

Degand, Liesbeth & Sanders, Ted (2002). The impact of relational markers on expository text comprehension in L1 and L2, *Reading and Writing* 15 (7-8), 739-758.

## **The impact of relational markers on expository text comprehension in L1 and L2**

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## **Abstract**

This article reports on an experiment investigating the impact of causal discourse markers (connectives and signaling phrases) on the comprehension of expository texts in L1 and L2.

Although several psycholinguistic studies have investigated the impact of connectives and lexical markers of text structure on comprehension (i.e. off-line), there is no consensus on the exact effect of explicit discourse markers on text understanding; three different findings are reported in the literature: markers would have a facilitating effect, an interfering effect or no effect at all.

The first goal of this article is to clarify this problem of contradicting results by limiting the scope of the study to causal relations, and to one specific text type: expository texts. Furthermore, the naturalness of the experimental texts was controlled, readers did not need specific background knowledge to understand the texts and the experimental method consisted of open answer questioning. Our second goal is to investigate to what extent a supposed effect of linguistic marking depends on readers proficiency in a first or second language.

The experiment consisted in the reading of short expository texts in two languages, Dutch and French, which both functioned as L1 and L2. The results indicate that readers benefit from the presence of causal relational markers both in L1 and in L2. Implications for (theories of) text processing are discussed, as well as for the further insights in reading comprehension in L1 and L2.

## **Key words**

coherence relations, connectives, discourse markers, second language reading, text processing, reading comprehension, causality

## Introduction

An important insight from recent research in text processing is that readers construct a cognitive representation of the information in the text, and that this representation is coherent (see, among many others, Garnham & Oakhill, 1992; Gernsbacher & Givón, 1995; Sanders & Spooren, 2001; Van Dijk & Kintsch, 1983). One of the ways in which readers establish coherence is by relating the different information units in the text by means of coherence relations that hold between the text segments (say clauses up to paragraphs) (Hobbs 1990; Noordman & Vonk, 1997; Sanders, Spooren, & Noordman, 1992; Sanders & Noordman, 2000). Examples are *cause-consequence*, *contrast* and *problem-solution* relations. Coherence relations are conceptual and they can, but need not, be made explicit by linguistic markers like connectives (*because*, *but*, *and*) or signaling phrases (*This is caused by...*, *the solution to this problem is...*, *On the other hand...*). Example (1) illustrates a causal relation that is made explicit by a connective (a), a signaling phrase (b), or left implicit (c).

- (1) (a) Pluto was very happy **because** he had eaten the roast beef.  
(b) Pluto was very happy. **The reason for this was that** he had eaten the roast beef.  
(c) Pluto was very happy. He had eaten the roast beef.

If coherence relations are indeed crucial for establishing a coherent discourse representation, one might expect that the linguistic marking of these relations influences both the reading process and the representation readers have built after reading. Although several recent psycholinguistic studies have investigated the actual processing of connectives and lexical markers of text

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structure, there is still no consensus on the exact role of explicit discourse markers in text (for an overview, see Sanders & Noordman, 2000; Sanders & Spooren, 2001). There is indeed much empirical support for the position that connectives and other linguistic coherence markers play a facilitating role *during* the reading process (Gaddy, van den Broek & Sung, 2001), i.e. they lead to faster processing of directly following text segments (Bestgen & Vonk, 1995; Britton, Glynn, Mayer, & Penland, 1982; Deaton & Gernsbacher, 2000; Haberlandt, 1982; Sanders, 1992; Sanders & Noordman, 2000). With respect to the influence of explicit coherence markers on the text representation afterwards, i.e. off-line, the situation is not so clear. On the one hand, some results show that linguistic marking of coherence relations improves the mental text representation. This becomes apparent from better recall performance (Loman & Mayer, 1983; Lorch & Lorch, 1986; Meyer, Brandt, & Bluth, 1980), a faster and more accurate response on a prompted recall task (Millis & Just, 1994), a faster response on a verification task (Sanders & Noordman, 2000) and better answers on comprehension questions (Degand, Lefèvre, & Bestgen, 1999). On the other hand, there are a number of studies indicating that linguistic markers do *not* have this facilitating role, as shown by a lack of effect on the amount of information recalled (Meyer, 1975; Sanders, 1992; Sanders & Noordman, 2000) or no better answers on comprehension questions (Spyridakis & Standal, 1987). Some authors even claim a negative impact of connectives on text comprehension (Millis, Graesser, & Haberlandt, 1993).

There are several plausible explanations for the reported contradictions. One is that the category of linguistic markers under investigation is not well-defined (see also, Lorch, 1989; Spyridakis, 1989; Sanders & Noordman, 2000). For instance, in the "signaling" literature two different types of "signals" seem to be conflated: importance signals and relational signals. It is plausible that each of these two types of signals influences text processing in a different way. The

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effect of signaling that was found in typical "mixed signal studies", such as Loman and Mayer (1983), Lorch and Lorch (1986), and Meyer et al. (1980), may very well be caused partly by importance signals: Information following importance signals is processed more slowly and (therefore) reproduced better. On the other hand, relational signals, as shown in studies like Millis & Just (1994), Deaton & Gernsbacher (2000) and Sanders & Noordman (2000), lead to faster processing but do not seem to affect recall.

A second explanation is experimental text construction. In some studies, connectives were more or less treated as linguistic elements that can be "plugged in" between two sentences, no matter the content of the sentences or the plausibility of the coherence relation. In reality, the processing of a connective implies that readers make a match between the relational meaning of the connective and the meaning of the content of the segments. In the Millis et al. (1993) study, for instance, readers may have had a difficult task in some conditions when it was hard to match the passage content with the relational information expressed by the connectives.

A third explanation for the contradicting results may be the use of experimental methods that are not "sensitive" enough to the effect of relational markers. Several researchers (e.g., Meyer, 1975; Sanders & Noordman, 2000) reported no effect of relational markers on text comprehension after reading, making use of the free recall method. However, it is possible that the recall task is simply too global to register the effect of relational markers. Other methods such as recognition, question answering or sorting (Kintsch, 1998) might be more sensitive in this respect. Indeed, Degand et al. (1999) did find an effect of causal connectives on question answering.

A fourth explanation is the neglect of other influencing factors such as specific characteristics of readers: reader's knowledge of the content domain and reader goals. From

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research on the influence of previous knowledge on text comprehension we know that readers who have a high degree of knowledge in the content domain are more likely to supply the information independent of the signals in the text. In contrast, readers with little knowledge of the domain ought to have a much more difficult time constructing an internally coherent mental model without the help the signals provide (Birkmire, 1985; Spyridakis & Standal, 1987; McNamara & Kintsch, 1996). Other influencing "reader factors" that seem to influence the effect of such relational markers are reader's goals (Noordman, Vonk, & Kempff, 1992) and verbal ability (Meyer, Young & Bartlett, 1989). If we want to get a clear view on the role of relational signals per se, we have to make sure that reader characteristics do not vary systematically between groups of readers.

The first goal of this article is to clarify this problem of contradicting results. We will do so by testing the hypothesis that relational markers *do* influence the reader's representation after reading, provided that the experimental set-up succeeds in avoiding research problems like the ones mentioned. In our view, a successful methodology for this type of research, has the following properties. First, it is limited in scope: the research is limited to one specific type of relational marker, in this case a signal or connective expressing a causal relation, and to one specific text type: expository texts. Second, we will make sure that participants read natural, well-formed texts, in which the presence or absence of a relational marker only constitutes an implicit or an explicit version of an identical coherence relation. There are no further differences between the experimental texts. Third, we make use of the question answering method as used previously by Degand et al. (1999) because this enables us to specifically test the way in which readers have access to the target-information (which was or was not preceded by a relational signal). Finally, in order to avoid too large a priori differences in the amount of knowledge

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readers have with respect to a certain topic, we have used basic encyclopedic information texts.

These texts belong to the popular-scientific genre and do not require any specific prior knowledge. They should be accessible to average readers with a secondary school degree (twelve years of education). This does not mean that no prior knowledge at all is required to read and understand these texts, but specific prior knowledge effects in the sense of McNamara & Kintsch (1996) should be reduced to a minimum.

A well-known effect that linguistic markers are supposed to have is that they result in better understandable texts, because they help readers in identifying text structure. For that reason, researchers have argued that connectives and signaling phrases might especially be useful for readers who have trouble understanding the text, such as readers in a foreign language. Although this is a plausible idea, there is not too much empirical work on this issue. The second goal of this paper is to explore the question of how the linguistic marking of relations interacts with linguistic knowledge and language proficiency: to what extent does a supposed effect of linguistic marking depend on a reader's proficiency in a first or second language? To get a grip on this issue, we compared reading comprehension of readers in L1 with their reading in L2, because this enables a clear view on the role of language proficiency.

Our hypothesis is that in L1 and L2 there should be an effect of linguistic marking of text structure on text comprehension. This effect might even be higher for L2 readers than for L1 readers, unless the level of language proficiency is not high enough. There are several reasons for this hypothesis.

Readers should benefit from linguistic marking of text structure, because the markers provide them with extra help in the construction of the text representation. One could argue that especially advanced L2-learners benefit greatly from structural markers, because they have no

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trouble in understanding the connectives and other linguistic markers (Goldman & Murray, 1992). In fact, the assumption is that L2 readers can use their knowledge of structure markers to alleviate their lower general and implicit linguistic knowledge in the foreign language. In that case, structural marking should be more beneficial to L2-readers than to L1-readers. Geva (1986) found some evidence in favor of this view, although her findings were heavily influenced by the use of typography as an additional independent variable. In her experiment, students read either an implicit, an explicit or a typographical explicit version of a text, where the latter version included bold face. Readers performed best in the latter condition. A very similar picture emerges from another study, with L1-readers who differed in the level of reading skills. Investigating the use of connectives by skilled readers (students in grade 5 and 7), Geva & Ryan (1985) distinguished between high, medium and low groups on the basis of a reading comprehension test, and found that all groups benefited from the typographical highlighting of connectives. But when the connectives were not highlighted, only highly skilled readers benefited from their presence. Similarly, in a study on the effects of reading level and the presence of explicit or implicit causal relationships upon recall and comprehension, Zinar (1990) showed that, in the late elementary grades, better readers use a reading strategy involving attention to text structure signals. Less skilled readers do not develop such a strategy.

From this we can conclude that if the language proficiency of the L2-readers is too low, it is possible that the benefit from linguistic marking of text structure will disappear, because the readers simply cannot make use of them. Connectives and other relational markers typically belong to the type of linguistic knowledge that is relatively complex, acquired late and is hard to use correctly (MacLean & d'Anglejan, 1988). Berman (1979) argues that connectives and other linking devices often cause problems for L2-readers because they are misunderstood or

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neglected. Clearly, such problems can be caused by L2-readers' limited vocabulary: they are not familiar with the meaning and use of many relational markers. Cooper (1984) argues for such an explanation and indeed he concludes from an experimental study with practiced and unpracticed non-native readers of English that, due to their lack of knowledge of connectors, non-practiced L2-readers do not benefit from these overt signals, but rather have trouble understanding them. Cohen, Glasman, Rosenbaum-Cohen, Ferrara and Fine (1979) report a similar finding. Moreover, Geva (1992) has shown that the ability to process logical relationships within *local* contexts is a necessary but not sufficient component of comprehension of such relations in extended discourse. In other words, L2 readers need an increased proficiency in order to be able to treat such relationships.

## Experiment

The aim of the experiment was to test the impact of linguistic markers of relational coherence on the comprehension of expository discourse in both L1 and L2. Participants read expository texts and answered comprehension questions. Texts were manipulated with respect to the presence or absence of linguistic markers: in some texts, we manipulated the presence or absence of causal connectives, in other texts, the presence or absence of causal signaling phrases. Doing this, we took care not to disturb the quality of the texts (adequately used and relevant connectives, texts that were long enough, etc.) so as to arrive at three versions of the texts that would be as natural as possible. The two languages under investigation were French and Dutch. Both languages functioned as L1 and L2 in the experiment, i.e. Dutch students read texts in their Mother Tongue and in French, and Belgian students read the same texts in French (L1) and Dutch (L2).

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Our hypothesis is that texts with linguistic marking (connectives and signaling phrases) should lead to better comprehension than the implicit versions both in L1 and in L2. In addition, we hypothesize that the effect of linguistic marking might be larger in L2 than in L1, unless the language proficiency is too low.

## **Method**

### Participants

Fifty-four participants took part in the experiment: Thirty-one undergraduate students at the University of Louvain (Louvain-la-Neuve), native speakers of French studying Dutch; twenty-three undergraduate students at Utrecht University, native speakers of Dutch studying French. All participants were volunteers and they were paid for their participation.

### Materials

The experimental material consisted of eighteen expository texts of approximately 250 words [min. 244 / max. 259] of which nine were in Dutch and nine in French. All texts were based on original encyclopedic or popular scientific articles and covered topics like *Snake bites*, *Pompeii*, *Tornadoes and hurricanes*, *Bone marrow transplant*, *The Big Bang theory*, etc. To avoid specific prior knowledge effects as much as possible, we discarded topics that could have been involved in recent course material or that would have been discussed in the recent national or international media<sup>1</sup>. We wrote three versions of each of the texts, two with explicit linguistic marking of causal relations and one implicit version in which the linguistic marking was left out, and, if

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<sup>1</sup> Of course, it is always possible that one of the participants in the experiment happens to be an expert in one of the domains treated by the texts. But then, this should become apparent in the analysis of the individual results (see below).

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necessary, replaced by a full stop. Linguistic marking consisted either of causal connectives or of causal signaling phrases. In the "connective versions" three causal connectives were manipulated for presence or absence. In each text, at least one connective signaled a backward causal relation and at least one a forward causal relation. Backward causal relations were marked in Dutch by either *omdat* ('because'), *want* ('because/for') or *doordat* ('because of the fact that'), and, in French, by either *parce que* ('because'), *car* ('because/for') or *puisque* ('since'). The forward causal relations were marked in Dutch by *daarom* ('that's why') or *dus* ('so'), and in French by *c'est pourquoi* ('that's why'), *donc* ('so'), or *dès lors* ('it follows that'). For the texts manipulating signaling phrases the same principle was followed. One of the phrases marked a backward relation (e.g., *De reden hiervan is dat/La raison en est que* ('The reason for this is that')), the other a forward relation (*Dit heeft als gevolg dat/Ceci a pour conséquence que* ('A consequence of this is that')). In all text versions, the texts also contained other (causal and non-causal) connectives that were not manipulated.

Each text was rated on a complexity scale by five independent judges. Complexity was in the first place defined as linguistic complexity (vocabulary, syntax and text structure) and in the second place as complexity of the content. Level of difficulty and type of topics addressed in the texts were kept as identical as possible across Dutch and French. For each language, we presented a "fairly easy" text, a "mean" text and a "fairly difficult" text in each of the three conditions. Text (2) is an example of a "connective" text, translated from Dutch. The original Dutch version is included in the Appendix. For illustrative purposes, the manipulated connectives are underlined here.

(2) People suffering from the Multiple Personality Syndrome (MPS) have as it were divided

their personality into a number of subpersonalities, that once and a while take over the control of the patient's life. The Netherlands have a high percentage of MPS-cases, possibly because in the Netherlands the illness has been receiving attention and has been treated for a longer time than in other countries. In most cases, MPS appears with patients as a result of serious traumatic experiences in the five first years of their life. The child is so young, that it has not been able yet to build its completed personality. Therefore it splits off very painful and confusing events from its own consciousness. Afterwards, these separated parts get their own consciousness and finally their own personality. These personalities are called alters or partial personalities. Eventually the alters can influence and dominate the life of the patient in a very serious way. Because of this the patients are threatened to lose the control of their lives. MPS-patients suffer from memory loss and can have a series of other troubles, for instance, unexplainable mood changes, depressions, eating problems, phobias, sleeping problems and relational problems. The treatment of MPS-patients generally consists of psychotherapy or psychoanalysis. The aim of the treatment is to make the patient experience the traumatic events with help of the memories of the subpersonalities, that have filled the wholes in the memory of the patient. When the patient finally accepts the subpersonalities as part of him/herself and accepts what they try to make him/her understand, the subpersonalities can merge into the main personality. That is how a complete personality comes to existence.

Four short-answer questions were prepared for each text. Two of them tapped the cohesive manipulation; that is the causal relation marked by absence or presence of a connective or a signaling phrase (see questions (a) and (d) relating to text (2)). The two other questions covered

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other non-manipulated parts of the text (see questions (b) and (c), again relating to text (2)).

Thus, for each text there were two questions focusing on the causal relations, and two on other parts in the texts.

(a) Why do the Netherlands have a high percentage of MPS-cases?

(b) What is an alter?

(c) How does a complete personality eventually come to existence?

(d) Why are the patients threatened to lose control over their lives?

In addition, as a distractor task between the reading of each text and the answering of the text comprehension questions, participants had to answer three general knowledge questions about the history, geography or culture of Belgium, The Netherlands and France.

Finally, a language competence test was presented to the participants, to determine their level of proficiency in L2. For Dutch, we used a reading comprehension test from Beheydt & Pekelder (1991). The test we used is part of a standardized globally administered exam by the "Certificate Dutch as a Foreign Language" ("Certificaat Nederlands als Vreemde Taal"). In particular, we used a reading comprehension test designed for the intermediate level, i.e. the level which the participants in our experiment should have reached. The test consisted of two narrative texts of the 1998 exam. Comprehension of each text was tested with five multiple choice questions with only one correct answer per question (maximum score 10). The questions were all text-based. For French, we used a reading comprehension task from Lobrot (1980). This is a standardized test used in orthophony to test the reading ability of young adolescent L1

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readers<sup>2</sup>. It consists of a narrative text and comprehension is scored with ten multiple-choice text-based questions (maximum score 10). In order to enable comparison of the level of proficiency in L1 and L2, the reading comprehension tests were also presented to the L1 readers<sup>3</sup>.

### Design

Three counter-balanced sets of materials were constructed for each language. Each set contained the nine texts: three of the texts were in the connective version, three in the signaling version and three in the implicit version. Across the three sets, each text appeared once in each experimental condition. A random order of texts was constructed. Half of the participants saw the texts following this random order, and half of them saw them in reversed order. This left us with twelve booklets of texts: three for each set of materials, one in each order, once for Dutch and once for French.

### Procedure

Texts were assembled in booklets. For each text, there were three pages. The text was printed on the first page. On the second page, there were three cultural multiple choice questions as a distracting task. The third page contained the comprehension questions.

First, participants read the texts in their second language (Dutch for the Belgian students, French for the Dutch students), after a short break of approximately 10 minutes, they read the texts in their first language (French for the Belgian students, Dutch for the Dutch students). Participants were tested by groups of ten to fifteen in a classroom. To keep subjects synchronized over the

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<sup>2</sup> At the time of the experiment we did not find any standardized text-based French as a Foreign Language test. This is why we turned to an L1 reading test for children.

<sup>3</sup> In fact, we expected a ceiling effect for the results of the L1 readers on the reading

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different tasks, time to process each task had been fixed according to a pilot study in which three subjects read the texts, and subsequently answered the questions. We took their mean reading and answering times as the maximum limit, to synchronize the participants and to prevent participants from adopting too diverging reading strategies. One hundred and twenty seconds were allowed for reading each text in the first language, 150 seconds for the texts in the second language, 30 seconds for answering the cultural multiple choice questions and 120 seconds and 150 seconds for answering all the questions in the first and the second language, respectively. At each transition point, the experimenter gave the signal to start.

Participants first processed one practice text, then the nine experimental texts in the second language and then, after a break, the nine experimental texts in the first language. This L2-L1 reading order was chosen because we expected that the L2 task would be a lot heavier than the L1 task. Presenting the tasks in the inversed order would have given the risk that the results on the most complex tasks would suffer from tired subjects having problems with their concentration.

The language competence test was presented to subjects immediately before the break. The whole experiment lasted approximately two hours.

## **Results**

The language competence tests had a maximum score of 10 points. In order to have a level of comparison, the same task was used both for the L1- and for the L2-readers. Table 1 displays the results on the language tests for the two groups.

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comprehension tests, but not for the L2 readers.

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insert Table 1 approximately here

A mixed analysis of variance (ANOVA) was performed, with the native language of the participants (French or Dutch speaking) as a between factor, and the language condition in which the proficiency test was passed (L1/L2) as a within factor. There was a main effect of the language condition ( $F(1, 52)=35.74$ ;  $p < 0.0001$ ) showing that the participants performed significantly better in their first language than in their second language. There was also a main effect of the language group ( $F(1, 52)=13.68$ ;  $p < 0.001$ ), i.e. the French speaking participants performed worse than the Dutch speaking participants. Finally, there was an interaction between the two factors ( $F(1, 52)= 10.88$ ;  $p < 0.01$ ) reflecting that the level of proficiency in L1 is comparable for the two groups, while the L2-proficiency level of the French speaking participants was significantly lower than that of the Dutch speaking participants.

For the experiment itself, answers to the comprehension questions were scored by two independent judges. Answers received scores from 0-2, depending on the extent to which the answer was in accordance with the information in the text: 2 for a correct answer and 1 for a partial answer. In a first trial, judges agreed in about 85 % of the cases. Ultimately, agreement was arrived at in all cases.

For each participant, we computed, within the two language conditions (L1 and L2), a mean score for each text condition (connective, signaling, implicit) and for each type of question: manipulation-tapping or non-manipulation-tapping. As a reminder, manipulation-tapping questions were related to the presence or absence of a connective or signaling phrase to mark a causal relation. The non-manipulation-tapping questions covered different matters in the text.

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Mean scores across participants for these twelve conditions are shown in Table 2 for the French-speaking participants and the Dutch-speaking participants. To facilitate reading of the results, scores have been recalculated in percentages.

Insert Table 2 approximately here

A mixed analysis of variance was performed using the native language of the participants (French or Dutch speaking) as a between factor, and language condition (L1/L2), question type (manipulated or not) and text condition (connective, signaling phrase or implicit) as within factors. The results are as follows.

First, there was an overall highly significant main effect of the language condition, i.e. participants performed a lot better in their mother tongue than in their foreign language ( $F(1,52)=113.44, p < 0.0001$ ). There was also a nearly significant effect of the native language of the participants, i.e. there was a tendency for the Dutch speaking participants to perform better than the French speaking participants ( $F(1,52)=3.52, p < 0.066$ ). However, it seems that this latter effect is due in the first place to a poorer performance of the French speaking participants in their foreign language. There was indeed a nearly significant interaction between the language condition (L1/L2) and the language group the participants belong to ( $F(1,52)=3.65, p < 0.061$ ). Table 2 shows that the scores in L1 are very similar for the two groups while the French speaking participants perform worse in L2 in comparison to the Dutch speaking participants. This latter result is in accordance with the lower scores of the French-speaking on the language proficiency test (Table 1 above).

Most notably, there was a significant main effect of the text condition ( $F(2,104)=17.75, p$

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< 0.0001). This factor did not interact with any of the other factors under investigation, nor with any combination of factors (all p's larger than 0.15). In other words, the impact of the text condition (connective vs. signaling phrase vs. implicit) applied equally to the two language groups (French and Dutch speaking) and it was not different in the first or second language of the participants. Comparison of the means of the three text conditions by one degree of freedom contrasts showed that the implicit condition differed significantly from the explicit conditions, i.e. marking with connective or signaling phrase, ( $F(1,52)=38.80$ ,  $p < 0.0001$ ), while the explicit versions did not significantly differ from each other ( $F(1,52)=0.58$ ,  $p > 0.40$ ). The scores in Table 2 show that texts with explicit (causal) coherence markers lead to a better comprehension performance than texts without these markers. It is noteworthy that this effect persisted throughout the nine French texts and the nine Dutch texts, i.e. they all showed an advantage for the cohesive versions.

Finally, there was a nearly significant impact of the question type condition (manipulation-tapping vs. non-manipulation-tapping), i.e. there was a tendency for the manipulation-tapping questions to be more sensitive to the text condition (presence or absence of cohesive markers) ( $F(1,52)=3.86$ ,  $p < 0.055$ ). It is noteworthy that this factor did not interact with any of the other factors. In particular, since there was no interaction with the text condition, we may conclude that the cohesive manipulation affected the questions about the marked relations as well as the questions covering other parts of the text.

## **DISCUSSION**

The results of this study lead to further insights into the role of linguistic markers in text processing in general, and into the specific role they have in text comprehension in L1 versus

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L2. We will subsequently discuss conclusions for both areas.

Even though many researchers of text processing agree on the importance of linguistic cues of text structure (Gaddy et al, 2001; Sanders & Spooren, 2001), recent empirical research on the exact role of these cues in text comprehension has produced a significant number of contradicting results. We have suggested that most research suffers from a lack of systematic control of the different factors that might influence text processing, in particular the type of text, the type of linguistic signal, the well-formedness of the text, and the background knowledge of the reader. Restricting our investigations to the impact of causal relational markers (connectives and signaling phrases) in expository texts that do not require specific background knowledge, we have shown that these linguistic signals *do* indeed influence the reader's representation after reading. As a matter of fact, we have replicated the finding of Degand et al. (1999): relational markers lead to better answers on comprehension questions after the text has been read. This effect holds for both signaling phrases and connectives. This finding clearly suggests that linguistic markers help readers construct a coherent cognitive representation of the information in the text.

Hence, for information texts such as the ones used, designed with the explicit purpose of communicating new information to the reader, it seems particularly important to use relational cues. In these expository texts, readers actually use the causal signals to create relatively tight connections among units of information as they try to construct a coherent mental model of the phenomena described in the text.

In this respect, it is important to note that the presence of causal markers seems to influence the construction of a coherent mental representation as a whole. Indeed, the question answering method we used revealed that not only the targeted relational information was recalled

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better, questions about *other* aspects of the text were also answered better. This effect might indicate that causal relations are particularly important for the construction of the mental representation during reading. In other words, causal markers would not only be useful in establishing local coherence, but they would also be instrumental in achieving global coherence. This is consistent with research on text processing underlining the special status of causal relations. For narratives, causal relations were shown to crucially affect the understanding and reproduction of textual information (e.g. Murray, 1995; Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985; van den Broek, 1990), and Graesser, Singer & Trabasso (1994) have even suggested that in narrative texts causal connections function as a default. In expository texts, the role of causal relations is to convey important contingency relations among states and events (Graesser & Franklin, 1990). In addition, several studies have demonstrated that causal relations have a large impact on on-line text processing, as well as on readers representation after they have read the text (Noordman & Vonk, 1998; Sanders & Noordman, 2000). In the latter study, for instance, it was found that causal relations lead to faster processing of the connected information, but still lead to a more integrated representation: better and faster verification of statements and better recall of information.

Returning to the influence of linguistic markers, there is a striking difference between our results and previous findings in the literature. In particular, where Sanders & Noordman (2000) conclude, both on the basis of literature and on the basis of their own experimental work, that the effect of relational markers is limited to the on-line reading process, whereas our results show that the presence of relational markers indeed affects the text representation that readers have constructed after reading. We believe this difference in results may very well be due to the methods used to investigate the off-line effect of relational markers. Both in the current study and

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in Degand et al. (1999), open comprehension questions were used, whereas other studies either used more global measures such as free recall (Meyer, 1975; Sanders & Noordman, 2000) or multiple choice questions (Spyridakis & Standal, 1987). It seems plausible that the latter methods are not "sensitive" enough for finding the effect that signaling phrases and connectives appear to have on text comprehension. The further comparison of these methods is an important issue for further research.

The combination of results that has now been found in independent studies is crucial for our understanding of expository text comprehension. On the one hand, the use of suitable relational markers making coherence relations between text segments explicit has been shown to speed up the on-line process of text processing. On the other hand, it results in a better representation of the textual information after the text has been read. Further studies, combining on- and off-line methods, are needed to confirm this conclusion.

The second goal of this article was to investigate whether a particular 'reader factor', the level of language proficiency, interacts with the impact of linguistic signals. To get a grip on this issue, we compared reading comprehension of two groups of readers in L1 with their reading in L2. Our first hypothesis stated that both in L1 and L2 there would be an effect of linguistic marking of text structure on text comprehension. Secondly, we expected that this effect might even be higher for L2 readers than for L1 readers, unless the level of language proficiency is not so high that they could benefit fully from the markers. The results show that our main hypothesis is borne out. Although there is an overall effect of the language proficiency - participants performing better in L1 than in L2 - both L1 and L2 readers benefit from the presence of causal markers during reading. That is, their comprehension performance is higher for texts *with* than *without* causal cues. However, contrary to our second hypothesis, no interaction effect was found

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between the language condition and the presence or absence of relational markers. L2 readers benefited neither more nor less from the relational signals than the L1 readers. The presence of the markers had an overall positive influence on text understanding, and there was no difference in impact between L1 and L2. Even the French-speaking participants that show lower scores for L2, both in proficiency, and in score on comprehension questions, did benefit from cohesive marking. This result does not immediately support previous research in which it was argued that L2-readers tend to misunderstand or neglect relational markers so that they do not benefit from these signals (Berman, 1979; Cohen et al., 1979; Cooper, 1984). We conclude that the language proficiency of the two language groups was probably so high that they could understand and make use of the causal signals. This does not mean that their performance in L2 is native-like, since their global performance in L1 was significantly higher than in L2. Still, their L2 proficiency was high enough to understand the general functions of the signals and their usage conditions. This ability can be explained in terms of the "inter-dependence hypothesis" (Cummins, 1984), which states that cognitive and linguistic skills acquired in one language can be transferred to another language. The same view is held by Bossers (1991) who reports evidence for the direct transfer of L1 reading skills to L2 reading if a certain amount of L2 knowledge has been acquired. This transfer does not take place at low levels of L2 competence. These findings seem to enforce our conclusion that even the French speaking participants in our experiment had a sufficiently high L2 competence level to adopt a reading strategy that makes use of discourse markers. Tentative as it may be, a plausible explanation for these findings is the following one. As soon as readers master an efficient reading strategy in their mother tongue, including the ability to utilize and infer coherence relations in discourse, they can transfer this skill to another language, provided they have also developed a sufficiently high L2 competence

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level. Although plausible, this explanation still leaves several questions to be answered. Here are some of the most urgent ones: When is this specific "higher" L2 competence level reached? How can (L1 and) L2 reading proficiency be specifically improved? In a first answer to the latter question, Goldman & Murray (1992) have argued for specific instructions for students, so that they get a better understanding of the relationships between sentences, as well as of the use of linguistic markers. This type of knowledge would help in constructing these relationships so that accurate and coherent mental models can be produced. It is this type of research that is needed to provide further insight in the exact role of textual characteristics in L1 versus L2 reading proficiency. And it is becoming more and more clear that linguistic markers of causal coherence relations are a crucial example of those textual characteristics that help readers in constructing a cognitive representation of the information in the text.

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## Appendix

### Example of an original Dutch experimental text

Mensen die aan het Meervoudig Persoonlijkheden Syndroom (MPS) lijden, hebben als het ware hun persoonlijkheid opgesplitst in een aantal nevenpersoonlijkheden, die bij tijd en wijle de regie over het leven van de patiënt overnemen. Nederland kent een hoog percentage MPS-gevallen, mogelijk omdat in Nederland de aandoening al langer in de belangstelling staat en wordt behandeld dan in andere landen. MPS treedt bij de meeste patiënten op als gevolg van ernstige traumatische ervaringen tijdens de eerste vijf levensjaren. Het kind is zo jong, dat het nog geen voltooide persoonlijkheid heeft kunnen opbouwen. Daarom splitst het zeer pijnlijke en verwarrende gebeurtenissen af uit het eigen bewustzijn. Vervolgens krijgen deze afgesplitste delen een eigen bewustzijn en uiteindelijk een eigen persoonlijkheid. Deze persoonlijkheden worden alters of deelpersoonlijkheden genoemd. Uiteindelijk kunnen de alters het leven van de patiënt sterk gaan beïnvloeden en beheersen. Daardoor dreigen zij de grip op het eigen leven kwijt te raken. MPS-patiënten lijden aan geheugenverlies en kunnen daarnaast nog allerlei klachten hebben, bijvoorbeeld onverklaarbare stemmingswisselingen, depressies, eetproblemen, fobieën, slaapproblemen en relationele problemen. De behandeling van MPS-patiënten bestaat in het algemeen uit psychotherapie of psychoanalyse. Het doel van de behandeling is de patiënt alsnog de traumatische ervaringen te laten doorleven met behulp van de herinneringen van de nevenpersoonlijkheden, die de hiaten in de herinnering van de patiënt kunnen opvullen. Als de patiënt ten slotte de nevenpersoonlijkheden accepteert als deel van zichzelf en aanvaardt wat zij hem of haar duidelijk willen maken, kunnen de nevenpersoonlijkheden opgaan in de hoofdpersoon. Daardoor ontstaat een complete persoonlijkheid.

Questions about the experimental text

Waarom kent Nederland een hoog percentage MPS-gevallen?

Wat is een alter?

Waardoor ontstaat uiteindelijk een complete persoonlijkheid?

Waarom dreigen patiënten de grip op het eigen leven kwijt te raken?

Table 1: Mean scores for the two groups in L1 and L2 on the language proficiency test

(maximum score = 10)

<i>Participants</i>	<i>L1</i>	<i>L2</i>
French-speaking	9.23	6.52
Dutch-speaking	9.22	8.43

Table 2: Mean comprehension score percentage for the two groups in L1 and L2 with text condition and question type as a function

Participants	Language	Question	Connective	S.D	Signaling	S.D	Implicit	S.D
French-speaking	L1	Manip.	71	.15	68	.21	57	.21
	(French)	Non-manip.	75	.20	72	.22	66	.24
	L2	Manip.	40	.20	42	.23	36	.18
	(Dutch)	Non-manip.	42	.20	38	.22	39	.24
Dutch-speaking	L1	Manip.	74	.18	73	.22	60	.20
	(Dutch)	Non-manip.	73	.21	71	.17	67	.22
	L2	Manip.	55	.20	54	.21	39	.25
	(French)	Non-manip.	54	.23	54	.22	43	.27