simple text, the reader must retrieve the meanings of the individual words and combine them into phrases and sentences. The result is a representation in which specific word meanings and the syntactic form of sentences are retained. This representation is not usually stored for any great length of time unless the precise wording is important, as for jokes (Kintsch, 1998).

When reading for meaning, skilled readers go beyond this surface level of representation. They construct a representation of the text's meaning in which the ideas and concepts expressed in separate clauses and sentences are related. In the above text, the pronoun "he" in the second sentence refers back to "James" who was introduced in the first sentence. The pronoun links the sentences and enables their meanings to be integrated. By integrating the meanings of successive clauses and sentences, readers achieve *local coherence*.

Integration between successive sentences is not always sufficient to understand the concepts and information contained in a text. Why did James go the hospital? The meaning and

significance of sentence three is not clear, unless the reader goes beyond the details provided explicitly in the text and provides a reason for the hospital trip by making an inference from general knowledge: James cut his foot on the glass. By establishing how the ideas fit together as a whole, the reader achieves *global coherence*. This results in a representation of the situation described by the text, rather than a description of the text itself: a *situation model* (Graesser, Singer, & Trabasso, 1994; Kintsch, 1998). These meaning-based representations are enduring and can be retrieved several days after the information was presented. They are not unique to reading comprehension: successful comprehension of spoken discourse also results in a coherent situation model.

Learning to read is not an end in itself.

Text comprehension is a dynamic and interactive process involving several sources of information and knowledge. These include the information provided by the author, the reader's linguistic, pragmatic, and world knowledge, and the reader's memory for the text that has been read so far, the situation model. The latter provides the context for interpreting subsequent words, phrases, and events. If the second sentence read: "He ate a peanut butter sandwich," to understand the final sentence, the reader might infer that James had an allergic reaction.

Continued on page 12

TABLE 1. Characteristics of good and poor comprehenders at ages 9-10 (14 children in each group)

	Good comprehenders	Poor comprehenders
Chronological age	9, 08	9, 08
Sight vocabulary	34.20	34.00
Word reading accuracy in context	10, 06	10, 07
Reading comprehension	10, 07	7, 11

Notes. Chronological and reading ages are given as years, months. A reading age indicates a child's competence compared with the average competence of a group of typically developing children of the same chronological age. Therefore, the poor comprehenders have achieved a level of reading comprehension that is below-average for both their chronological age and their word reading level. The sight vocabulary measure has a maximum possible score of 45. It assesses children's ability to read and understand words presented in short phrases, by asking them to choose an appropriate synonym for a target word, which is underlined. For example: "a different sword" with the choices: weapon, practice, turn, team, spurt.

Children with Reading Comprehension Difficulties

Word reading is essential for reading comprehension: if a child cannot read any of the words on the page, he or she cannot comprehend the written text. An ability to read words does not, however, ensure adequate text comprehension. Approximately 10% of young readers acquire age-appropriate word reading skills but do not develop commensurate reading comprehension ability. These children are *unexpectedly poor comprehenders* because their reading comprehension is below the level predicted by their word reading ability and their chronological age (Cain & Oakhill, 2007). Their listening comprehension is also poor. Table 1 illustrates the typical characteristics of poor comprehenders in comparison with their peers.

Text comprehension is a dynamic and interactive process involving several sources of information and knowledge.

Poor comprehenders have weaknesses on many language and cognitive tasks that may influence their ability to construct a situation model of a text's meaning. Some poor comprehenders have weak semantic and syntactic skills, which will presumably affect their ability to construct representations of the meanings of phrases and sentences (Nation, Clarke, Marshall, & Durand, 2004). Other groups of poor comprehenders do not demonstrate significant difficulties with word or sentence processing, but have problems with text processing skills that may lead to difficulties with the construction of a situation model. These skills are integration and inference, comprehension monitoring, and knowledge and use of text structure (Cain & Oakhill, 2007).

Integration and Inference

Integration and inference making are crucial for good text comprehension. Children with poor reading comprehension are less likely than good comprehenders to integrate meanings across sentences and to combine information in the text with general knowledge for inference generation. Clearly, an inference can only be made if readers have the requisite knowledge. Research in which knowledge availability has been carefully controlled, rules out the possibility that knowledge deficits are the primary source of poor comprehenders' inference making difficulties.

Comprehension Monitoring

Skilled readers appear to monitor their comprehension as they read. They notice when an inference or additional processing is required to incorporate a new piece of information into their situation model. Children with poor reading comprehension do not monitor their comprehension consistently: they often fail to notice if two lines in a text state contradictory information. An example of a text used to assess comprehension monitoring is provided in Table 2. Good comprehenders are

also more likely than poor comprehenders to engage in strategic processing, such as rereading previous text, to resolve comprehension failure.

Knowledge and Use of Text Structure

Knowledge about text macrostructure may aid comprehension by providing a framework for the identification and integration of important information. For example, narrative texts typically comprise a goal-directed sequence of events, which are causally related. A common method to assess knowledge and application of narrative text structure is to get children to produce their own stories, usually orally. When asked to tell a story about a general topic, such as *the holiday*, poor comprehenders produce poorly structured stories, which tend to comprise a list of events with no obvious goal. In contrast, good comprehenders are more likely to produce a narrative with a clear causal structure, in which events happen for a reason and characters develop goal plans to achieve their aims. Performance improves when picture sequences and informative goal-directed titles are used as prompts.

Memory

Text comprehension and the skills that support it are dependent on memory. *Short-term memory* enables the reader (or listener) to store and recall short pieces of information. It might be useful for processing sentences with long or complex structures. Although short-term memory is often poor in children with word reading difficulties, children with good word reading but poor reading comprehension typically do well on measures of short-term memory (Cain, 2006).

Working memory refers to the type of memory involved in the simultaneous processing and storage of information. Many comprehension processes rely on working memory,

TABLE 2. Example of a text with contradictory information used to assess children's ability to monitor comprehension

Moles are small brown animals that live underground using networks of tunnels.

- * Moles cannot see very well but their sense of smell is good.
They sleep underground in nests lined with grass, leaves, and twigs.
Moles use their front feet for digging.
- * Moles can easily find food for their young because their eyesight is so good.
They mainly eat worms but they also eat insects and snails.

* These two lines contain contradictory information. The distance between them can be manipulated so that they are either adjacent or separated by other lines, as shown here.

for example, the integration of two sentences requires the reader to maintain the meaning of one sentence while reading another. Children with reading comprehension difficulties do poorly on measures of working memory that involve the processing of verbal information (Cain, 2006).

Text Processing and Memory

Poor comprehenders have deficits in skills that may directly contribute to the construction of a situation model: integration and inference, comprehension monitoring, knowledge and use of story structure. All three are related to independent measures of working memory, suggesting that at least some of the difficulties experienced by poor comprehenders on these tasks may be due to working memory limitations (Cain, 2006). For example, poor comprehenders are particularly poor at spotting inconsistencies in text when several lines of text separate the two contradictory sentences (as in the example provided in Table 2). In this instance, the reader will only notice that something does not make sense if he or she tries to integrate the just-read information with the existing situation model, rather than with the previous sentence.

Which Skills Drive the Development of Reading Comprehension?

In a study with Jane Oakhill, I tracked the development of reading comprehension in young readers between the ages of 8 and 11 years to explore how skills that support the construction of situation models influence comprehension development (Oakhill & Cain, under review). We were particularly interested in the three skills found to be poor in children with reading comprehension difficulties: integration and inference, comprehension monitoring, and knowledge and use of story structure.

Similar to research with younger readers, we found that different skills explained the development of word reading and reading comprehension. Verbal ability, vocabulary, and phonological processing at ages 8 and 9 years helped to explain children's word reading ability at age 11. Early verbal ability and vocabulary knowledge were also important predictors of later reading comprehension. In addition, each of the three text processing skills was an important predictor of a child's level of reading comprehension at 11 years. A diagram of the skills that directly predicted reading comprehension is provided in Figure 1.

At each time point in the study, working memory was related to reading comprehension and the three text processing skills (i.e., integration and inference, comprehension monitoring, and use of story structure). However, working memory was not an independent predictor of children's reading comprehension development across time. One explanation for this finding is that working memory and its influence on reading comprehension was indirectly assessed by the three text processing skills.

The Wider Consequences of Poor Comprehension

Many dyslexics experience literacy problems throughout the lifespan. The same may be true for poor comprehenders: they do not appear to grow out of their difficulties. In a study of 23 poor comprehenders who were identified at age 8, only one obtained an age-appropriate reading comprehension score three years later (Cain & Oakhill, 2006).

Poor comprehension may also have an impact upon language and literacy development more widely. Children who fail to understand adequately what they read may lack the motivation to read in their leisure time. As a result, they will get less practice in word reading and comprehension than their peers and have fewer opportunities to acquire new vocabulary and knowledge (Stanovich, 1986). Preliminary work indicates that their vocabulary development suffers over time. Poor comprehension skills may impair the ability to learn more generally. Children who have poor reading comprehension at 8 years obtain lower scores than their classmates on United Kingdom national assessments of English, maths, and science taken at age 11 (Cain & Oakhill, 2006). Thus, the consequences of unremediated reading comprehension difficulties may extend beyond literacy skills.

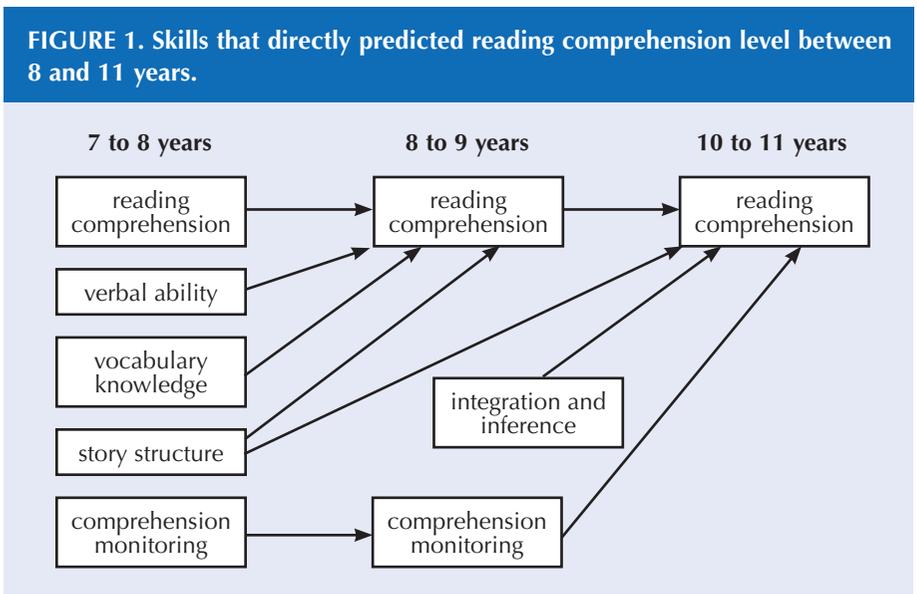
Implications for Teaching

Children with unexpectedly poor reading comprehension have difficulties with the skills needed to construct the meaning-based representation of a text. These difficulties are not restricted to visually presented text: they also have listening comprehension problems. Poor comprehenders do not appear to have a developmental delay and will probably require targeted interventions to remediate their comprehension difficulties.

How to Spot a Poor Comprehender

Children with unexpected comprehension difficulties comprise around 10% of school population in the United Kingdom but are rarely spotted by their teachers (Nation et al., 2004). It is easy to detect the child with word reading difficulties, because he or she will read slowly or inaccurately. Many

Continued on page 14



children with unexpectedly poor comprehension probably go unnoticed by parents and classroom teachers because their accurate and fluent word reading skills hide their difficulties. Comprehension difficulties become apparent when these children are asked questions about texts that require more than recall of simple facts. For example, to answer the question “Why did James go to hospital?” for the text used earlier, the reader must generate an inference. Poor comprehenders will also produce poorly structured written and oral narratives.

What Should Be Taught?

There have been relatively few intervention studies with unexpectedly poor comprehenders, to date. Published studies indicate that instruction in text processing skills will alleviate poor comprehenders’ difficulties. Teaching children to read effectively by learning how to summarize what has been read so far and to generate questions to test understanding, is an effective strategy (Brown, Palincsar, & Armbruster, 1984). Poor comprehenders have also successfully been taught how to make inferences from “clue” words in texts. This type of lexical inference involves identifying and using key words: for example, the words *steam*, *splash*, *soap*, and *towel* indicate a bathroom. A combination of training both lexical inference and question generation to test understanding leads to significant gains on standardized measures of reading comprehension (Yuill & Oakhill, 1991). Although poor comprehenders reliably demonstrate limited memory capacity, inference training is unlikely to lead to memory gains. Instead it might enable some poor comprehenders to compensate by using their memory resources more effectively.

When Should We Teach These Skills?

It is well established that the foundation skills for word reading develop before reading instruction begins. In a similar way, reading comprehension draws on skills and knowledge that develop before children are taught to read. Preschoolers generate inferences to understand spoken and televised narratives. Children under 3 years monitor their comprehension: they can detect when the order of events in a familiar storybook has been changed. An understanding of narrative develops before school, through listening to stories and making sense of events in everyday life. These crucial comprehension skills can be nurtured before reading instruction begins during storybook interactions and conversation.

Summary

Skilled readers construct a representation of a text’s meaning that encodes the state of affairs described by the text. To do this, successful comprehenders engage in meaning-making processes in addition to word identification and sentence processing. They make links between the meanings of different sentences and fill in missing details, often by making inferences. Skilled comprehenders monitor their comprehension as they read, to check that the text makes sense. They use their knowledge of text structure to guide the construction of the representation of the text’s meaning.

Children with unexpectedly poor comprehension have difficulties with these three text processing skills: integration and inference, comprehension monitoring, and knowledge and use of story structure. These skills contribute to growth in reading comprehension during middle childhood. Educators and researchers need to be aware that comprehension can be limited not just by word reading proficiency but by these other skills, as well. Importantly, these text comprehension skills can be taught through both written and spoken language activities and fostered before reading instruction begins.

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