# Different readers, different texts, different processes : the effects of reader and text properties on text processing

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# 01

## Chapter

# General Introduction

**1.1 Introduction**

Reading comprehension is a complex skill, in which readers use various cognitive processes. Comprehension of a text involves the construction of a mental representation of the meaning of the text. To understand what they are reading, readers need to employ both basic language skills and comprehension skills. A distinction can be made between cognitive processes for basic language skills and cognitive processes for comprehension skills (e.g., Gough & Tunmer, 1986; Hoover & Gough, 1990; Kendeou, van den Broek, Helder, & Karlsson, 2014). The former involve processes that relate to decoding text, for example phonemic awareness and the linking of sounds to characters, whereas the latter involve processes related to understanding the information in a text. Examples of comprehension skills include making connections, noting a disruption of understanding, and being aware of text structures (e.g., Cain & Oakhill, 2007; Helder, van den Broek, Van Leijenhorst, & Beker, 2013; van den Broek & Espin, 2012). Many of these comprehension skills apply not only to written text but also, for example, to understanding films, presentations, and the like.

**1.2 Basic language skills and comprehension skills**

Both basic language skills and comprehension skills are important for reading comprehension. During the first years of primary education, a relatively high degree of attention is paid to the automation of basic language skills. When students start learning to read, converting characters into sounds and words makes large demands on their limited cognitive capacity. If all goes well these basic language skills are automated on average halfway through primary school, making more cognitive capacity available for students to apply comprehension skills (De Jong & Van der Leij, 2002; Kendeou, Papadopoulos, & Spanoudis, 2012; Perfetti & Hart, 2002). At the same time, the cognitive capacity of children increases, especially during primary school, and continues to increase well into adolescence (Huizinga, Dolan, & Van der Molen, 2006; Luna, Garver, Urban, Lazar, & Sweeney, 2004). The amount of cognitive capacity available is related to a child's reading comprehension level: more cognitive capacity leaves more room for comprehension. However, the fact that more capacity is available does not necessarily mean that texts that are decoded correctly are actually well understood. Comprehension skills play an important role here.

Much less is known about the development of comprehension skills than about the development of basic language skills. Nevertheless, a number of conclusions relevant to education can be drawn, including conclusions from longitudinal studies, whereby the same tests are carried out in the same group of children in successive years (Kendeou, Bohn-Gettler, White, & van den Broek, 2008; Kendeou, van den Broek, White, Lynch, 2009; Oakhill & Cain, 2011). First, it emerges that the development of comprehension skills starts at a young age. Even before children receive formal reading instruction, they are capable of making connections between events in stories that they see or hear. Second, it emerges that comprehension skills develop relatively independently of basic language skills. So, if a child is not good at decoding a text, this does not necessarily mean that he/she is unable to understand the content of the text –and vice versa. Third, it turns out that individual differences in comprehension skills at a younger age predict reading comprehension level later in life, independently of basic language skills.

**1.3 From comprehending narrative texts to comprehending expository texts**

The relationship between the amount of attention devoted to basic language skills and comprehension skills changes during the primary school years. Generally, in kindergarten equal attention is paid to basic language skills and comprehension skills. In Grade 1 and Grade 2 some attention is paid to comprehension skills, but the emphasis is on basic language skills. From Grade 3 on, there is more attention for comprehension skills. In primary schools in the Netherlands, reading comprehension becomes a subject in its own right. There is a shift from "learning to read", to "reading to learn" (Chall, 1996, Chall, Jacobs, & Baldwin, 1990). At the same time, there is a shift from the use of narrative texts to the use of expository texts in education. These texts differ in the ways they are organized, the causal coherence of information, the vocabulary, and the presence of a central character (Wolfe, 2005). For most children, expository texts are more difficult to comprehend than narrative texts (Best, Floyd, & McNamara, 2008). Adequate comprehension of expository texts is crucial, however. In the final years of primary school, children are expected to learn and apply information from expository texts in history, geography, and biology books in other contexts (Allington & Johnston, 2002). This is also expected of them in most forms of further education.

**1.4 Same text, different mental text representations**

Although a text has the same title, sentences, words, and layout for each reader, the mental representations that readers construct differ. These depend, among other things, on the cognitive processes that the reader uses during reading. While reading, things can go 'wrong' in the reader's mind. For example, low-comprehending readers may find it difficult to recognize certain connections in the text, to make relevant connections at the right moments, or to integrate the information in the text with his or her background knowledge (Perfetti, Landi, & Oakhill, 2005; Yuill & Oakhill, 1991). This leads to a less coherent mental text representation, which in turn leads to superficial processing of the content and less-than-optimal understanding of the text (Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007; van den Broek et al., 2006). Research by Karlsson et al. (2018), McMaster et al. (2012) and Rapp et al. (2007) has revealed two distinct subtypes of struggling readers with their own characteristic reading style: paraphrasers and elaborators. Paraphrasers typically construct a limited mental representation that mainly reflects the literal meaning of the text, whereas elaborators attempt to enrich their mental representation by generating elaborative and predictive inferences, often unsuccessfully (Rapp et al., 2007).

**1.5 Different research methods to investigate cognitive processes**

Cognitive processes can be investigated in various ways, using varying research methods. In doing so, we differentiate between methods to investigate what the reader has stored in his/her mental representation of the text *after* reading, and methods to investigate what occurs in the mind of the reader *during* reading. For instance, *after* reading, readers can be asked about the content of the text – the main topic and/or details – or about what they remember of the text. These are ways to find out what is stored in the mental representation that the reader has built up after reading a text. *During* reading, on the other hand, a reader can be prompted to express his/her thoughts after reading each sentence (think-aloud method). Another, more indirect way to investigate the underlying cognitive processes during reading is to measure reading times and/or eye movements. Each research method has its own strengths and weaknesses. For example, some methods only reveal the reader's conscious thoughts (e.g., asking questions, think-aloud method), whereas other methods

measure unconscious processes that are more difficult to interpret (e.g., reading times, eye movements). By using a combination of research techniques, we can gain different kinds of insight into how readers comprehend what they read.

## 1.6 Effect of text layout on text processing

How well a reader comprehends a text does not solely depend on characteristics of the reader. Text characteristics also have an impact on readers' text-processing approaches and their construction of a mental representation of the meaning of the text. In text-orientated approaches it is common belief that beginning readers will benefit from an easy text, in which words are easily recognized and decoded and sentences are easily parsed, because this should facilitate the construction of a qualitatively good mental representation of the text. Therefore, texts for beginning readers often are written in a large font, with increased spacing between letters, words, and lines (e.g., Zorzi et al., 2012). Moreover, infrequent words and sentences with subordinating clauses are avoided, sentences are generally short and to avoid line-breaks in the middle of a sentence texts are presented in a fragmented layout in which each sentence is presented on a new line (Land, 2009).

The idea behind these adaptations in the text layout is that they optimize the eye movements and basic decoding processes during reading, and possibly free up cognitive resources for higher-order comprehension processes such as comprehension monitoring and inference generating (cf., Schneps, Thomson, Chen, et al., 2013; Schneps, Thomson, Chen, Sonnert, & Pomplun, 2013). In other words, the visuo-spatial features of a text can effect reading in several ways, ranging from reducing the cognitive load of basic decoding and eye-movement processes to probing higher-order integration processes. By varying the layout of texts, we can explore whether and why beginning readers may benefit from a specific layout. And, by examining readers with different reading skills we can explore whether and how individual differences in reading skills constrain the efficacy of the layout of a text.

## 1.7 Outline of this dissertation

Although comprehension differences between children have been observed, little attention has been paid to on-line text processing. Moreover, the processing of narrative texts and

expository texts has often been studied in isolation. The central aim of this dissertation is to gain insight into the on-line text processing of young low- and high-comprehending children as they read expository and narrative texts for comprehension, by using a variety of on-line research methods. An additional aim is to gain insight into distinct reading profiles. The second aim of this dissertation is to gain insight into the effect of different forms of text layout on the text comprehension and reading speed of young children as they read expository and narrative texts for comprehension. The dissertation consists of three sections.

The first section of this dissertation consists of a theoretical chapter (**Chapter 2**). This chapter reviews research on sources of individual differences in reading comprehension abilities. First, I discuss what text comprehension is and what cognitive processes occur during reading for comprehension. Then, I highlight sources of individual differences in executing these processes. Finally, I discuss the development of the skills and abilities required for successful reading comprehension.

The second section of this dissertation consists of four empirical studies (**Chapters 3-6**). The aim of the study described in **Chapter 3** was to investigate the on-line comprehension processes and strategy use of second-grade low- and high-comprehending readers when reading expository and narrative texts for comprehension; this was investigated by using a think-aloud protocol. An additional aim was to investigate whether the distinction of two types of struggling readers, -- *paraphrasers* and *elaborators* (McMaster et al., 2012; Rapp et al., 2007) -- already exists at a young age, and whether this distinction also applies to high-comprehending readers. To assess the quality of their after-reading mental text representation, the participants answered literal and inferential comprehension questions. In addition, to determine possible factors contributing to comprehension differences, they completed a test battery assessing general cognitive and language-related proficiencies. In **Chapter 4** the on-line text processing of second-grade low- and high comprehending readers was investigated by tracking their eye movements as they read expository and narrative texts for comprehension. After reading, the participants answered literal and inferential comprehension questions to determine the quality of their mental text representation. We hypothesized that our participants needed to adapt their reading approach to obtain a proper understanding of expository texts, because young readers are known to have greater difficulty processing expository texts than narrative texts (Best et al., 2008), and that high-comprehending readers would adjust their reading approach more easily to the text than low-

comprehending readers (Duke & Pearson, 2002; Rapp et al., 2007). In **Chapter 5** we investigated whether subgroups of readers that were characterized as low-comprehending and high-comprehending paraphrasers and elaborators on the basis of the think-aloud study described in *Chapter 3*, were also characterized by different eye-movement patterns. We did so by analyzing the data of the eye-tracking study described in *Chapter 4* and the think-aloud study (*Chapter 3*). We also explored the effect of text genre on the eye-movement patterns. In addition, we explored whether the eye-movement patterns of paraphrasers and elaborators showed similarities with eye-movement patterns of subgroups of readers that are distinguished in eye-tracking studies by others. **Chapter 6** concerns a study on text layout in which we explored the idea that the visuo-spatial properties of segmented layouts support beginning readers by reducing the demands of basic eye-movement processes. We examined whether young, beginning readers either benefit or experience drawbacks from segmented texts. We also explored *why* beginning readers may benefit from a specific layout. In addition, we wanted to gain more insight into whether and how individual differences in reading skills constrain the efficacy of the layout of a text. A series of four self-paced reading experiments with different text layouts was conducted to assess the effect on the text comprehension and reading speed of second- and third-grade pupils. In each experiment, participants read several narrative and expository texts with different layouts. The reading times for the texts were recorded and after reading each text, participants answered literal and inferential comprehension questions to assess the quality of their after-reading mental text representation.

In the studies described in *Chapters 3-5*, we defined low-comprehending readers as readers who have difficulty comprehending connected text despite having age-appropriate technical reading skills (cf., Cain & Oakhill, 2007; Nation, 2005), with the addition that their intelligence is normally developed and that they don't have diagnosed behavioral problems. In *Chapter 6*, two Dutch standardized tests for reading comprehension and decoding proficiency were used as continuous variables for reading-comprehension skills and word-decoding skills, respectively.

In **Chapter 7,** the third and final section of this dissertation, the results and conclusions from the empirical studies are summarized and discussed in a broader context, and recommendations are given for educational practice.