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DOI
10.1111/1467-9817.12090

Publication date
2017

Document Version
Final published version

Published in
Journal of Research in Reading

Journal of Research in Reading
UKLA
The United Kingdom Literacy Association

Journal of Research in Reading, ISSN 0141-0423
Volume 40, Issue S1, 2017, pp S42–S65
DOI:10.1111/1467-9817.12090

Expository text comprehension in secondary school: for which readers does knowledge of connectives contribute the most?

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The present study examined whether knowledge of connectives contributes uniquely to expository text comprehension above and beyond reading fluency, general vocabulary knowledge and metacognitive knowledge. Furthermore, it was examined whether this contribution differs for readers with different language backgrounds or readers who vary in reading fluency, general vocabulary knowledge or metacognitive knowledge levels. Multilevel regression analyses revealed that knowledge of connectives explained individual differences in eighth graders' text comprehension ($n = 171$) on top of the variance accounted for by the control variables. Moreover, the contribution of knowledge of connectives to text comprehension depended on a reader's level of metacognitive knowledge: more metacognitive knowledge resulted in a larger association between knowledge of connectives and text comprehension. Reading fluency, vocabulary knowledge and language background did not interact with knowledge of connectives. Findings are interpreted in the context of the strategic use of connectives during expository text reading.

What is already known about this topic?

- Connectives (words such as moreover, because and although) help the reader in establishing coherence between text parts.
- In primary school, for fifth graders, knowledge of connectives has been shown to be uniquely related to English text comprehension controlling for reading fluency and general vocabulary knowledge.

- For fifth graders, the relationship between knowledge of connectives and English text comprehension was higher for English-only students than for their peers who learned English as a second language.

What this paper adds:

- The present study found that knowledge of connectives also has a unique relation with Dutch expository text comprehension for eighth graders above and beyond reading fluency, general vocabulary knowledge and metacognitive knowledge (about text structure and reading and writing strategies).
- The relationship between knowledge of connectives and text comprehension was not moderated by reading fluency, general vocabulary knowledge and language background (monolingual versus bilingual Dutch).
- Metacognitive knowledge did impact the relationship between knowledge of connectives and text comprehension: the higher the metacognitive knowledge, the higher the association between knowledge of connectives and text comprehension.

Implications for theory, policy or practice

- Secondary school readers are assumed to benefit from knowing connectives because these words are frequent in expository texts and signal relationships that students may often not infer without the help of these devices (i.e., with the use of background knowledge). This seems to apply in particular for expository texts that are intended to convey new information and relationships to students (see also Singer & O'Connell, 2003).
- We found a significant interaction between knowledge of connectives and metacognitive knowledge, which seems to indicate that knowing more connectives does not help much in improving expository text comprehension when metacognitive knowledge about text structure and reading strategies is low. This result suggests that it may be wise to couple instruction on the meaning of connectives with instruction about the structure of expository texts and ways to strategically deal with these texts.
- More specifically, besides instruction on the meaning of connectives, we advise teachers in secondary school to get students to understand the importance of connectives as markers of local and global coherence in texts, and to teach them how to strategically use connectives during reading.

Rationale for the present study

Vocabulary knowledge has been identified as an important predictor of text comprehension in many studies (e.g., Beck, Perfetti, & McKeown, 1982; Carlisle, 2007; McKeown, Beck, Omanson, & Perfetti, 1983; Nagy, 2007; Stahl & Fairbanks, 1986; Van Gelderen, Schoonen, Stoel, de Glopper, & Hulstijn, 2007) as well as in reading comprehension models, such as Perfetti et al.'s framework for reading comprehension (Perfetti, 1999; Perfetti, Landi & Oakhill, 2005) and Kintsch et al.'s construction–integration model (Kintsch, 1998; Kintsch & Rawson, 2005). However, the importance of knowledge of specific vocabulary, such as connectives, for understanding certain text types is less well established.

The present study focuses on the role of knowledge of connectives in understanding expository texts. Crosson and Lesaux (2013) found that in fifth grade, knowledge of

connectives was positively associated with English text comprehension controlling for word reading fluency and general vocabulary knowledge. In contrast to Crosson and Lesaux whose comprehension measure combined narrative and expository texts, we will examine whether this unique contribution of knowledge of connectives holds for expository texts in particular. Also, in contrast to Crosson and Lesaux, we will examine an older population of readers (eighth graders) and a different language (Dutch).

Although we assume that knowledge of connectives facilitates readers' expository text comprehension, we consider the possibility that not all readers may benefit to the same extent from knowing connectives. In the following section, we will first describe why knowledge of connectives is expected to be helpful for expository text understanding. Next, we will discuss five reader characteristics that may prevent readers from benefiting optimally from their knowledge of connectives: high topic knowledge, limited reading fluency, limited general vocabulary knowledge, a language background associated with limited reading fluency or general vocabulary knowledge and limited metacognitive knowledge (knowledge about text structure, and reading and writing strategies). To date, we know little about the last four characteristics; therefore, the present study will put to the test if these characteristics have an impact on the association between knowing connectives and text comprehension.

Connectives as guiding devices in text comprehension

Knowledge of connectives is expected to be particularly helpful for expository text comprehension. Given that expository texts often describe relationships between text ideas that are (yet) unknown to students, they often need to be informed about the way ideas are related in order to create a coherent representation of these ideas (cf., Degand, Lefèvre, & Bestgen, 1999; Degand & Sanders, 2002; Singer & O'Connell, 2003; Van Silfhout, Evers-Vermeul, Mak, & Sanders, 2014). Connectives provide this information. They indicate, for example, whether the relationship between text parts is additive, causal, temporal or adversative in nature (see, for example, Halliday & Hasan, 1976; McNamara, Graesser, & Louwerse, 2012; Sanders & Noordman, 2000; Sanders & Spooren, 2007). Connectives thus work as a processing instruction to the reader (cf., Cain & Nash, 2011; Van Silfhout et al., 2014); therefore, it comes as no surprise that connectives speed up establishing a relationship between text parts (e.g., Britton, Glynn, Meyer, & Penland, 1982; Cain & Nash, 2011; Kintsch & Keenan, 1973; Sanders & Noordman, 2000; Van Silfhout et al., 2014). However, if readers do not know the meaning of connectives, they will not benefit from their presence: they have to infer the textual relations by themselves.

For expository texts, knowledge of connectives is also considered to be helpful to infer the overall structure of a text, that is, to establish global coherence in a text. Meyer (1985) identified five basic patterns to describe the overall organisation of most expository texts: problem–solution, causation, description, comparison and collection. According to Meyer, Brandt, and Bluth (1980), connectives may signal these overall structures. For example, the connective 'because' may signal a causation top-level structure and 'however' a comparison overall structure. The more knowledge of connectives, the better readers are expected to identify and interpret connectives that signal overall text structure.

Knowledge of connectives and reader characteristics

Not all readers may exploit their knowledge of connectives during reading to establish local or global coherence. Findings from McNamara and Kintsch (1996) suggest that readers with high knowledge about the topic of a text may not use their knowledge of connectives optimally if signalling in a text is too obvious, considering their high topic knowledge. Faced with 'too much' explicit signalling, highly knowledgeable readers may get the impression that the text is too easy for them and could start reading sloppily. If so, they will not utilise their knowledge of connectives fully. Results from O'Reilly and McNamara (2007a) specified McNamara's and Kintsch's assumption: only readers with high topic knowledge and low reading skills seem to be disadvantaged by too explicit signalling (and hence may not benefit optimally from their knowledge of connectives). The proficient readers with high topic knowledge attained better text comprehension for highly cohesive texts than for texts low in cohesion, which indicates that they benefit from their knowledge of connectives irrespective of their topic knowledge levels.

Besides topic knowledge, reading fluency might also affect the use of connectives. Connectives can be classified as predicates that take two complex text parts, often clauses, as arguments, for example, [*clause*] *because* [*clause*] (see, for example, Kintsch, 1998, p. 60). In order for a connective to link two text parts, both parts have to be in working memory for a successful linking operation (cf., Baddeley, 1986, 2007). If reading is too slow, the propositions that have to be combined may have faded from working memory (Kirby, 2007), which will prevent a connective from performing its linking function. Moreover, if word and sentence reading is slow and effortful, it requires substantial attentional resources and may not leave enough resources to execute other reading processes, such as the strategic use of connectives to establish global coherence. This suggestion is in line with research that acknowledges the limited capacity of working memory and the competition between reading processes for attentional resources, which results from this limited capacity (e.g., Just & Carpenter, 1992; LaBerge & Samuels, 1974; Perfetti, 1985; Perfetti & Hart, 2001; Perfetti & Lesgold, 1977).

A sufficient general vocabulary knowledge base seems another prerequisite to benefit from knowing connectives. Although the meaning of words in propositions that have to be linked by a connective can be inferred to some extent from context, a certain vocabulary base is necessary in order to establish meaningful links. Moreover, in the context of a limited working memory capacity, Crosson and Lesaux (2013) and Geva (1986) argued that if too many attentional resources are required to find out the meaning of unknown words, the processing of connectives may be hampered.

Given that a limited reading fluency and general vocabulary knowledge may block the use of connectives, readers with a language minority background may be hampered to a greater extent than their monolingual peers to benefit from connectives because the former have been shown to perform worse on fluency and vocabulary tests in the majority language (Aarts & Verhoeven, 1999; Mancilla-Martinez & Lesaux, 2010; Páez, Tabors, & López, 2007; Trapman, van Gelderen, van Steensel, van Schooten, & Hulstijn, 2014; Van Gelderen et al., 2003). The disability to maximally benefit from knowledge of connectives could be an additional reason (besides lower fluency and general vocabulary knowledge levels) why language minority readers have been shown to perform worse on reading comprehension tests in the majority language (for a review in North-American context, see August & Shanahan, 2006; for the situation in the Netherlands, see, for example, Aarts & Verhoeven, 1999; Trapman et al., 2014; Van Gelderen et al., 2003). Findings from

Crosson and Lesaux (2013) support the view that language background may affect the association between knowing connectives and text comprehension. They found a significantly lower positive correlation between knowledge of connectives and text comprehension for fifth grade second language learners of English than for their monolingual peers and hypothesised that the second language learners may be hampered to a greater extent to use their knowledge of connectives.

Metacognitive knowledge is another characteristic that may have an impact on the advantage of knowing connectives, especially for expository text understanding. Readers with more metacognitive knowledge about the way expository texts are normally structured and with knowledge about strategies to deal with these texts are expected to better understand the importance of connectives as devices to establish coherence and to make better use of them. Primary school readers or readers at the start of secondary school are still developing their metacognitive knowledge (e.g., Baker, 1989; Pressley & Afflerbach, 1995; Walczyk, 2000) and are not expected to understand the relevance of connectives fully (cf., Cain & Nash, 2011). Hence, they may not have optimal advantage of knowing connectives in reading extended dense texts. Findings from Geva and Ryan (1985) and Zinar (1990) support this assumption because knowing connectives was often not sufficient for fifth and seventh graders to employ this knowledge during reading: these readers needed to be directed to connectives by questioning techniques or by highlighting them in texts. Baker (2005) also pointed out that complex reading strategies may not develop until middle or high school; the strategic use of connectives may be one of them.

As readers progress in secondary school, their metacognitive knowledge becomes more developed (e.g., Baker, 1989; Pressley & Afflerbach, 1995; Schoonen, Hulstijn, & Bossers, 1998; Walczyk, 2000), and therefore, it is expected that secondary school readers are better able than primary school readers to use their knowledge of connectives during reading, especially those with more metacognitive knowledge. In accordance with Meyer, Brandt, and Bluth (1980), it is assumed that readers with more metacognitive knowledge about text structure and reading strategies are expected to actively search for signalling markers such as connectives to infer the overall structure of a text. Readers with less metacognitive knowledge approach texts with less knowledge about the structure of expository texts and less knowledge about appropriate reading strategies for expository texts (for example, close reading). Therefore, they are expected not to take full advantage of connectives for creating coherence on different text levels.

Intervention studies seem to support the causal link between strategic use of connectives and text comprehension. Training students to attend to text structure and connectives has been shown to improve memory for texts and text understanding (e.g., Cook & Mayer, 1988; Gordon, 1989; Meyer & Poon, 2001; Meyer, Young, & Bartlett, 1989; Paris, Cross, & Lipson, 1984; Wijekumar, Meyer, & Lei, 2013; Williams, Stafford, Lauer, Hall, & Pollini, 2009).

For secondary school readers, metacognitive knowledge might also affect whether slow reading or limited general vocabulary knowledge will restrict benefits from knowing connectives. Given enough time and motivation to compensate (e.g., Walczyk, 1995, 2000; Walczyk et al., 2007), readers with a broader repertoire of strategies to cope with slow reading and vocabulary problems may be able to compensate to a greater extent for suboptimal fluency and vocabulary skills that could affect their processing of connectives. The use of knowledge of connectives might therefore not be affected by disfluent reading or lack of sufficient word knowledge per se but rather by the extent to which a reader has knowledge about strategies to deal with fluency or vocabulary problems and is able to act accordingly.

The present study

The first research question this study aims to answer is whether knowledge of connectives explains unique variance in eighth graders' expository text comprehension above and beyond the influence of reading fluency, general vocabulary knowledge and metacognitive knowledge. In contrast to Crosson and Lesaux (2013) who controlled for the influence of word recognition fluency, we decided to control for the fluency of sentence comprehension, because this level of fluency was shown to be significantly related to seventh and eighth graders' reading comprehension, while word recognition fluency was not (Trapman, van Gelderen, van Steensel, van Schooten, & Hulstijn, 2014; Van Gelderen, Schoonen, Stoel, de Glopper, & Hulstijn, 2007), even for low achievers in seventh grade (Trapman et al., 2014). We also assume that a sentence-level fluency measure is more appropriate for eighth graders, as several studies have demonstrated that the relationship between word recognition and reading comprehension decreases with age (e.g., Adams, 1990; Francis, Fletcher, Catts, & Tomblin, 2005; Hoover & Gough, 1990; Van Gelderen et al., 2007). We controlled for the influence of general vocabulary knowledge to examine whether knowledge of connectives is more than simply an indication of general vocabulary knowledge, which appeared to be the case for fifth graders in Crosson and Lesaux (2013). The question is whether this also applies to the eighth graders in our study. Previous research with secondary school readers on the relation between knowledge of connectives and text comprehension did not address this issue because the contribution of general vocabulary knowledge was not taken into account (e.g., McClure & Steffensen, 1985). In addition, we also controlled for readers' metacognitive knowledge because this type of knowledge has been found to be an important predictor for text comprehension in secondary school (e.g., O'Reilly & McNamara, 2007b; Schoonen, Hulstijn, & Bossers, 1998; Trapman et al., 2014; Van Gelderen et al., 2004).

Our second research question is whether the contribution of knowledge of connectives to expository text comprehension depends on one's reading fluency, general vocabulary knowledge, language background and metacognitive knowledge. The present study will examine whether these four characteristics have a direct impact on the relationship between knowledge of connectives and text comprehension; for metacognitive knowledge, it will also be examined whether its impact could be indirect, that is, via a potential influence of reading fluency and general vocabulary knowledge as described in the last paragraph of the previous section.

With respect to language background, Crosson and Lesaux (2013) found a difference between fifth grade second language learners and monolinguals: the correlation between knowledge of connectives and text comprehension was higher for the latter group. We want to put to the test whether the relationship between knowledge of connectives and text comprehension differs between monolingual and bilingual Dutch readers as well.

Method

Participants

Three hundred thirty-seven eighth graders from 13 classes from three secondary schools in Amsterdam (the Netherlands) participated in the present study. Sixteen students were excluded from the analyses because they had reading or learning problems according to

school reports. Of the 321 remaining participants, we only had valid scores for 191 students on the text comprehension test for various reasons. First, 59 students performed misbehaviour during administration of the expository text comprehension test according to the test administrator's notes. The large attrition due to misbehaviour is related to the challenging school population at the participating urban schools and the teachers' ability to manage the classroom during test administration. Second, test scores of five students were considered invalid because they skipped half or more of the items or scored below chance level because both were regarded as an indication of test disturbance. Third, 66 students had missing test scores on the expository text comprehension test because of absence on the testing session; this large proportion of missing values due to absence was mainly caused by the decision of one school to discontinue participation in our study for 40 students.

Of the 191 students with a valid score on expository text comprehension, we performed our analyses with 171 students who had no missing scores for the other tests. In this sample, with 171 students, the distribution in terms of educational levels was as follows: 36% received instruction at a low educational level (61 students), 24% at an intermediate educational level (42 students) and 40% at a high educational level (68 students).

Students were regarded as monolingual Dutch ($n = 54$) if they indicated in the background questionnaire (see Instruments section) that Dutch was their only mother tongue and as bilingual Dutch ($n = 117$) if one or more language(s) other than Dutch were involved in their initial language acquisition. All but seven of the bilingual students were born in the Netherlands, and only two of those had received less than 5 years of primary education in the Netherlands. Bilinguals indicated that they spoke the following languages at home: Arabic ($n = 56$), Turkish ($n = 34$), Papiamentu ($n = 4$), Punjabi ($n = 4$), Portuguese ($n = 3$), Bosnian ($n = 2$), Chinese ($n = 2$), English and Punjabi ($n = 2$), Akan ($n = 1$), Bahasa Indonesia ($n = 1$), Cantonese ($n = 1$), Spanish ($n = 1$), English ($n = 1$), English and Hindi ($n = 1$), English and Urdu ($n = 1$), Hindi ($n = 1$), Russian and Urdu ($n = 1$) or Urdu ($n = 1$).

Instruments

Students took five tests tapping into expository text comprehension, knowledge of connectives, reading fluency, general vocabulary knowledge and metacognitive knowledge. In addition, they filled out a questionnaire about background information.

Expository text comprehension. The expository text comprehension test comprised six expository texts and 35 multiple choice questions about these texts (with three or four answer options). The texts addressed various topics (about energy systems in the body, the history of whaling, etc.) and varied in length between 184 and 449 words. One text was derived from the reading comprehension test used in a study by Van Gelderen, Schoonen, Stoel, de Glopper, and Hulstijn (2007). The other texts were selected from a database developed by the company *Diataal* from which texts are used to measure the reading comprehension of secondary school students (Hacquebord, Stellingwerf, Linthorst, & Andringa, 2005). These texts and questions were adapted slightly.

Knowledge of connectives. Knowledge of connectives was measured by means of a fill-in-the-blanks test consisting of six short expository texts that varied in length between 85 and 177 words and which addressed various topics (e.g., spiders, vitamins, the origin of

the @-symbol, etc.). For each blank, students had to choose the appropriate connective out of three options. Relationships between the propositions that had to be connected were regarded as familiar to all students. To ensure that the texts did not posit any other vocabulary knowledge demands on the selection of the right connective (i.e., other than knowledge of connectives), texts contained for 95% words (or transparent derivations/inflexions of these words) that belong to the 5,000 most frequent words in written Dutch according to the Hazenberg and Hulstijn (1996) list (85% 0–2,000; 10% 2,000–5,000). The remaining 5% of the words (predominantly proper names) were considered not to cause any difficulties for selecting the right connective.

The knowledge of 43 connectives from various semantic classes was tested. Connectives expressed *additive–positive* (7), *additive–negative* (6, also known as *contrastive*), *temporal* (8), *causal* (10) and *adversative* (4) relationships (e.g., Crosson, Lesaux, & Martiniello, 2008; Halliday & Hasan, 1976; Sanders & Spooren, 2007; Sanders, Spooren, & Noordman, 1992). In addition, in accordance with McNamara, Graesser, and Louwerse (2012), the test contained *additive-clarifying* (8) connectives. Connectives varied in difficulty level and were matched with distractors of corresponding difficulty levels in order to reduce the possibility that test takers could benefit from their knowledge of relatively easy distractors in their selection of the target connective. Distractors were chosen that could fit the blank syntactically, but only the targets fitted the blank semantically. Five expert readers (researchers) had 100% agreement on the correct responses.

To determine the difficulty level of connectives and distractors, results from Hacquebord, Alberts, and Andringa (2011) were used. In that study, 68 secondary school teachers were asked to rate the expected difficulty of words from school book texts on a scale from 1 (*very easy*, known at the end of primary school) to 5 (*too hard* and/or *irrelevant*, not known at the end of eighth grade); for each word, the mean difficulty level was computed. The test contained 22 connectives with a low (mean judgement from 1 to 2.3), 16 with a medium (mean judgement from 2.4 to 3.6) and 5 with a high difficulty level (mean judgement from 3.6 to 5). Each of the six semantic classes contained connectives from at least two difficulty levels. Most distractors differed between 0 and 1.3 points (within the range of a difficulty level) in difficulty from the target items, except for eight distractors, which differed from 1.4 to 2 points in difficulty from the target. Appendix A shows the 43 connectives, their difficulty level and semantic class, and the difficulty level of the distractors.

Reading fluency. Reading fluency was measured by a sentence verification test similar to the one used by Van Gelderen, Schoonen, Stoel, de Glopper, and Hulstijn (2007). Students were presented sentences on laptop screens and had to indicate as quickly as possible whether the sentences made sense or not by pressing a red (sentence makes no sense) or a green-stickered key (sentence makes sense) on their laptop keyboards. All students were expected to determine with ease whether sentences made sense or not (e.g., *Most bicycles have seven wheels* was a sentence that does not make sense). The mean reading fluency was calculated by averaging the reaction times on the correct responses to the sensible sentences.

Vocabulary knowledge. A 70-item digital multiple choice test developed by *Diataal* (Hacquebord, Stellingwerf, Linthorst, & Andringa, 2005) measured general vocabulary knowledge. Items were selected from a corpus of school books. Selection criteria for the items were frequency in the corpus and difficulty level (as judged by teachers). The test

included general academic words, for example, *aspects*, as well as domain or subject-specific words, for example, *roam* (e.g., in a forest), *interior* (i.e., of a house) or *executed* (i.e., murdered). Four target items were connectives. One of these connectives was also a target in the knowledge of connectives test, and two of these connectives were used as a distractor in the knowledge of connectives test. Target items were presented in sentences with neutral context (i.e., inferring the word meaning from context was not possible).

Metacognitive knowledge. Metacognitive knowledge was measured by means of a test based on the metacognitive knowledge test from Van Gelderen, Schoonen, Stoel, de Glopper, and Hulstijn (2007). The test was reduced to 45 statements about text structure (12 statements), reading (21 statements) and writing strategies (12 statements). Participants had to indicate whether or not they agreed with the statements. For example, a correct response would be if they agreed with the following statement: *if you do not understand the meaning of a word, it is useful to try and guess its meaning by looking at other words and sentences surrounding the unfamiliar word.*

Table 1 shows the internal consistency (Cronbach's alpha) of the five tests for each subgroup as reliability estimates. Except for the metacognitive knowledge test, for which reliability estimates are around .60, tests show in general satisfactory reliability estimates between .73 and .96.

Background questionnaire. The background questionnaire requested the following information: sex, country of birth, mother tongue, language(s) the parents/caretakers speak to participants (and percentages of the time they speak these languages to them), country of birth of parents/caretakers, the highest completed educational level of parents/caretakers and jobs of parents/caretakers.

Procedure

From March till June 2014, each test was administered in a separate testing session during regular classes, except for the reading fluency test for which participants were taken out of their classes in groups of four. Students were given enough time to complete the tests. The approximate administration time for the fluency test was 10–15 minutes, for the expository text comprehension test 40–45 minutes, for the knowledge of connectives test 20–

Table 1. Reliability estimates of the tests for the whole sample and the subsamples

	Number of items	All students ($n = 171$)	Monolingual Dutch ($n = 54$)	Bilingual Dutch ($n = 117$)
Expository text comprehension	35	.79	.85	.73
Knowledge of connectives	43	.83	.86	.79
Reading fluency (reaction time in msec)	46	.95	.96	.95
Vocabulary knowledge	70	.82	.78	.80
Metacognitive knowledge	45	.63	.60	.62

25 minutes, for the general vocabulary knowledge test 10–15 minutes and for the metacognitive knowledge test 20–25 minutes. Test administrators took notes on students' behaviour during the plenary test administrations.

Scoring and missing value treatment

There were no missing items on the general vocabulary knowledge and reading fluency test because these digital tests required a response for every item. Skipped items from the text comprehension, knowledge of connectives and metacognitive knowledge test were scored as incorrect. For the reading fluency test, the procedure described in Van Gelderen et al. (2003) was used for scoring and missing value treatment. First, to ensure that linguistic knowledge did not influence performance on the fluency test, nine of the 55 sentences with an accuracy rate lower than .875 were excluded from the analyses. Mean reaction times were calculated on the basis of the remaining 46 sentences. Second, inaccurate responses or potentially untrustworthy ones (too slow or too fast reaction times) were turned into missing values and estimated with the multiple imputation procedure in SPSS (SPSS Inc., Chicago, IL, USA). For our 171 participants, 5.7% of the reaction times were missing and estimated.

Analyses

Means and standard deviations on the five administered tests were computed for the whole sample and separately for the monolinguals and bilinguals. For all regression analyses, a model with a random intercept for class served as the base model. Differences in scores on the five tests between monolinguals and bilinguals were analysed with regression models with the tests as dependent variable and a dummy variable contrasting monolingual and bilingual Dutch students as a predictor variable. Effect sizes of the differences were reported as the increase in explained variance (with the symbol Δr^2). Furthermore, correlations between the test scores were calculated for the subgroups and the sample as a whole.

Before we investigated our research questions, we investigated whether each of the predictor variables (i.e., reading fluency, general vocabulary knowledge, metacognitive knowledge and knowledge of connectives) were curvilinearly related to text comprehension, because it has been shown that curvilinear relationships between predictors and dependent variables may affect the estimation of interaction effects (Ganzach, 1997).

To answer our first research question, we started with a model with reading fluency, general vocabulary knowledge and metacognitive knowledge, and we investigated whether knowledge of connectives improved model fit. The model with these four predictors was used as the base model to investigate our second research question, that is, potential interaction effects with knowledge of connectives.

To test whether language background interacted with knowledge of connectives, a model with the aforementioned language background dummy and its interaction with knowledge of connectives was added to the base model. In a similar vein, interactions between knowledge of connectives and reading fluency, between knowledge of connectives and general vocabulary knowledge, and between knowledge of connectives and metacognitive knowledge were tested. Lastly, the effects of two three-way interactions were tested (i.e., knowledge of connectives × reading fluency × metacognitive knowledge, and knowledge of connectives × vocabulary size × metacognitive knowledge) to examine

whether metacognitive knowledge moderates the effect reading fluency and general vocabulary knowledge have on the relationship between knowledge of connectives and text comprehension.

To check for the robustness of our outcomes, we also performed the aforementioned regression analyses with a sample of 191 students. These 191 students all had a score on expository text comprehension, and 20 of these students had a score missing on one ($n = 18$) or two ($n = 2$) of the predictor variables. For the robustness check, we created a dummy variable for each predictor variable that represented whether a score was missing (a score of 1) or not (a score of 0) for the associated predictor variable. These dummy variables were entered along with the associated predictor variables in our regression models. These models did not include a fixed intercept, and missing scores on the standardised predictor variables were recoded into a score of 0 (Koomen & Hoeksma, 1991). This method enabled us to investigate whether the outcomes of our models were affected, that is, different from the sample with 171 students, when controlling for the variance that was accounted for in text comprehension by differences between students who either missed or did not miss a score for every predictor variable.

Results

Descriptive statistics

Expository text comprehension scores were normalised with Blom's formula (Blom, 1958). Table 2 shows the means and standard deviations on our five measures for the whole sample and the subgroups. There were no floor or ceiling effects present in the data. Monolinguals outperformed the bilinguals on text comprehension (χ^2 (1) = 9.07, $p = .00$, $\Delta r^2 = .08$), knowledge of connectives (χ^2 (1) = 12.98, $p = .00$, $\Delta r^2 = .11$), general vocabulary knowledge (χ^2 (1) = 18.38, $p = .00$, $\Delta r^2 = .14$) and metacognitive knowledge (χ^2 (1) = 4.43, $p = .04$, $\Delta r^2 = .05$), but there were no differences in reading fluency between monolinguals and bilinguals (χ^2 (1) = 0.37, $p = .54$, $\Delta r^2 = .00$).

Table 2. Means (and standard deviations) on the five measures for all students and the subgroups

	Number of items	All students ($n = 171$)	Monolingual Dutch ($n = 54$)	Bilingual Dutch ($n = 117$)
Expository text comprehension	35	24.52	26.71	23.51
		(5.31)	(5.94)	(4.69)
Knowledge of connectives	43	31.44	34.37	30.09
		(5.99)	(5.83)	(5.59)
Reading fluency	46	2847	2805	2866
(reaction time in msec)		(497)	(509)	(492)
Vocabulary knowledge	70	52.92	57.26	50.91
		(7.82)	(6.33)	(7.65)
Metacognitive knowledge	45	35.58	36.91	34.97
		(4.07)	(3.68)	(4.11)

Correlations

Table 3 shows the correlations between test scores for the whole sample and for the subgroups. For all groups, text comprehension related moderately to knowledge of connectives, vocabulary knowledge and metacognitive knowledge, and weakly to reading fluency. For knowledge of connectives, correlations ranged from .48 to .55, for vocabulary knowledge from .34 to .40, for metacognitive knowledge from .34 to .51 and for reading fluency from −.10 to −.13 (the higher reaction times, the lower the text comprehension). Correlations of reading fluency with vocabulary knowledge, knowledge of connectives and metacognitive knowledge were weak to moderate (correlations were between −.15 and −.46). Interestingly enough, correlations between knowledge of connectives and vocabulary knowledge were not particularly strong, that is, between .37 and .51. Knowledge of connectives and metacognitive knowledge correlated around .40.

Curvilinear effects

We could not establish a curvilinear relationship with text comprehension for reading fluency (χ^2 (1) = .41, p = .52, Δr^2 = .00), general vocabulary knowledge (χ^2 (1) = .68, p = .41, Δr^2 = .00) and metacognitive knowledge (χ^2 (1) = 1.30, p = .25, Δr^2 = .00), but we did find a curvilinear relationship between knowledge of connectives and text comprehension (χ^2 (1) = 6.84, p = .01, Δr^2 = .04). The parameter estimates of the linear and quadratic term of knowledge of connectives were both positive, which means that the relationship between knowledge of connectives and text comprehension is positive and becomes

Table 3. Correlations between the five measurements for all students (n = 171), the monolinguals (n = 54) and the bilinguals (n = 117)

	KOC	RF	VOC	Metacognitive knowledge
Expository text comprehension				
All students	.55*	−.12	.40*	.43*
Monolingual Dutch	.54*	−.13	.34*	.51*
Bilingual Dutch	.48*	−.10	.34*	.34*
KOC				
All students		−.29*	.48*	.43*
Monolingual Dutch		−.42*	.51*	.42*
Bilingual Dutch		−.22*	.37*	.38*
RF – reaction time in msec.				
All students			−.31*	−.22*
Monolingual Dutch			−.46*	−.15
Bilingual Dutch			−.26*	−.23*
VOC				
All students				.40*
Monolingual Dutch				.24
Bilingual Dutch				.38*

KOC, knowledge of connectives; RF, reading fluency; VOC, vocabulary knowledge *$p < .05$.

stronger for higher levels of knowledge of connectives. We included both the linear and the quadratic term of knowledge of connectives in our regression models. Interactions with the quadratic term were tested only if there was a significant interaction with the linear term of knowledge of connectives.

Research question 1: effects of knowledge of connectives

Tables 4 and 5 show the results of the models to answer our research questions. Table 4 shows the fit of each model and its explained variance. Table 5 displays the parameter estimates of the models. The answer to our first research question, that is, whether knowledge of connectives had a unique contribution to text comprehension, was positive. Knowledge of connectives (linear + quadratic term) accounted for unique variance in expository text comprehension controlling for reading fluency, general vocabulary knowledge and metacognitive knowledge, compare model 2 (M2) with model 1 (M1) in Table 4; χ^2 (2) = 26.98, $p = .00$, $\Delta r^2 = .14$.

Research question 2: interactions with knowledge of connectives

The answer to our second research question, that is, whether four reader characteristics interact with knowledge of connectives, was positive only for one characteristic. That is, the interaction between knowledge of connectives (linear term) and metacognitive knowledge improved model fit (M6 compared with M2: χ^2 (1) = 5.23, $p = .02$, $\Delta r^2 = .01$), whereas interactions between knowledge of connectives (linear term) and language background, reading fluency or vocabulary knowledge were not significant and did not lead to further model improvement (compare models 3, 4 and 5 with M2 in Table 5). The model with knowledge of connectives × metacognitive knowledge (model 6) was the best fitting model because neither the interaction between the quadratic term of knowledge of connectives and metacognitive knowledge nor the two three-way interactions (i.e., knowledge of connectives × reading fluency × metacognitive knowledge, and knowledge of connectives × vocabulary knowledge × metacognitive knowledge) did improve model fit further (see models 7, 8 and 9 in comparison with M6 in Table 4).

Figure 1 shows how the interaction between knowledge of connectives and metacognitive knowledge has to be interpreted. This figure shows that the relationship between knowledge of connectives and expository text comprehension is stronger for readers with more metacognitive knowledge given at least an average level of knowledge of connectives. That is, metacognitive knowledge does not reinforce the effect of knowledge of connectives for readers with lower than average knowledge of connectives. Figure 1 shows that our best fitting model (i.e., M6 in Tables 4 and 5) predicts that more knowledge of connectives does not substantially improve text comprehension for readers with a low metacognitive knowledge (the dashed line in Figure 1), whereas more knowledge of connectives is associated with a substantial higher text comprehension for readers with a high metacognitive knowledge (the solid line in Figure 1). More specifically, for readers who have low metacognitive knowledge levels, the difference in text comprehension between those with average (a score of 0 on the *x*-axis) or high knowledge of connectives levels (a score of 2 on the *x*-axis) is 'only' 0.4 standard deviation. For readers with high metacognitive knowledge levels the same difference in knowledge of connectives is related to a difference of 1.7 standard deviation in text comprehension.

Table 4. Model fit and variance components of the models predicting expository text comprehension ($N_{students} = 171$, $N_{classes} = 13$)

Models		M0	M1	M2	M3	M4	M5	M6	M7	M8	M9
Variance	Class	.21 (.11)	.10 (.06)	.04 (.04)	.05 (.04)	.04 (.03)	.05 (.04)	.05 (.04)	.05 (.04)	.04 (.04)	.05 (.04)
	Students	.75 (.08)	.64 (.07)	.57 (.06)	.56 (.06)	.57 (.06)	.56 (.06)	.55 (.06)	.55 (.06)	.55 (.06)	.55 (.06)
	Total	.96	.74	.61	.61	.61	.61	.60	.60	.59	.60
Distribution of variance	Class (%)	21.9%	13.5%	6.6%	8.2%	6.6%	8.2%	8.3%	8.3%	6.8%	8.3%
	Students (%)	78.1%	86.5%	93.4%	91.8%	93.4%	91.8%	91.7%	91.7%	93.2%	91.7%
Explained variance	Class (%)		52.3%	81.0%	76.2%	81.0%	76.2%	76.2%	76.2%	81.0%	76.2%
	Students (%)		14.7%	24.0%	25.3%	24.0%	25.3%	26.7%	26.7%	26.7%	26.7%
	Total (%)		22.9%	36.5%	36.5%	36.5%	36.5%	37.5%	37.5%	38.5%	37.5%
Increase in explained variance	Class (%)		52.3%	28.7%	–	–	–	–	–	4.8%	–
	Students (%)		14.7%	9.3%	1.3%	–	1.3%	2.7%	–	–	–
	Total (%)		22.9%	13.6%	–	–	–	1.0%	–	1.0%	–
Fit in −2LL		456.37	423.95	396.97	395.07	396.61	396.52	391.74	391.66	390.69	391.65
Difference in −2LL			32.42*	26.98*	1.90	0.36	0.45	5.23*	0.08	1.05	0.09
Difference in *df*			3	2	2	1	1	1	1	3	3
Compared with model			M0	M1	M2	M2	M2	M2	M6	M6	M6

The difference in −2 log likelihood is chi-square distributed. For the predictors and parameter estimates of each model, see Table 5.
*$p < .05$.

Table 5. Parameter estimates of the models to predict expository text comprehension ($N_{students} = 171$, $N_{classes} = 13$)

Parameter estimates										
Models	M0	M1	M2	M3	M4	M5	M6	M7	M8	M9
Intercept	−.10	−.05	−.13	−.14	−.13	−.14	−.15	−.15	−.14	−.15
	(.15)	(.11)	(.10)	(.10)	(.10)	(.10)	(.10)	(.10)	(.10)	(.10)
Reading fluency		.06	.10	.10	.10	.10	.11	.11	.11	.11
		(.07)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)	(.06)
Vocabulary knowledge		.26*	.10	.10	.10	.12	.12	.12	.13	.13
		(.08)	(.08)	(.08)	(.08)	(.08)	(.07)	(.07)	(.08)	(.08)
Metacognitive knowledge		.27*	.20*	.20*	.20*	.20*	.22*	.21*	.23*	.22*
		(.07)	(.07)	(.07)	(.07)	(.07)	(.07)	(.08)	(.07)	(.07)
Knowledge of connectives			.43*	.42*	.44*	.42*	.41*	.40*	.41*	.41*
			(.08)	(.08)	(.08)	(.08)	(.08)	(.09)	(.08)	(.08)
Knowledge of connectives^2			.11*	.10*	.12*	.10*	.06	.06	.07	.06
			(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.05)	(.06)
Language background MD versus BD (LB)				−.02	–	–	–	–	–	–
				(.05)						
Knowledge of connectives × LB				−.05	–	–	–	–	–	–
				(.04)						
Knowledge of connectives × reading fluency					.04	–	–	–	.05	–
					(.06)				(.07)	
Knowledge of connectives × vocabulary knowledge						.04	–	–	–	−.00
						(.06)				(.07)
Knowledge of connectives × metacognitive knowledge							.16*	.17*	.17*	.17*
							(.07)	(.07)	(.07)	(.09)
Knowledge of connectives^2 × metacognitive knowledge								.02	–	–
								(.05)		
Metacognitive knowledge × vocabulary knowledge									–	−.01
										(.08)
Metacognitive knowledge × reading fluency									.04	–
									(.08)	
Knowledge of connectives × reading fluency × metacognitive knowledge									−.01	–
									(.08)	
Knowledge of connectives × vocabulary knowledge × metacognitive knowledge										−.02
										(.06)

MD, monolingual Dutch; BD, bilingual Dutch.
Predictors are standardised. Standard errors in parentheses.
Knowledge of connectives^2 = quadratic term of knowledge of connectives.
*$p < .05$.

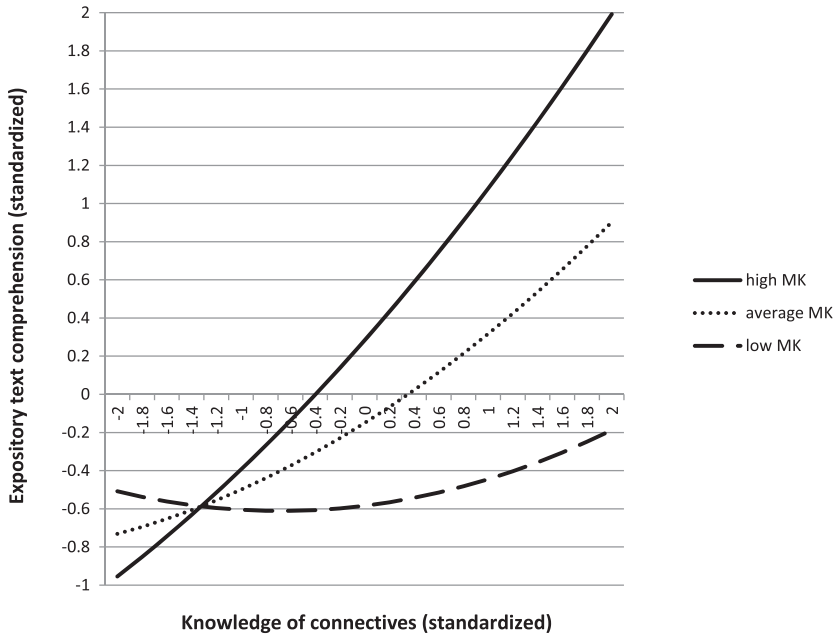

Figure 1. Predicted expository text comprehension (*y*-axis) as a function of knowledge of connectives (*x*-axis) for readers with a high (two standard deviations above the mean), an average or a low (two standard deviations below the mean) metacognitive knowledge (MK). For all three groups, sample means of general vocabulary knowledge and reading fluency were used to predict expository text comprehension.

Robustness check: models with 191 students

Regression analyses performed with a sample of 191 students revealed that there were no differences between text comprehension scores of students who either missed or did not miss a score on reading fluency (t (191) = 1.66, p = .10), general vocabulary knowledge (t (191) = .66, p = .51) and knowledge of connectives (t (191) = −1.16, p = .25). However, students who missed a score on metacognitive knowledge performed lower on expository text comprehension than those with scores on metacognitive knowledge (t (191) = −2.87, p = .01). Despite these results for metacognitive knowledge, outcomes from the models with a sample of 191 students led to the same conclusions as with a sample of 171 students in terms of model improvement: that is, a model that included knowledge of connectives in addition to the control variables led to model improvement (χ^2 (2) = 23.80, p = .00, Δr^2 = .11, compare with M2 versus M1 in Table 4) as well as adding the interaction knowledge of connectives × metacognitive knowledge (χ^2 (1) = 7.18, p = .00, Δr^2 = .03, compare with M6 versus M2 in Table 4). Furthermore, similar to the sample with 171 students, inclusion of the other interactions in the regression model did not lead to model improvement.

Note that for the sample with 191 students, in contrast to the sample with 171 students, the quadratic term of knowledge of connectives was not included in the regression models. Although the quadratic term did lead to model improvement controlling for the linear term (χ^2 (1) = 4.36, p = .04, Δr^2 = .03) in the larger sample, the curvilinear relationship was considered invalid for this sample as the quadratic term led to nonsignificance of the linear term (cf., Breetvelt, Van den Bergh, & Rijlaarsdam, 1994).

Discussion

The present study aimed to provide an answer to the question whether knowledge of connectives uniquely contributes to expository text comprehension controlling for reading fluency, general vocabulary knowledge and metacognitive knowledge about text structure and reading and writing strategies. This appeared to be the case for the eighth graders in our study. Our findings concur with Crosson and Lesaux (2013) who found that knowledge of connectives explained unique variance in fifth graders' text comprehension above and beyond reading fluency and general vocabulary knowledge. The present study shows that this unique contribution of knowledge of connectives also applies to an older population of readers, to a different language (i.e., Dutch), to expository texts in particular and when metacognitive knowledge is taken into account as an additional control variable along with reading fluency and general vocabulary knowledge. Furthermore, the unique contribution of knowledge of connectives is substantial: of the variance explained by all predictor variables (37.5%), knowledge of connectives uniquely accounted for more than one third of the variance (13.6%). Moreover, our results in particular seem to suggest that knowledge of connectives is not merely an indication of general vocabulary knowledge in secondary school readers because the eighth graders in our study who differed in vocabulary knowledge did not differ in a comparable way in their knowledge of connectives.

Our second research question was whether the contribution of knowledge of connectives to expository text comprehension depends on one's reading fluency, general vocabulary knowledge, metacognitive knowledge and language background. As regards language background, in contrast to Crosson and Lesaux (2013) who found that monolingual English fifth graders had a higher positive correlation between knowledge of connectives and text comprehension than second language learners of English, we found no such difference for monolingual and bilingual Dutch eighth graders. Nor did we find that eighth graders' levels of reading fluency or their general vocabulary knowledge levels affected the relationship between knowledge of connectives and text comprehension. We did, however, find a significant interaction between knowledge of connectives and metacognitive knowledge, which indicates that readers with more metacognitive knowledge have a stronger relationship between knowledge of connectives and text comprehension than readers with lower levels of metacognitive knowledge. Lastly, we hypothesised that metacognitive knowledge could influence the effect of reading fluency and vocabulary knowledge on the relationship between knowledge of connectives and text comprehension, but we found no support for this hypothesis.

Because reading fluency levels, general vocabulary knowledge levels and language background did not influence the association between knowledge of connectives and text comprehension, we conclude that eighth graders with relatively smaller general vocabulary knowledge levels or lower reading fluency levels (or a bilingual background associated with one or more of these characteristics) are not significantly constrained by less fluent reading or vocabulary problems to process connectives and benefit from their knowledge of connectives. Furthermore, because the effect of reading fluency and vocabulary knowledge on the relationship between knowledge of connectives and text comprehension did not depend on metacognitive knowledge, we assume that for the eighth graders in our study with relatively lower metacognitive knowledge levels, less fluent reading or vocabulary problems were not blocking the benefits of knowledge of connectives more than for eighth graders with higher levels of metacognitive knowledge.

The ability to compensate for fluency and vocabulary problems might be a key factor to explain our results and also the difference with Crosson and Lesaux's findings. We assume that the eighth graders in our study were better able to compensate for vocabulary or fluency problems (irrespective of their metacognitive knowledge levels) than the fifth graders in Crosson and Lesaux's study, and that they were therefore less likely to be disrupted by these problems in their processing of connectives. This is in line with several studies that have shown that relatively experienced readers have developed broader repertoires of behaviours and strategies to deal with reading problems than relatively beginning readers (e.g., Baker, 1989; Pressley & Afflerbach, 1995; Walczyk, 2000). On top of that, the monolingual and bilingual students in our study were more alike in their general vocabulary knowledge than the second language learners and monolingual English students in Crosson's and Lesaux's study: although our monolinguals and bilinguals differed on average approximately one standard deviation on the general vocabulary test, the language background groups in Crosson and Lesaux (2013) differed around two standard deviations on their general vocabulary knowledge test. Because of these differences, it is more likely that Crosson's and Lesaux's readers with distinct language backgrounds differed more substantially in the interference of vocabulary problems with processing connectives succesfully than the monolingual and bilingual readers in our study.

Although we we did not find effects of indicators of reading problems (i.e., reading fluency levels or vocabulary knowledge levels) on the relationship between knowledge of connectives and text comprehension, we did find support for the assumption that not all readers may have equal advantage of their knowledge of connectives. The finding that readers with more metacognitive knowledge show a stronger relationship between knowledge of connectives and text comprehension than readers with lower levels of metacognitive knowledge seems to suggest that readers with less metacognitive knowledge are less successful in processing connectives and therefore do not benefit from their knowledge of connectives maximally. Readers with more metacognitive knowledge might be more successful in processing connectives because they know the importance of connectives as indicators of local and global coherence and they are better in using them strategically to establish coherence.

Limitations and further directions

There are several limitations to this study. First, in our study, many participants were excluded because of inappropriate behaviour during administration of the expository text comprehension test: this raises concerns about the representativeness of our sample. Second, our results have to be interpreted with caution because our metacognitive knowledge test had a relative low reliability and this may have influenced our outcomes (see, for example, Cole & Preacher, 2014). We consider it therefore important that this study is replicated with a metacognitive knowledge test with a higher reliability and a sample of students with less attrition on the text comprehension test.

A third limitation is that we did not tap into students' online reading behaviour or mental processes. Therefore, we were not able to test to what extent readers experienced vocabulary and fluency problems during reading and to what extent they compensated for these problems. In order to clarify whether the ability to compensate for reading problems is indeed an influential factor for the processing of connectives, and to what

extent reading experience plays a role in the ability to compensate, we suggest that future research taps into the online reading behaviour and mental processes of primary and secondary school students with different levels of reading fluency and general vocabulary knowledge. The role metacognitive knowledge plays in the processing of connectives could possibly be unravelled with a similar research method. Is it indeed the case that students with more metacognitive knowledge make better strategic use of connectives during reading as we hypothesised? And to what extent is this reflected in their reading behaviour and their text comprehension? To answer these questions, we need a design that uses not only online reading measures but also offline comprehension scores of readers varying in metacognitive knowledge. The necessity of using a combination of online and offline measures has been stressed recently by Van Silfhout, Evers-Vermeul, Mak, and Sanders (2014), who have shown that connectives do not only speed up inferences during reading but also lead to better answers to comprehension questions after reading.

Using a combination of online and offline measures could also show if more knowledge of connectives *causes* more text comprehension. Because this study used a correlational design, we cannot infer from our results that readers with more knowledge of connectives were more successful in processing connectives during reading than readers with relatively less knowledge of connectives. Proficient readers could also have had more knowledge of connectives because of more reading experience and may not need to use this better developed knowledge during reading. It is plausible, however, that readers used their knowledge of connectives to reach a better understanding of the texts in our reading comprehension test, given that texts contained on average 5.2 connectives per 100 words.

Educational implications and conclusions

In primary school, knowledge of connectives has been shown to be uniquely related to text comprehension controlling for reading fluency and general vocabulary knowledge. The present study found that knowledge of connectives also has a unique relation to expository text comprehension in secondary school readers above and beyond reading fluency, general vocabulary knowledge and metacognitive knowledge. Because of the correlational design of the present study, we are not able to tell whether better readers are simply characterised by a better knowledge of connectives or whether more knowledge of connectives actually causes better expository text comprehension. However, we assume that secondary school readers benefit from knowing connectives because these words are frequent in expository texts and signal relationships that students may often not infer without the help of these devices (i.e., with the use of background knowledge). This seems to apply in particular for expository texts that are intended to convey new information and relationships to students (see also Singer & O'Connell, 2003). Furthermore, we found a significant interaction between knowledge of connectives and metacognitive knowledge, which seems to indicate that knowing more connectives does not help much to improve expository text comprehension when metacognitive knowledge about text structure and reading strategies is low. These results suggest that it may be wise to combine instruction on the meaning of connectives with instruction about the structure of expository texts and ways to strategically deal with these texts.

Acknowledgements

We wish to thank the students who participated in the study as well as the teachers and principals of the participating secondary schools for their cooperation. We are also grateful to the anonymous reviewers for their comments on an earlier version of this paper. Special thanks go out to the test assistants Milana Baslerová and Merel Burghouwt who helped with testing the students and data entry.

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Appendix A. Dutch connectives from the knowledge of connective test (in order of test with English translation), their semantic class and difficulty level, and the difficulty level of the distractors

	Connective in Dutch (English translation)	Semantic class	Difficulty-level connective	Difficulty-level distractor 1	Difficulty-level distractor 2
1	zo (for example)	Clarification	Low	Medium	Low
2	echter (however)	Contrastive	Medium	Medium	Low
3	in tegenstelling tot (in contrast to, as opposed to)	Contrastive	Low	Low	Medium
4	daarentegen (however)	Contrastive	High	Low	Medium
5	overigens (otherwise)	Additive	Medium	Medium	Medium
6	maar (but)	Contrastive	Low	Low	Low
7	het gevolg van (the consequence of)*	Causal	Low	Low	Medium
8	zoals (like)	Clarification	Low	Low	Low
9	maatregelen (measures)*	Causal	Low	Medium	Medium
10	ondanks (despite)	Adversative	Medium	Medium	Medium
11	eveneens (also, likewise)	Additive	Medium	High	High
12	denk hierbij aan (take for example)	Clarification	Medium	Low	Medium
13	kortom (in short, in sum)	Clarification	Medium	Medium	Low
14	indien (in the event of)	Temporal (or conditional)	Medium	Medium	Medium
15	niettemin (nevertheless)	Contrastive	High	High	High
16	namelijk (namely)	Clarification	Low	Low	Medium
17	oftewel (that is)	Clarification	High	High	Medium
18	uiteindelijk (in the end, finally)	Temporal	Low	High	Medium
19	als (when)	Temporal (or conditional)	Low	Medium	Low
20	immers (namely, since)	Clarification	Low	Medium	Medium
21	tenslotte (after all)	Temporal	Low	Medium	Medium
22	daarom (that is why)	Causal	Low	Medium	Low
23	hoewel (though, although)	Adversative	Medium	Low	Low
24	al (though, although)	Adversative	Medium	Low	Medium
25	vanwege (because of)	Causal	Low	Low	Low
26	behalve (except for)	Contrastive	Low	Medium	Low
27	door (by means of)	Causal	Low	Medium	Medium

	Connective in Dutch (English translation)	Semantic class	Difficulty-level connective	Difficulty-level distractor 1	Difficulty-level distractor 2
28	hiernaast (besides)	Additive	Low	Medium	Low
29	waardoor (through which)	Causal	Low	Low	Medium
30	gedurende (during)	Temporal	Medium	Medium	Medium
31	evenals ((just) like)	Additive	Low	Low	Medium
32	destijds (in those days)*	Temporal	High	High	Medium
33	ondanks (despite)	Adversative	Medium	Low	Medium
34	omdat (because)	Causal	Low	Low	Low
35	tevens (besides, also)	Additive	Medium	Medium	Medium
36	onder andere (among other things)	Clarification	Low	Medium	Medium
37	bovendien (moreover)	Additive	Low	Low	Low
38	gezien (given)	Causal	Medium	Medium	Low
39	met behulp van (with the aid of)	Causal	Medium	Medium	Low
40	zodra (as soon as)	Temporal	Medium	Low	Medium
41	daarnaast (besides)	Additive	Medium	Low	Low
42	daardoor (therefore)	Causal	Medium	Low	Low
43	nadat (after)	Temporal	Low	Low	Low

*Items 7, 9 and 32 are signalling words.

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Received 08 April 2015; revised version received 24 August 2016. Accepted 27 September 2016.

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