



# Unraveling Reading Comprehension

## Behavioral, Neurobiological, and Genetic Components

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## CHAPTER 6

# Reading Comprehension Difficulties in Struggling Readers

Kate Cain

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**R**eading is a widespread and varied activity. We read different types of text for different purposes. For example, we read fiction for pleasure and entertainment; we read information (or expository) texts in order to learn new ideas and extend our knowledge; and we read e-mails, text messages, and the contents of social message boards to communicate with family and friends. Clearly, reading plays a central role in our educational, working, recreational, and social lives. Although these various reading scenarios cover a range of task-specific goals, they also include a common aim: Readers seek to understand the content of what they read. The focus of this chapter is comprehension and why some children struggle to understand what they read.

### WHAT IS INVOLVED IN READING COMPREHENSION?

Before we can examine and determine the reasons for reading comprehension failure, we must first identify what is involved in the act of comprehending. Consider the following text:

Ruby was carrying the glass of juice. She tripped on the step. Her eyes filled with tears. Mum fetched the mop. *“Don’t worry, darling,”* said Mum, *“there’s no use crying over spilt milk.”*

Skilled comprehenders recognize the individual words on the page and readily access their meanings. The strings of words form meaningful sentences, and skilled comprehenders identify the connections between them and integrate their meanings. In the example above, there are cohesive cues that signal some of these links: *she* and *her* and *darling* all refer back to Ruby, the main protagonist. Good memory aids the integration process: Readers need to store the meanings from individual sentences accurately in order to establish the overlap between them. In fiction, such as the foregoing passage, we want to find out what happens and why. What is the motivation for a character’s action? Why does Mum fetch the mop? The text does not explicitly state that Ruby spilled some of the juice when she tripped, but that is a reasonable inference to make. In generating such inferences, to make sense of Mum’s actions we use general knowledge about the likely consequences of tripping when carrying a glass of juice.

Skilled comprehenders are also sensitive to context and appreciate that Mum is not literally referring to spilt milk; rather, she is using a figurative expression.

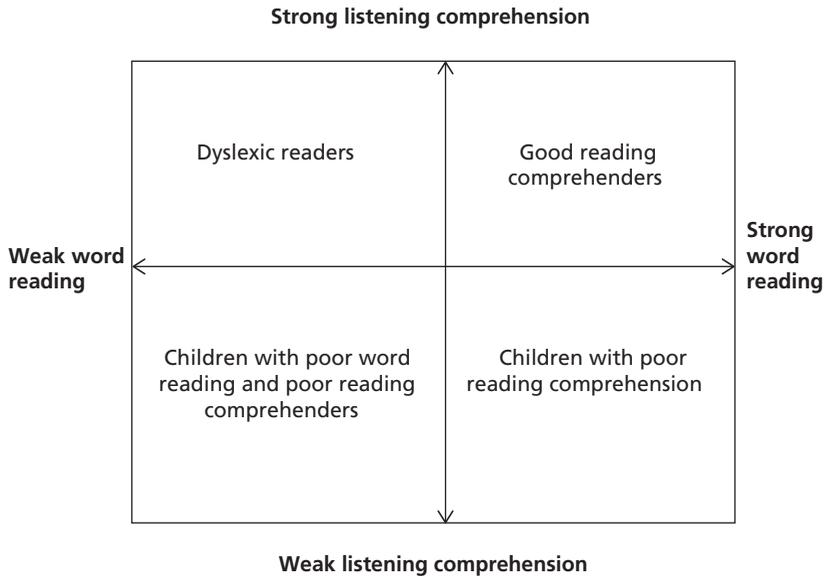
These processes do not occur sequentially, but in parallel. Thus, comprehension is a dynamic process. The current situation model informs the recognition of subsequent words, the comprehension of the current sentence, and the interpretation of new events. By engaging in these processes during reading as well as drawing on knowledge that is external to the text (i.e., general knowledge), skilled comprehenders construct a memory-based representation of the text's meaning. This representation is not a verbatim record of the individual words or sentences; rather, it is a coherent and integrated account of the state of affairs described in the text, referred to as a *mental model* or *situation model* (Johnson-Laird, 1983; Kintsch, 1998). For skilled adult comprehenders, the act of comprehension is not cognitively demanding when the text is considerate and readers have sufficient background knowledge of the topic; but for younger and/or struggling readers the task is not so effortless, and comprehension failures can and do occur.

## WHO HAS READING COMPREHENSION DIFFICULTIES?

Reading is a complex cognitive activity: It draws on a range of knowledge bases and skills that must be coordinated to achieve successful understanding, and sufficient memory resources are required to support this. For this reason, skilled reading has been likened to the performance of a symphony orchestra (Anderson, Hiebert, Scott, & Wilkinson, 1985), and there are several potential barriers to successful comprehension.

A useful framework within which to consider the most likely sources of comprehension difficulty is the simple view of reading (Gough & Tunmer, 1986). According to this framework, reading comprehension is the product of two sets of knowledge and skills: those that enable the individual to read the words on the page in order to access their meanings and those that support comprehension of the text. The primary challenge for beginner readers is to learn to decode, but they must also draw on their existing listening comprehension skills to make sense of what they read. For young readers, reading comprehension will be limited by word-reading proficiency: thus they will be able to understand more complex texts if these are read aloud to them. For the mature reader, for whom word reading is effortless and automatic, reading and listening comprehension are strongly related and predictive of each other (Gough, Hoover, & Peterson, 1996).

Proficiency in each component of the simple view of reading lies on a continuum. Furthermore, as illustrated in Figure 6.1, three different types of poor readers exist: children with poor word recognition skills



**Figure 6.1.** Different types of readers predicted by the simple view of reading.

(children with dyslexia, poor decoders), who may have relatively intact language comprehension; children with poor reading comprehension in the presence of adequate word recognition skills (poor comprehenders); and children who have poor reading comprehension because they have both poor word recognition and poor language comprehension (poor word readers and poor comprehenders). Readers with dyslexia may have reading comprehension problems when they struggle to decode an adequate number of critical words in a text. This is not always the case, however. Because their oral language skills are intact, some poor decoders probably use these oral skills to compensate for their poor word reading; as a result, they can have reading comprehension scores that exceed their word-reading ability (Catts, Adlof, & Weismer, 2006; Leach, Scarborough, & Rescorla, 2003). However, readers who lack fast and efficient word-decoding skills may be unable to retain sufficient information in memory to enable integration between sentences because their cognitive resources have been directed at word decoding (Perfetti, 1985). Thus, some readers have a secondary deficit in reading comprehension as a result of a primary deficit in decoding. For children with unexpectedly poor reading comprehension relative to their word reading, weak language comprehension is the primary source of reading comprehension difficulties. This chapter will explore how weak language comprehension and limited processing resources can result in poor reading comprehension.

## A CLOSER LOOK AT THE BARRIERS TO SUCCESSFUL COMPREHENSION

The ability to read words is essential for reading comprehension to occur. There is now a fairly consistent literature that has unpacked the word-reading component of the simple view and identified the critical factors that support its development, namely, print awareness, letter-sound knowledge, phonological processes (including phonological awareness and memory), and orthographic knowledge (Ehri, 2005). Researchers are now gaining a detailed picture of the different knowledge, skills, and resources that contribute to the language comprehension component and, therefore, serve as the critical barriers (or pressure points) to comprehension during reading development. These factors include both lower and higher level language skills (Perfetti, 2007).

Such lower level language skills as vocabulary and knowledge of grammar are needed to understand individual words and sentences. Typically, however, the reader's goal is not to understand words and sentences in isolation: rather, the goal is to relate the information between successive sentences and between what is in the text and the reader's own general knowledge in order to construct the situation model of the text's meaning. These processes of integration and inference interact with our ability to monitor our comprehension, for example, by detecting when something just read does not fit with the meaning of a previous part of the text and with our current situation model. In such instances, strategic readers may reread and/or generate an inference to ensure that the situation model is coherent. Skilled comprehenders are also guided by knowledge about text structure, which can provide a framework for processing the relations between different parts of a text and, therefore, for the construction of the situation model. Thus, reading comprehension involves both lower and higher level language skills.

Although some poor comprehenders have difficulties with both lower and higher level language skills, others have intact lower level language but weaknesses at the higher level. For example, Catts and colleagues (2006) found that poor comprehenders identified in grade 8 had poorer receptive vocabulary, grammar, and discourse comprehension than did same-age typical readers, a pattern that indicates widespread oral language comprehension difficulties. In contrast, Cain and Oakhill (2006) identified 7- to 8-year-old poor comprehenders who had age-appropriate receptive vocabulary and grammar skills. These children showed weak performance not only on a standardized measure of reading comprehension but also on experimenter-designed tasks that tap the skills critical to the construction of the situation model: integration and inference, comprehension monitoring, and knowledge and use of (narrative) text structure (see Box 6.1 for examples). Other research groups have also identified poor comprehenders with good receptive vocabulary skills (Stothard & Hulme, 1992). Thus,

**BOX 6.1*****Extract from a Text to Assess Inference Making***

Jenny was late getting home from school. She was angry because the bus had broken down.

*Note:* Children read or listen to texts containing sentence pairs such as these. They are then asked questions to tap their ability to integrate information within the text and to generate such inferences as “Why was Jenny late home from school?”

***Example of an Inconsistency Detection Task to Assess Comprehension Monitoring***

Gorillas are clever animals that live together in groups in Africa. *Gorillas sleep on the ground on a bed of leaves and they like to eat different types of fruit.* They are shy and gentle and they hardly ever fight with each other. Gorillas have flat noses and a very poor sense of smell but their eyesight is very good. *Gorillas sleep up in trees and they often build a shelter out of leaves above them to keep out the rain.*

*Note:* Children read the text and are required to underline the bits that do not make sense. The two sentences in italics, which contain inconsistent information, are the target information. Here, the sentences are separated by filler text, which increases the working memory load. When these two sentences are adjacent, poor comprehenders are more likely to detect the inconsistency.

***Example of a Story Anagram Task Used to Assess Knowledge of Story Structure***

Once there was a farmer with a horse.  
The farmer wanted to get his horse into the barn.  
The horse wanted to play in the field so she wouldn't go.  
The farmer went into the barn and held out some sugar.  
The horse had a sweet tooth and walked into the barn.  
The horse felt foolish because she had been tricked.

*Note:* Children are presented with the story as separate sentences in a randomized order and asked to rearrange the sentences into a story that makes sense. Children who have a good sense of story structure are better able to respond with the target sequence, shown above. This text is adapted from Stein and PolICASTRO (1984).

these different patterns of language strength and weakness cannot be dismissed as spurious findings. They point to the complexity readers face when unpacking reading comprehension and how reading comprehension ability develops over time, something that we will return to later.

Cognitive resources that support language processing, such as the working memory system, are important for good reading. Children with poor word reading often have weak short-term memory: they are poorer than same-age typical readers at retaining and recalling strings of verbal stimuli (Shankweiler, Liberman, Mark, Fowler, & Fischer, 1979). Children with good word reading but poor comprehension do not typically have difficulties with short-term retention of information, but they are weak on memory tasks that require both the retention and the manipulation (or processing) of verbal information (Cain, 2006). A consistent finding across the life span is that memory tasks that tap the capacity to store and process information simultaneously are more highly predictive of reading comprehension level

than are tasks that assess only storage (Shah & Miyake, 1996). This is because these more complex working memory tasks mimic, in part, the integrative processes involved in constructing the mental representation of a text's meaning. Indeed, when memory resources are stressed because information in a text has to be integrated over several sentences (as illustrated in Box 6.1), children with poor reading comprehension are particularly impaired at making inferences and detecting inconsistencies (Cain, Oakhill, & Lemmon, 2004; Catts et al., 2006; Oakhill, Hartt, & Samols, 2005).

## **WHAT CAN READING COMPREHENSION DEVELOPMENT TELL US ABOUT THE SOURCES OF READING COMPREHENSION DIFFICULTIES?**

By examining reading comprehension within a developmental context, we can gain insight into the knowledge bases, skills, and resources that not only drive its development but also enable good reading comprehension. In doing so, we gain a more detailed picture of the weaknesses that underlie comprehension failure.

Acquisition of good word-reading skills does not guarantee successful comprehension, as shown by the identification of children with unexpectedly poor reading comprehension in relation to their word-reading level. Similar to research into word-reading development that has sought to identify which skills and knowledge contribute to word reading, recent work has sought to identify the best concurrent (Cain, Oakhill, & Bryant, 2004; Vellutino, Tunmer, Jaccard, & Chen, 2007) and longitudinal predictors (Oakhill & Cain, 2012) of reading comprehension. The following key findings emerge. Specific discourse skills that aid the ability to construct meaning from text—*inference and integration, comprehension monitoring, and knowledge and use of text structure*—each account for unique variance in concurrent measures of reading comprehension at ages 8, 9, and 11, over and above vocabulary knowledge, word reading, and general verbal ability (Cain, Oakhill, et al., 2004). In addition, working memory makes a separate contribution to reading comprehension performance (Cain, Oakhill, et al., 2004). When we look across time, discourse skills explain reading comprehension development from 8 to 11 years of age, in addition to verbal IQ and vocabulary (Oakhill & Cain, 2012). Thus, the meaning-making skills that are weak in poor comprehenders predict reading comprehension development in unselected samples.

Comprehension of extended discourse develops before literacy instruction begins: Children enjoy sharing storybooks and personal narratives from an early age (Reese & Newcombe, 2007). Thus, it is not surprising to find that oral language skills, including vocabulary, inferencing, and integration, are related to preschoolers' comprehension of spoken text (Florit, Roch, & Levorato, 2011; Lynch et al., 2008) and that these, in turn, are related to later reading comprehension (Kendeou, van den Broek, White, & Lynch, 2009).