



Individual Differences in Reading Comprehension. A Componential Approach to Eighth Graders' Expository Text Comprehension.

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Summary

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Adequate text understanding is a prerequisite to learn from texts. In secondary school, textbooks play an important role in information exchange. However, secondary school students need to be able to understand their textbooks to a certain degree, to be able to absorb the information provided in these books. Unfortunately, about a quarter of secondary school students fails to achieve the text comprehension level necessary to understand their school book texts (Hacquebord et al., 2004; National Centre for Education Statistics, 2003). The results of the OTAW project ("Opbrengst Taalonderwijs Amsterdam-West", which translates into 'Results of Language Education Amsterdam-West') have demonstrated that expository text comprehension skills seem especially inadequate for readers with a language minority background and a low SES.

In this context, we consider it important to improve our understanding of the components underlying expository text comprehension, especially for readers with a language minority background and a low SES. To this end, the present study investigated predictors of expository text comprehension in a sample of eighth graders who had, on average, low SES, and of whom the majority spoke another language than Dutch at home. In our samples, varying between 151 and 171 eighth graders, between 65 and 68 percent of the students had a language minority background. Most of these students spoke Turkish or Arabic at home. In our samples, students were more or less evenly distributed across the educational levels in Dutch secondary schools: the study had students from prevocational (*vmbot*), general secondary education (*havo*) and pre-university tracks (*vwo*) participating.

Based on the literature, the present study investigated whether four components in reading comprehension have unique predictive value for individual differences in the expository text comprehension of these eighth graders. These components were knowledge of connectives, text reading fluency, text structure

inference skill and reading motivation. Sentence reading fluency, general vocabulary knowledge and metacognitive knowledge served as control variables. Thus, in this study, unique predictive value means predictive beyond the three control variables.

Unique predictive value of four components

Knowledge of connectives is assumed to be especially important for expository texts, because connectives signal the nature of relationships between information elements, and expository texts aim to convey new information and relationships to readers. Connectives indicate, for example, whether the relationship between text parts is additive, causal or contrastive. Although earlier research has shown convincingly that inserting connectives in expository texts leads to better expository text comprehension (cf., Degand et al., 1999; Degand & Sanders, 2002; Singer & O'Connell, 2003; Van Silfhout et al., 2014), it was not clear yet what the role of knowledge of connectives was. It was not clear yet whether knowledge of connectives is simply an indication of secondary school readers' general vocabulary knowledge or a separate component. Neither was it clear whether knowledge of connectives has a unique association with expository text comprehension, controlling for other predictors, such as general vocabulary knowledge.

We investigated the unique predictive value of text reading fluency in the context of fluent word and sentence reading as a prerequisite for executing higher order comprehension processes (e.g., Just & Carpenter, 1992; LaBerge & Samuels, 1974; Perfetti, 1985; Perfetti & Lesgold, 1977; Perfetti & Hart, 2001). We hypothesized that, together with fluency at the word and sentence level, fluency in text level processes (text reading fluency) could be an important requirement for expository text comprehension. A reader's working memory capacity is limited and therefore text reading fluency may be essential, especially for expository texts, which are challenging in terms of attention, effort and strategic processing.

We considered text structure inference skill, that is, the ability to infer overall text structure, important to expository text comprehension. Text structure inference skill enables readers to distinguish between more and less important text

information and to store information accordingly (i.e., hierarchically) in their mental representations of texts. The existence of a link between expository text comprehension and text structure inference skill has been established (Meyer et al., 1980), but its unique role in an individual differences approach to expository text comprehension, separate from other components, was not yet studied. Therefore, we considered it important to investigate the role of text structure inference skill in combination with other predictors of text comprehension.

Lastly, we hypothesized that reading motivation moderates the contribution of the aforementioned cognitive components to expository text comprehension. We expected that less motivated readers would benefit less from their cognitive resources than their more motivated peers. For example, an unmotivated reader might read sloppily, and therefore will have a smaller advantage from his vocabulary knowledge, in terms of text understanding, than a more motivated peer would. We examined the moderating role of ten motivational aspects drawn from various theoretical perspectives.

We found knowledge of connectives and text structure inference skill to have unique predictive value for expository text comprehension, taking into account sentence reading fluency, general vocabulary knowledge and metacognitive knowledge as control variables. Knowledge of connectives had strong unique predictive value: this single component accounted for more than one third of the total variance accounted for in expository text comprehension by all predictors together (37.5% total variance). Imagine two eighth graders with equal sentence reading fluency, general vocabulary knowledge and metacognitive knowledge levels; our results show that the student with more knowledge of connectives will have a higher expository text comprehension level. The unique contribution of knowledge of connectives also indicates that knowledge of connectives and general vocabulary knowledge are separate constructs.

The unique contribution of text structure inference skill was lower than that of knowledge of connectives, namely 6.7% unique variance of the total variance explained by text structure inference skill and our control variables (29.9% total

variance). Interestingly enough, text structure inference skill did not relate to expository text comprehension uniquely if knowledge of connectives was included as an additional control variable. Moreover, separate regression analyses with subsets of the control variables indicated that text structure inference skill did not predict expository text comprehension, when controlling for metacognitive knowledge and knowledge of connectives. This outcome stresses the importance of metacognitive knowledge and knowledge of connectives for text structure inference skill. A robustness check of the latter findings, showed that metacognitive knowledge and knowledge of connectives are not able to account for the predictive value of text structure inference skill for every reader. This finding seems to indicate that having the knowledge to infer text structure (knowledge of connectives and metacognitive knowledge) does not necessarily lead to active text structure inference for every eighth grader.

The lack of unique predictive value for text reading fluency was expected, considering the correlations we found, because fluency, whether at sentence level or text level, did not correlate with expository text comprehension for our eighth graders. Based on our results, we conclude that fluency at the sentence and text level does not play a role in limiting readers in the execution of higher order comprehension processes or in making use of their cognitive resources. We argued that, for eighth graders, individual differences in reading fluency are beyond the point where they play a role in expository text comprehension levels.

The absence of an effect for reading motivation does not correspond with earlier studies that found motivational aspects to contribute to expository text comprehension, controlling for cognitive skills (Anmarkrud & Bråten, 2009; Logan et al., 2011; Schaffner & Schiefele, 2013; Taboada et al., 2009). In the present study, the lack of correlations between motivational aspects and expository text comprehension was also remarkable in light of studies that have shown that better expository text readers are more motivated to read these texts (Ho & Guthrie, 2013; Wigfield et al., 2012). As most studies have found an effect of motivational aspects on text comprehension, we considered it unlikely that motivational levels did not influence expository text comprehension differences in our study. Therefore, we

argued that inaccurate measurement of actual motivational levels during reading was the most plausible explanation for the lack of effect of motivational aspects. Additional research seems necessary to examine motivational aspects as potential moderators of cognitive resources underlying expository text comprehension.

Language background and cognitive resources as possible moderators of the four components

In addition to the hypothesized unique predictive value of the four core components (research question 1), we also hypothesized that the effect of these four components on expository text comprehension might depend on readers' cognitive resources and on their language backgrounds (research question 2). With regards to language background, we argued that bilinguals with a language minority background, compared to their monolingual peers, might not benefit fully from their knowledge of connectives, text reading fluency, and text structure inference skill, due to their lower word and sentence reading fluency, and their lower general vocabulary knowledge levels (e.g., Aarts & Verhoeven, 1999; Mancilla-Martinez & Lesaux, 2010; Manis et al., 2004; Páez et al., 2007; Swanson et al., 2006; Trapman et al., 2014; Van Gelderen et al., 2003; Verhoeven, 2000). Because of reading relatively slow and having less vocabulary knowledge, bilinguals may require substantial attentional resources for word and sentence processing. As a result, bilinguals might be unable to employ the attentional resources required to benefit from their knowledge of connectives, text reading fluency and text structure inference skill. In line with this view, we also examined whether the effect of knowledge of connectives, text reading fluency and text structure inference skill depended on sentence reading fluency and vocabulary knowledge levels.

We did not find evidence for the assumption that readers with lower sentence reading fluency or general vocabulary knowledge levels (or a language background that is associated with these characteristics), have smaller advantages from their knowledge of connectives, text reading fluency and text structure inference skill. Interactions of sentence reading fluency or vocabulary knowledge

with these three components were absent. In line with these results, although we found bilinguals to have lower general vocabulary knowledge than their monolingual peers (we found no difference on sentence and text reading fluency), these groups did not differ with regard to the effect these three components have on expository text comprehension. In a similar vein, we found no difference in the contribution of the three components between bilinguals with and without Dutch as a dominant home language, despite more fluent sentence reading of the former group. Taken together, these findings do not support the idea that lower sentence reading fluency or general vocabulary knowledge levels prevents readers from using other cognitive resources to the same extent as than their more knowledgeable and fluent peers.

More specifically, based on these results, we argued that lower vocabulary knowledge is merely a direct cause of bilinguals' lower expository text comprehension and not likely to be a factor that hampers bilinguals in their use of other cognitive components. In addition to a smaller amount of general vocabulary knowledge, we found bilinguals to have less metacognitive knowledge and knowledge of connectives too. Our results also revealed that bilinguals did not score lower than monolinguals on expository text comprehension when general vocabulary knowledge, metacognitive knowledge and knowledge of connectives were taken into account.

We have also put forward perspectives from which text structure inference skill and reading motivation are components that have a larger effect on text comprehension for bilinguals. Text structure inference skill could be more important for bilinguals according to Hacquebord's view, which assumes that bilinguals direct their attention to global understanding as a compensating mechanism for the word and sentence level problems they encounter during reading (Hacquebord, 1989; 1999). From the perspective that reading motivation helps to compensate for vocabulary knowledge or fluency problems (cf., Walczyk, 1995; 2000; Walczyk et al., 2007), we argued that motivational aspects may have more predictive value for bilingual readers, who are hypothesized to experience more of these reading problems than their monolingual counterparts.

We found no interaction between language background and text structure inference skill, which is not in line with Hacquebord's compensatory view, which would suggest an interaction. Therefore, we considered it likely that bilinguals focus directly on the language problems they encounter, instead of compensating by focusing on higher textual levels. Other studies based on think-aloud data have argued likewise (e.g., Davis & Bistodeau, 1993; Horiba, 1990; 1996; 2000; Stevenson et al., 2003). Our assumption of a direct focus on problems at the local text level seems to hold for both bilingual groups, since no differences between these groups were found in terms of the predictive value of text structure inference skill.

We found no interaction between reading motivation and language background either. We hypothesized that this effect could indicate that the degree to which readers with different language backgrounds experience reading difficulties, does not vary enough for motivational aspects to play a different role for these subgroups. This hypothesis requires further examination, as we did not measure comprehension problems during reading of readers with different motivational levels and language backgrounds.

For text structure inference skill, in addition to sentence reading fluency and general vocabulary knowledge, we examined reading proficiency level as a possible moderator. We argued that poor readers may not be able to exploit their text structure inference skills to the same extent as their better comprehending peers, as poor readers may need their attention for word and sentence level processing, thereby preventing them from inferring text structure more strategically. Moreover, we expected that poor readers were less likely to meet the requirements suggested as important for the successful execution of reading strategies, such as text structure inference. These requirements are: i) being aware of the relevance of strategies, ii) being motivated to employ them and iii) having had enough practice in using them (e.g., Baker, 2005; Pintrich & Zusho, 2002; Veenman et al., 2006).

We also examined reading proficiency level as a moderator of the effects of reading motivation. Although we hypothesized that poor readers have lower reading

motivation in general (e.g., Ho & Guthrie, 2013; Wigfield et al., 2012), we argued that motivation may play a more crucial role within a subgroup of poor readers than within a subgroup of proficient readers. We expected poor readers to experience more reading difficulties, hence requiring more effort to achieve a high level of text understanding than their better comprehending peers, and we considered motivation crucial for surmounting reading difficulties, and for putting effort into reading.

Similar to language background, a moderating effect of reading proficiency level could not be established either. This finding seems to indicate that poor readers do not profit less from their text structure inference skills than their more proficient counterparts. Reading proficiency level did not moderate the effect of motivational aspects either. However, our study may not be the best test of the hypothesized idea that poor readers benefit more from motivational aspects than good readers. Further investigation into this topic is needed.

Lastly, we also investigated the interaction between metacognitive knowledge and knowledge of connectives, as we hypothesized that readers with limited knowledge about text structure and reading and writing strategies (i.e., metacognitive knowledge as operationalized in the present study) could benefit less from knowing connectives. Readers with limited metacognitive knowledge may have a more limited understanding of the importance of connectives, and may not use them as well to establish coherence as their peers with more metacognitive knowledge.

This hypothesis was confirmed. We found a significant interaction between knowledge of connectives and metacognitive knowledge: the contribution of knowledge of connectives to expository text comprehension was larger when metacognitive knowledge increased. This significant interaction shows that cognitive resources can act as moderators for other components. More specifically, this finding supports the idea that having knowledge of connectives is not sufficient to be able to use them successfully: readers need to have sufficient metacognitive knowledge as well. Due to our correlational design, we did not have online evidence for the idea that metacognitive knowledge had an impact on the use of connectives during reading. Findings from a recent eye-tracking study by Vlaar, Sanders and Welie (in preparation), however, support our assumption that readers with more

metacognitive knowledge use connectives more successfully, compared to their peers with less metacognitive knowledge.

Educational implications

The findings from the present study add to our knowledge about expository text comprehension at secondary school and they also are of interest for educational practitioners. We underscored that metacognitive knowledge, knowledge of connectives and text structure inference skill should be addressed in reading comprehension instruction, in addition to general vocabulary knowledge. Our advice is in line with other studies that showed that training students on these components results in better expository text comprehension (e.g., Cook & Mayer, 1988; Meyer et al., 1989; Meyer & Poon, 2001; Moeken et al., 2015b; Wijekumar et al., 2013; Williams et al., 2004; Williams et al., 2009).

What our study adds, is that instruction in knowledge of connectives and text structure inference skill seems to be beneficial for eighth graders irrespective of their language background and their levels of reading fluency, general vocabulary knowledge, and reading proficiency¹². In other words, as we found no evidence that readers with less than optimal cognitive resources are restricted from using their knowledge of connectives and text structure inference skill, we assumed that eighth graders do not require their cognitive resources to be better developed first, that is, as a prerequisite, before they are able to benefit from instruction in knowledge of connectives and text structure inference skill.

There is, however, one exception to this assumption. Our results seem to indicate that having knowledge of connectives does not seem very helpful in improving expository text comprehension if the reader's metacognitive knowledge is insufficient; therefore we advise teachers to combine instruction in knowledge of connectives and metacognitive knowledge. Furthermore, because our study found that bilinguals with a language minority background not only have less general

¹² Reading proficiency level was examined only as a moderator for text structure inference skill.

vocabulary knowledge, but less knowledge of connectives and metacognitive knowledge than their monolingual peers too, we propose that these components get special attention in reading instruction for bilinguals. Finally, we do not advise secondary school teachers to initiate reading practices aimed at increasing reading fluency. Given the absence of predictive value of reading fluency in the present study, we do not expect fluency training to lead to an increase in secondary school readers' expository text comprehension.

Concluding remarks

Our study has broadened our understanding of the individual differences related to eighth graders' expository text comprehension. We suggested that research designs that combine online and offline data will help in gaining a better understanding of the reading processes of readers with different cognitive and motivational make up, as well as of how these processes affect text comprehension.

Finally, we do want to stress the social importance of long-lasting reading comprehension interventions for bilingual readers with a language minority background. Both the present study and the preceding OTAW project have shown that bilinguals with a language minority background lag behind their peers in linguistic knowledge, metacognitive knowledge and expository text comprehension. Closing these gaps between monolingual and bilingual students is not expected to be an easy task. Extra effort and interventions are required to promote knowledge and text comprehension, both at school and outside of school situations, in order to reduce the differences between monolingual and bilingual students. In the present dissertation, we underscored the importance of tailored remedial activities at schools and we also proposed educational practices in Dutch language arts classes that could improve students' language proficiency. However, more research is required to examine what the most efficient and effective ways are for schools to help in closing the gaps between monolingual and bilingual students. Outcomes from this research, and language policy based on these outcomes, will bring us closer to an ambitious goal: creating equal opportunities for students to finish their school careers successfully.