

Perspective-Driven Text Comprehension

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SUMMARY

The present article reports results of an eye-tracking experiment, which examines whether the perspective-driven text comprehension framework applies to comprehension of narrative text. Sixty-four participants were instructed to adopt either a burglar's or an interior designer's perspective. A pilot test showed that readers have more overlapping prior knowledge with the burglar-relevant than with the interior designer-relevant information of the experimental text. Participants read either a transparent text version where the (ir)relevance of text segments to the perspective was made apparent, or an opaque text version where no direct mention of the perspective was made. After reading participants wrote a free recall of the text. The results showed that perspective-related prior knowledge modulates the perspective effects observed in on-line text processing and that signalling of (ir)relevance helps in encoding relevant information to memory. It is concluded that the proposed framework generalizes to the on-line comprehension of narrative texts. Copyright © 2008 John Wiley & Sons, Ltd.

Readers often have a specific viewpoint or perspective in mind when reading. For example, you may read a historical novel from the viewpoint of a civil rights advocate or a biography of Marilyn Monroe imagining what it would have been like to be her. The present study examined the influence of a reading perspective on on-line processing and memory of narrative texts. More specifically, the present study examined whether prototypical prior knowledge related to the reading perspective and the transparency of relevance of the text information influences reading and memory of a narrative.

Next, we will briefly review the previous research on perspective effects on the text comprehension. We then present a framework of perspective-driven text comprehension, which aims at describing the interplay between knowledge, attention and memory during goal-directed reading. We will then describe the present study.

PERSPECTIVE EFFECTS ON TEXT COMPREHENSION

The perspective adopted by the reader prior to reading makes certain information in the text important or relevant to the reader (e.g. Pichert & Anderson, 1977). For example, if readers are told to imagine that they are burglars while they are reading a text describing different houses, readers rate text information relevant to a burglar (e.g. sentences describing a

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valuable stereo system or the location of a safe) as more interesting and important than other information presented in the text (e.g. sentences describing a leaking tap or mold in the laundry room). After reading, readers have better memory of the perspective-relevant than of the perspective-irrelevant text information (e.g. Baillet & Keenan, 1986). Recall studies suggest that the reading perspective exerts its influence already during text encoding. For example, in the study of Baillet and Keenan (1986), participants read a story describing three different houses from one of two potential perspectives: a burglar or an interior designer perspective. After reading, participants were asked to recall everything they could remember of the story. The results showed that readers recalled more perspective-relevant than perspective-irrelevant information of the story. After the first recall, the participants were told to change the perspective (e.g. from a burglar to an interior designer) and use it in order to try to recall new text information that they didn't recall during the first recall attempt. The results showed that after adopting a new perspective, participants tended to omit information that became irrelevant after the perspective change but were not able to recall new facts from the text. Thus, the perspective active during reading heavily constrains what can be later recalled of the text. Although a retrieval perspective can make relevant information more accessible for output than irrelevant information, the encoding perspective ultimately constrains what can be recalled of the text (see also Kaakinen, Hyönä, & Keenan, 2001).

There is also direct evidence showing that the reading perspective exerts its effect primarily during text encoding (Kaakinen & Hyönä, *in press*, 2005; Kaakinen, Hyönä, & Keenan, 2002, 2003). The results of eye tracking studies on expository text comprehension show that readers spend more time processing perspective-relevant than perspective-irrelevant text information (e.g. Kaakinen et al., 2002). For example, if participants are instructed to read a medical text describing several different diseases in order to find information related to a specific disease (e.g. trigeminusneuralgy), readers invest extra attentional effort on text segments concerning this disease (e.g. Kaakinen et al., 2003). This perspective effect in processing can already be observed during the first-pass reading of the relevant target sentences (Kaakinen et al., 2003); moreover, under certain circumstances the perspective effect can be observed already in the beginning of the sentence (Kaakinen & Hyönä, *in press*). The magnitude and timing of the perspective effect depends (at least) on two factors: the amount of prior knowledge the reader possesses of the text topics (Kaakinen & Hyönä, *in press*) and the reader's working memory capacity (Kaakinen et al., 2002, 2003).

Previous studies on expository text comprehension show that when readers have ample prior knowledge of the text topics the magnitude of the perspective effect on on-line processing is smaller than when readers have no or minimal prior knowledge related to the text contents. An interesting finding is that even though readers do not spend extra time on relevant text information when they have prior knowledge on the text topics, they still show superior memory for relevant in comparison to irrelevant text information (Kaakinen et al., 2003). This finding suggests that relevant information about familiar contents can be readily encoded to memory without the need to spend additional time in doing it.

The timing of the perspective effect also depends on the available prior knowledge: the perspective effect appears earlier for an expository text about familiar than unfamiliar contents (Kaakinen & Hyönä, *in press*). In high prior knowledge conditions readers slow-down reading already in the beginning of relevant sentences, whereas in low prior knowledge conditions the perspective effects is observed mainly as increased reading time at the end of the sentences and as more rereading of the sentences initiated from the

sentence end. These findings suggest that a reading perspective can be more readily utilized to guide on-line text comprehension when reading a text of familiar contents.

In sum, previous research shows that a reading perspective makes certain information in text particularly interesting or important from the reader's point of view (e.g. Pichert & Anderson, 1977), it directs reader's attention to relevant information in text (e.g. Kaakinen et al., 2002) and results in improved memory for perspective-relevant text information (e.g. Baillet & Keenan, 1986). Exactly how a reading perspective influences on-line processing of text depends on how much prior knowledge the reader has. In high prior knowledge conditions the perspective effect is relatively small but may materialize very early on, that is, immediately when encountering relevant text information. In low prior knowledge conditions the perspective effect is greater in magnitude and is observed in rereading, that is, after reading through the perspective-relevant sentence.

But what type of theoretical framework would explain these findings? Next, we will sketch out a framework of perspective-driven text comprehension, which aims at describing the interplay between knowledge, attention and memory in perspective-driven reading.

A FRAMEWORK FOR PERSPECTIVE-DRIVEN TEXT COMPREHENSION

A graphical description of our framework is presented in Figure 1. Our framework is based on current models of attention and memory such as those put forth by Cowan (1995, 1999) and Kane, Conway, Hambrick, and Engle (2007). The general idea is that sensory input, for example text, automatically activates elements in long-term memory (LTM). The LTM

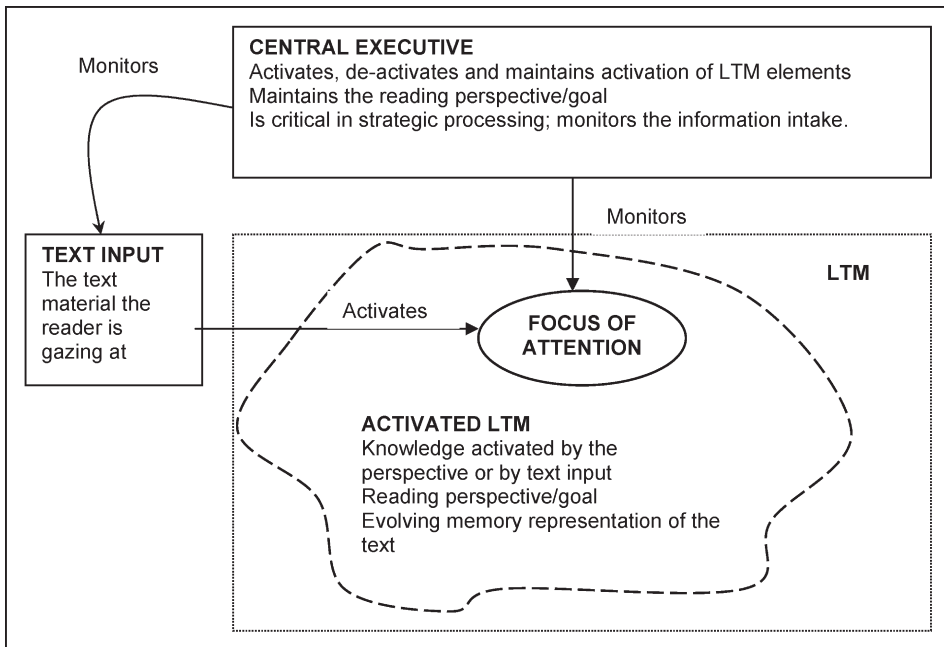


Figure 1. A framework for perspective-driven text comprehension

elements that are most activated are in the conscious awareness (the focus of attention). However, the focus of attention is limited in capacity; thus, LTM elements with lower activation values are not in the focus of attention but they are still relatively easily accessible (cf. Ericsson & Kintsch, 1995). In accordance with these models, we assume that there is a control mechanism, the central executive that is responsible for activating LTM elements, maintaining their activation, as well as for de-activating or inhibiting the activation of LTM elements in accordance with the task demands. The central executive is also involved in the control of overt visual attention, so that during reading the eyes sample text information in a task-appropriate manner.

According to our framework, the perspective instructions or the adopted reading goal activate relevant concepts in the reader's knowledge base. For example, if the reader's task is to read the text in order to find information about a specific disease, for example, causes and cures of diarrhoea, all task-relevant information in the reader's knowledge base gets activated: for example, that diarrhoea is typically caused by ingestion of contaminated food or water, that it typically involves quite inconvenient symptomatology, and that it fortunately only lasts for a short period of time. The task instructions also set the *standards of coherence* for the memory representation of the text to be read (van den Broek, Ridsen, & Husebye-Hartmann, 1995). If the reading task is to be able to tell things about diarrhoea, then readers try to form a coherent representation of the diarrhoea-relevant text information (Kaakinen & Hyönä, 2005), whereas a relatively superficial memory representation is considered sufficient for all perspective-irrelevant information (Kaakinen & Hyönä, in press).

During the course of reading the incoming text information is constantly interpreted in the light of the activated knowledge and the standards of coherence (cf. Sanford & Garrod, 1998). When the reader gazes at a word, the meaning of the word is encoded and related concepts as well as relevant world knowledge (e.g. schema-type of knowledge structures in the LTM) are automatically activated, akin to the resonance process proposed by Myers and O'Brien (1998). When perspective-relevant text information is encountered, activated knowledge structures (cf. 'Activated LTM' in Figure 1) resonate with the text input, allowing a quick recognition of the text information as relevant. Perspective-relevant text information is easily incorporated into the developing text representation and the high standards of coherence are met without much effort. Perspective-irrelevant information, on the other hand, is only superficially processed; even though readers may read through the irrelevant sentences in order to be able to determine their irrelevance, readers do not attempt to integrate irrelevant information to the developing memory representation and they proceed in the text relatively quickly. However, if the reader does not have task-relevant prior knowledge, recognizing the incoming text information as relevant (or irrelevant) may not be readily accomplished. Moreover, building the necessary links to incorporate text information to the developing memory representation requires extra attentional effort. Thus, readers may decide to reread the relevant sentence before moving on in the text, or, they may stop at the sentence end to allow additional time for integration and rehearsal (see also Blanchard & Iran-Nejad, 1987).

The central executive is responsible for directing attentional resources so that the task requirements are fulfilled (i.e. meeting the standards of coherence set for perspective-relevant and perspective-irrelevant information). To achieve a sufficient understanding of the text (if deemed necessary), (1) knowledge structures may be activated, for example, in order to make a necessary text inference, (2) parts of the constructed text representation are brought to the focused attention (e.g. when the text refers back to contents mentioned

earlier in the text) and/or (3) reading perspective or goal is reactivated if its activation level has dropped and the reader is in the process of assessing the relevance of a text element. The central executive also monitors the deployment of overt visual attention and is responsible for adapting the reading strategies to the adopted goal, for initiating reprocessing of text information, and for suspending the new information intake in case a sufficient understanding of the currently processed text is not yet achieved.

A memory representation of the text builds up as knowledge structures are activated in the LTM: some are retrieved from the LTM by the automatic resonance process and some concepts may be retrieved by searching from memory or by making inferences (van den Broek, Rapp, & Kendeou, 2005). The resulting memory representation of the text entails all the memory traces activated during reading in one way or another (van den Broek et al., 2005).

OVERVIEW OF THE PRESENT STUDY

The proposed framework is based on our previous studies on perspective effects in the comprehension of expository text. In the present study, we wanted to examine whether the framework also applies to the reading of narratives. Even though there exists several different types of expository and narrative texts, the two genres do differ in several aspects (see e.g. Graesser, Golding, & Long, 1991). In the following, we discuss their differences.

Previous research shows that narratives are easier to comprehend and remember than expository texts (e.g. Lehto & Anttila, 2003; Olson, 1985; Tun, 1989; Zabrocky & Moore, 1999; Zabrocky & Ratner, 1992). There are several potential reasons for this difference. Expository texts are written to provide readers new information on a topic of interest, so they often contain a lot of information that is unfamiliar to the reader, whereas narratives typically are written for the purpose of entertainment and they contain information that is at least to some degree familiar to the reader. More importantly, narratives are based on *event sequences* that people experience also in real life (see Graesser et al., 1991). Research shows that as the sequence of events unfolds during the course of a narrative, readers keep track of at least five situational dimensions: flow of time, space, causality of the events, and protagonist(s) and their intentions (for a review, see Zwaan & Radvansky, 1998). While expository texts may contain descriptions of time, space or causal relations, expository text does not engage the reader to experience the text to the same degree as narratives do. For example, Sadoski, Goetz, and Rodriguez (2000) suggested that while it is possible to induce imagery with expository text, narratives induce more spontaneous imagery than expository texts. It could thus be argued that narratives and expository texts induce different processing strategies (McDaniel & Einstein, 1989): general thematic information may be regarded as central in narratives, whereas in expository texts readers may concentrate more on factual details. In accordance with this view, Wolfe (2005) showed that novel associations between the concepts described in the story (i.e. the event sequence) seem crucial in the comprehension of narratives, whereas knowledge-based semantic associations play a more important role in the comprehension of expository texts. Kintsch and Young (1984) examined the memory for details embedded in narrative and expository texts. They hypothesized that the narrative structure would decrease the memory for details because it encourages the processing of the more general thematic information, whereas the expository text structure would increase the memory for details. This is exactly what

Kintsch and Young (1984) found. In sum, narratives and expository texts are likely to invite the readers to apply different processing strategies: expository texts induce the processing of details and the use of knowledge base, whereas narratives induce the processing of the thematic structure and guide readers to pay particular attention to the story plot as it unfolds (instead of the details).

The two genres also typically have a very different textual organization. Expository texts often are organized according to a topic structure, and thus different textual signals, such as headings, numbering and underlining can be used to identify important or relevant information in the text (Lorch, 1989). Single words may also serve as cues for relevant details (e.g. if the task is to read about diarrhoea, the word 'diarrhoea' in the text marks the relevance of that text segment). Finding the relevant details in expository text is thus relatively easy because they are explicitly marked. On the other hand, in narratives signalling devices that mark relevant details are hardly ever used. Instead, the reader has to infer the relevance of text information.

Do these differences between narrative and expository texts have consequences to perspective-driven or goal-guided reading? In the present study, we examined whether our previous findings observed for expository texts generalize to the processing of narratives. More specifically, we examined whether (1) the amount of available prior knowledge modulates the perspective effects also in narratives, and (2) whether explicit signalling of relevant details as is typical in expository texts enhances the perspective effect observed in on-line processing of narratives.

As outlined in our framework, prior knowledge plays a crucial role in perspective-driven reading. If readers have ample prior knowledge related to the perspective, perspective instructions automatically activate it and it becomes part of the activated LTM component of working memory. Relevant text information is then quickly recognized as such and also encoded to memory without extra effort (Kaakinen et al., 2003; Kaakinen & Hyönä, in press). In accordance with this view, previous studies examining perspective effects on text memory for narrative texts suggest that the familiarity with the perspective does modulate the magnitude of the perspective effect (e.g. Baillet & Keenan, 1986; Borland & Flammer, 1985; Goetz, Schallert, Reynolds, & Radin, 1983; Newsome, 1986). These studies have used some version of the housewalk passage originally introduced by Anderson and Pichert (1978), which describes people walking in a house (or in different houses). Readers were given either a burglar's, a potential home buyer's or an interior designer's perspective. A recurring finding in these studies is that burglar-relevant information is overall better recalled than house buyer-relevant or interior-designer-relevant text information. Moreover, the burglar perspective produces larger perspective effects in recall than the house buyer perspective. In their seminal study, Anderson and Pichert (1978) speculated that this may be a consequence of college students being more familiar with the burglar than with the home buyer perspective. The burglar perspective may also be considered more constrained in the sense that there is a relatively fixed set of items in a house deemed relevant from a burglar's perspective. On the other hand, the number of items relevant to an interior designer or to a home buyer may be greater. Moreover, perspective-relevance is perhaps less constrained by the interior designer or home buyer perspective than by the burglar perspective. Thus, instructions to adopt an interior designer's or a house buyer's perspective may activate a relatively diverse set of concepts in the reader's knowledge base, whereas the instructions to adopt the burglar perspective perhaps results in a relatively stereotypical (and thus consistent across readers) 'burglar schema'. Recognizing text information as relevant (or irrelevant) and encoding it

to memory may be more difficult when reading the housewalk text from the interior designer's perspective than from the burglar's perspective.

In order to confirm these intuitions, we collected normative data on the prior knowledge related to the two different perspectives, and found that participants' burglar-related prior knowledge overlapped to a greater extent with the information presented in our text's burglar-relevant sentences, in comparison with the overlap observed between interior-designer-related prior knowledge and designer-relevant text sentences. In the actual experiment, participants read the housewalk story, adapted from the study of Baillet and Keenan (1986), from one of two perspectives (burglar vs. interior designer) while their eye movements were recorded. After reading they produced a free recall of the text. We expected that the perspective effect in on-line processing occurs earlier and is smaller in size in the high prior knowledge condition (i.e. for the readers who were assigned the burglar perspective) than in the low prior knowledge condition (i.e. readers who were assigned the interior designer perspective). In text recall, on the other hand, the availability of relevant prior knowledge was predicted to increase the magnitude of the perspective effect.

We also manipulated the transparency of perspective-relevance in the text. In the expository texts used in our previous studies, a direct reference to the perspective is typically made in the text before presenting the perspective-relevant information. For example, when reading a travel guide in order to find information about the Pitcairn Island, we may encounter a sentence *On the Pitcairn Island, the temperature is around 20 degrees Celsius throughout the year*. According to our framework, a direct mention of the Pitcairn Island in the beginning of the sentence should increase the activation of the reading perspective and the possible relevant prior knowledge related to it, thus strengthening their status in the activated part of LTM. This should make it easy to recognize the perspective-relevance of this text segment. On the other hand, if the text does not remind the reader in any way about the reading perspective, the perspective may lose at least some of its activation. This in turn may lead to weakening of the perspective effect, as readers may not prioritize perspective-relevant text information over perspective-irrelevant information (i.e. they become less selective in processing); or the perspective effect may become more delayed, as it might take readers longer time to determine the (ir)relevance of different text elements. In the present study, we tested these predictions by using two different versions of the same narrative: one where no reference was made in the text to signal perspective (ir)relevance and another where perspective-relevance and perspective-irrelevance was explicitly signalled immediately before presenting the target information. These two versions were coined opaque and transparent, respectively.

In the transparent text version, the text described two main protagonists taking part in a housewalk. Olli, a young male, was described as a burglar planning to rob one of the three houses that the housewalk party is visiting. Susanna, a young female, was described as a student of interior design looking for new ideas for her course work. Thus, the reading perspective was explicitly attached to the identity of one of the protagonists. In the transparent version, the text reminded of the protagonist's 'occupation' immediately prior to presenting the perspective-relevant and perspective-irrelevant target information. In the opaque version, these reminders were omitted. We expected that the transparency of relevance would speed up the recognition of relevance and encoding relevant text information to memory. Thus, a smaller perspective effect in processing times and a larger perspective effect in text recall were expected for the transparent than for the opaque text version.

METHOD

Participants

Sixty-four university students from the University of Turku participated in the experiment to fulfil a course requirement.

Apparatus

Eye movements were collected by the EyeLink I eyetracker manufactured by SR Research Ltd (Ontario, Canada). The eyetracker is an infrared video-based tracking system combined with hyperacuity image processing. There are two cameras mounted on a headband (one for each eye) including two infrared LEDs for illuminating each eye. The headband weighs 450 g in total. The cameras sample pupil location and pupil size at the rate of 250 Hz. Registration can be done either monocularly or binocularly. We performed it for the selected eye (usually the right eye) by placing the camera and the two infrared lights 4–6 cm away from the eye. The resolution of eye position is 15 seconds of arc and the spatial accuracy approximately 0.5 degrees. Head position with respect to the computer screen is tracked with the help of a head-tracking camera mounted on the centre of the headband at the level of the forehead. Four LEDs are attached to the corners of the computer screen, which are viewed by the head-tracking camera, once the participant sits directly facing the screen. Possible head motion is detected as movements of the four LEDs and is compensated for on-line from the eye position records.

Materials

The housewalk story used in the present experiment was a translated (written in Finnish) and edited version of the text used by Baillet and Keenan (1986). Two different versions of the text were prepared: in the transparent version, relevance of the text segments to the reading perspective was marked by inserting text that made an explicit reference to the perspective (i.e. a reference to the protagonist who was associated with the perspective); in the opaque version, perspective-relevance was not apparent in the text, as these explicit references to the perspective were excluded from the text (examples are presented in Table 1).

Table 1. An excerpt of the experimental text

[As she stepped into the living room, Susanna sighed of delight.] A guide pointed out a very special plaster ornament on the ceiling. A heavy mahogany bookshelf dominated the living room. [Having sneaked in the room,] Olli raised his eyebrows when he noticed the highest shelf being covered with thick dust and **Mr. Helenius' credit cards, which he had forgotten, on the lowest shelf**. Going into the kitchen to get a drink of water, Susanna was startled to see that the cabinets and drawers were of a modern design that did not include handles. She was trying to see how they worked when Mrs. Helenius came in the room. 'Oh, Mrs. Helenius', she exclaimed, 'these are the most intriguing cabinets! How do they work?' [Also Olli had found his way to the kitchen and] Mrs. Helenius showed how to open the cabinets and pulled out a drawer to demonstrate its mechanism. [Olli was very interested in the drawer as] **it was full of Chippendale sterling silver flatware**.

Note: Sentences that were only present in the transparent version are marked here with brackets. The target sentences were same in both text versions: Interior designer-relevant target sentences are underlined, burglar-relevant are presented in boldface (in the actual experimental text, the target sentences were presented without underlining or boldface).

The transparent text was 1080 words long and it described two main protagonists taking part in a housewalk. Olli, a young male, was described as a burglar planning to rob one of the three houses that the housewalk party visits. Susanna, a young female, was described as a student of interior design looking for new ideas for her course work. Half of the participants were assigned the burglar's perspective and were instructed to imagine that they were burglars and to decide which house they would rob. The other half of the participants were assigned to the interior designer's perspective and were instructed to imagine that they were interior designers and asked to decide which house has the fanciest decor and would be nicest to live in. The perspective from which the participant read the story determined the title of the text ('An Interior Design Student Studies Classic Homes' or 'A Burglar Checks Out Future Jobs'). The text included two sets of target segments, which were rated in the Baillet and Keenan (1986) study for relevance to a given perspective. The target information sets consisted of text segments highly relevant to one perspective but irrelevant to the other perspective. For example, sentences (or phrases) describing valuable and easily robbed objects were part of the burglar-relevant information set, whereas sentences (or phrases) describing the decor of the houses belonged to the designer-relevant information set. The text contained 14 target phrases relevant to burglary and 14 target phrases relevant to interior design. When reading the text from the burglar perspective, the burglar-relevant target phrases comprised the perspective-relevant information set, while the interior-designer-relevant information set comprised the perspective-irrelevant information set. On the other hand, for participants reading the text from the interior designer perspective the relevance of the two information sets was reversed. The target information sets were matched for the mean length (measured in number of words) and the mean word frequency (word frequencies were based on a newspaper corpus accessed by the WordMill software of Laine & Virtanen, 1999). Throughout the text, the protagonists were referred to by their name and 'occupation'. Thus, the reading perspective was explicitly attached to the identity of one of the protagonists. Prior to each target segment, an explicit reference was made to the protagonist. For example, the target segment 'A guide pointed out a very special plaster ornament on the ceiling' was preceded by a sentence 'As she stepped into the living room, Susanna sighed of delight' (see Table 1).

The opaque text was composed by editing the transparent text: the explicit references to the 'occupation' of the protagonists that preceded the target phrases were removed (see Table 1). The opaque text version of the housewalk story was 907 words long and it simply described a young couple touring three houses. Thus, the 'professional' identity of the couple was unspecified in the text. The perspective from which the participant read the story determined the title of the text (see above). The target phrases were exactly the same as in the transparent text.

In a pilot experiment, 24 participants (who did not participated in the actual experiment) were given 90 seconds to write down as many things as came to their mind of each perspective (burglar and interior designer). Participants produced about an equal number of items related to the two perspectives; they retrieved an average of 8.42 (SD = 2.41) burglar-relevant and an average of 8.38 (SD = 3.23) interior designer-relevant items within the given time, $t(23) < 1$. However, the burglar-relevant items that were listed overlapped to a greater extent with the information included in our experimental text than the designer-relevant items: participants spontaneously produced about 21% of the ideas included in the burglar-relevant target phrases, but only 4% of the ideas included in the interior designer-relevant target phrases, $t(23) = 6.69$, $SE = .02$, $p < .001$.

RESULTS

Recall

Two independent raters scored 32 out of the 64 protocols. The protocols were scored for the number of target phrases mentioned in the recall protocol. The phrase was scored as recalled when its main content was mentioned in the recall protocol—no verbatim recall was required. The interrater consistency was satisfactory (mean interrater error rate was 4.6%); thus, the rest of the protocols were scored by only one rater.

The data were analyzed with a 2 (Relevance: Relevant vs. Irrelevant) \times 2 (Reading Perspective: Burglar vs. Interior designer) \times 2 (Text Version: Opaque vs. Transparent) mixed factors ANOVA. Relevance was a within-subjects factor, reading perspective and text versions were between-subjects factors.

A clear perspective effect was observed in text recall: perspective-relevant target phrases were better recalled than perspective-irrelevant target phrases ($F(1, 60) = 48.26$, $MSE = .004$, $p < .001$) (see Table 2). However, a significant Relevance \times Reading Perspective interaction ($F(1, 60) = 26.28$, $MSE = .004$, $p < .001$) indicated that the magnitude of the perspective effect depended on the reading perspective. The burglar perspective produced a significant perspective effect ($t(31) = 9.15$, $p < .001$, $SE = .015$), whereas the interior designer perspective did not ($t(31) = 1.20$, $p = .238$, $SE = .018$). In other words, readers demonstrated a clear perspective effect in text memory only when they had ample perspective-relevant prior knowledge that overlaps with the relevant text information. None of the other effects reached significance, largest $F(1, 60) = 3.07$, $MSE = .015$, $p = .085$ for the Reading Perspective \times Text Version interaction.

Fixation time measures

Phrase-level analyses of readers' eye movement patterns were conducted. Eye fixations were categorized into first-pass and second-pass fixations. First-pass fixations were those that were made when reading through the target phrase for the first time, whereas second-pass fixations were those that are directed back to the target phrase from a subsequent phrase (i.e. after its initial processing was completed). We computed two first-pass measures: progressive fixation time and first-pass rereading time. For the progressive fixation time, the duration of those fixations were summed up that landed on an unread part of the phrase; for the first-pass rereading time, we computed the sum of

Table 2. Mean recall of the relevant and irrelevant target sentences, as a function of text version and reading perspective

	Opaque text version				Transparent text version			
	Relevant sentences		Irrelevant sentences		Relevant sentences		Irrelevant sentences	
Reading perspective	<i>M</i>	SE	<i>M</i>	SE	<i>M</i>	SE	<i>M</i>	SE
Burglar	0.34	0.02	0.18	0.02	0.28	0.02	0.16	0.03
Interior designer	0.23	0.02	0.22	0.03	0.28	0.03	0.24	0.03

Note: Values reflect the proportion of recalled sentences to the total number of target sentences in the text.

fixations that landed on sentence regions that were already fixated during the first-pass reading. The durations of second-pass fixations were summed up to yield the look-back fixation time (for further details of the measures used, see Hyönä, Lorch, & Rinck, 2003).

The data were analyzed with a 2 (Relevance: Relevant vs. Irrelevant) \times 2 (Reading Perspective: Burglar vs. Interior designer) \times 2 (Text Version: Opaque vs. Transparent) mixed factors ANOVA. Relevance was a within-subjects factor, reading perspective and text versions were between-subjects factors.

In the *progressive fixation time*, a significant Relevance \times Reading perspective interaction ($F(1, 60) = 59.97$, $MSE = 18\,276$, $p < .001$) indicates that the magnitude of the perspective effect varied as a function of the reading perspective (see Table 3). The burglar perspective did not produce a perspective effect at all—in fact, irrelevant target phrases attracted 158 milliseconds longer progressive fixation times than relevant target phrases ($t(31) = 4.22$, $SE = 37.30$, $p < .001$). The designer perspective, on the other hand, produced a clear perspective effect: relevant phrases attracted 212 milliseconds longer progressive fixation times than irrelevant phrases ($t(31) = 7.15$, $SE = 29.74$, $p < .001$). None of the other main effects or interactions proved significant, all F 's < 2 .

As for the *first-pass rereading time*, a significant main effect of relevance indicates that the relevant phrases were reinspected more during the first-pass reading than irrelevant phrases ($F(1, 60) = 12.58$, $MSE = 24\,649$, $p = .001$) (see Table 4). A Relevance \times Reading Perspective interaction ($F(1, 60) = 3.91$, $MSE = 24\,649$, $p = .053$) indicates that the magnitude of the perspective effect varied as a function of reading perspective. Readers who had adopted the burglar perspective reinspected relevant target phrases only 45 milliseconds longer than irrelevant phrases ($t(31) = 1.33$), whereas readers who had adopted the designer perspective produced a robust 153 milliseconds perspective effect ($t(31) = 3.33$, $SE = 46.03$, $p = .002$). Moreover, a two-way interaction between relevance and text version ($F(1, 60) = 3.87$, $MSE = 24\,649$, $p = .054$) suggests that the magnitude of the perspective effect was reduced when the relevance of the text information was transparent in the text. The perspective effect was significant in the opaque text version ($t(31) = 3.14$, $SE = 48.77$, $p = .004$) but failed to reach significance in the transparent version ($t(31) = 1.54$, $SE = 28.51$, $p = .13$). Further comparisons indicated that the transparency of perspective relevance influenced especially the rereading time of the relevant target phrases: rereading times for relevant target phrases were 300 milliseconds shorter in the transparent than in the opaque text version ($t(62) = 2.16$, $SE = 138.92$, $p = .035$). The difference between the opaque and transparent text versions was not significant for the irrelevant target phrases ($t(62) = 1.46$, $SE = 130.63$, $p = .149$). The marginally significant main effect of text version ($F(1, 60) = 3.51$, $MSE = 549\,545$,

Table 3. Mean progressive fixation time (in milliseconds) for the relevant and irrelevant target sentences, as a function of text version and reading perspective

	Opaque text version				Transparent text version			
	Relevant sentences		Irrelevant sentences		Relevant sentences		Irrelevant sentences	
Reading perspective	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
Burglar	1634	106	1836	116	1601	105	1714	120
Interior designer	1629	116	1419	96	1779	132	1563	124

Table 4. Mean first-pass rereading time (in milliseconds) for the relevant and irrelevant target sentences, as a function of text version and reading perspective

Reading perspective	Opaque text version				Transparent text version			
	Relevant sentences		Irrelevant sentences		Relevant sentences		Irrelevant sentences	
	<i>M</i>	SE	<i>M</i>	SE	<i>M</i>	SE	<i>M</i>	SE
Burglar	741	238	659	228	242	34	237	42
Interior designer	563	91	340	61	463	105	379	96

$p = .066$) reflects the fact that the mean first-pass rereading times were somewhat shorter in the transparent than in the opaque text version. All other main effects and interactions failed to reach significance, largest $F(1, 60) = 2.70$ for the Reading Perspective \times Text Version interaction.

In the *look-back fixation time*, a significant Relevance \times Reading Perspective interaction ($F(1, 60) = 6.21$, $MSE = 21\,845$, $p = .016$) indicates that the magnitude of the perspective effect depended on the reading perspective (see Table 5). As with the other fixation time measures, the burglar perspective did not produce a reliable perspective effect ($t(31) = 1.13$), whereas readers who adopted the interior designer perspective spent longer time looking back to relevant than to irrelevant phrases ($t(31) = 2.49$, $SE = 34.90$, $p = .018$). None of the other main effects or interactions proved significant, largest $F(1, 60) = 2.03$ for the Reading Perspective \times Text Version interaction.

DISCUSSION

The present study examined whether the previous findings on perspective effects on expository text comprehension generalize to the comprehension of narratives. We were especially interested in (1) whether the amount of prior knowledge modulates perspective effects in narratives, and (2) if the transparency of perspective-relevance of the text segments affects the extent to which reading perspective is utilized to guide on-line text processing.

Table 5. Mean look-back fixation time (in milliseconds) for the relevant and irrelevant target sentences, as a function of text version and reading perspective

Reading perspective	Opaque text version				Transparent text version			
	Relevant sentences		Irrelevant sentences		Relevant sentences		Irrelevant sentences	
	<i>M</i>	SE	<i>M</i>	SE	<i>M</i>	SE	<i>M</i>	SE
Burglar	341	296	371	234	54	23	110	32
Interior designer	77	28	22	15	217	58	98	27

In line with our previous studies on expository text comprehension (Kaakinen & Hyönä, 2005, *in press*; Kaakinen et al., 2002, 2003) the present results show that also in narratives readers spend more time reading perspective-relevant than perspective-irrelevant text information and have better memory of perspective-relevant than of perspective-irrelevant text information after reading. Moreover, the perspective effect in on-line processing may materialize already during the initial reading of the relevant sentences, as indicated by the progressive first-pass reading times.

As for the role of prior knowledge in perspective-driven narrative reading, the present results suggest that, similarly to expository texts, prior knowledge modulates the magnitude of the perspective effect. When the perspective-relevant text information substantially overlapped with prototypical prior knowledge, encoding relevant text information to memory was easy and did not require extra attentional resources: even though no perspective effect (i.e. longer processing of relevant than irrelevant text information) was observed in any of the fixation time measures in the high prior knowledge condition (i.e. the burglar perspective), a clear perspective effect was observed in text recall. In other words, readers were able to encode relevant text information to memory without the need to spend additional time on the relevant sentences to achieve a better memory for relevant than irrelevant text information. In contrast, when the perspective-relevant information did not overlap strongly with readers' prior knowledge (i.e. the interior designer perspective), readers failed to gain superior memory for perspective-relevant text information even though they spent a considerably longer time reading the perspective-relevant than perspective-irrelevant sentences.

The observation that prior knowledge is capable of modulating the size of the perspective effect is further strengthened by the fact that the effect is obtained using the same experimental text. We only varied the degree of overlap between the prior knowledge related to the adopted reading perspective and the corresponding information set in the text. Even though it may be considered somewhat surprising that the interior designer perspective did not produce a perspective effect in text recall, this finding is in line with previous memory studies that used a similar text and similar reading perspectives (e.g. Baillet & Keenan, 1986; Borland & Flammer, 1985; Goetz et al., 1983; Newsome, 1986). The failure to observe a perspective effect is probably due to the perspective-irrelevant information set producing a relatively good recall. Note that the irrelevant set consists of items relevant to the burglar perspective—information that is part of a prototypical burglar schema that may be automatically activated to some degree even when it is not relevant to the interior designer perspective.

Naturally, the role of prior knowledge in perspective-driven text comprehension could be studied using a different experimental design than what we applied in the present study, for example, by comparing the perspective use by knowledgeable and unknowledgeable readers (see Chiesi, Spilich, & Voss, 1979), by comparing the perspective use during reading of text on familiar and unfamiliar topics (Kaakinen et al., 2003), or by examining the perspective use when the same text is reread (Kaakinen & Hyönä, *in press*). However, the first approach (between groups design) is problematic, because reading times and on-line reading strategies vary substantially even among adult readers (see e.g. Hyönä, Lorch, & Kaakinen, 2002), making it difficult to conclude whether differences between knowledgeable and unknowledgeable readers are due to differences in prior knowledge or in text processing style. Moreover, these two factors probably are closely intertwined. The two other approaches have produced very similar results to the ones observed in the present study (see Kaakinen & Hyönä, *in press*; Kaakinen et al., 2003).

The second question of interest was whether making the relevance of text segments transparent in text would modulate the perspective effect during the reading of a narrative. We expected that when the relevance of text segments is clearly signalled in the text (as is typically the case with expository texts), it would be easier to identify perspective-relevance, to direct attentional resources to relevant text information, and to encode relevant information to memory. The present results show that signalling the relevance and irrelevance of the target information reduced the need to immediately reread relevant text information. However, this did not lead to a memory decrement, as the memory performance was not affected by the transparency of relevance. Thus, transparency of relevance in the text does not increase the visual attention devoted to relevant text information; instead, it enables efficient encoding of relevant information to memory.

In sum, the present results are in line with our previous studies on expository text comprehension and suggest that the framework for perspective-driven text comprehension presented in the Introduction is also applicable to narrative comprehension. In other words, even though narratives and expository texts do differ from each other in significant ways (see the Introduction for details), a reading perspective does have a significant impact on on-line processing and memory of both expository and narrative texts. Moreover, prior knowledge plays an important role in the comprehension of both expository and narrative texts, and activating the relevant prior knowledge either with perspective instructions or by linguistic signals embedded in the text facilitate the encoding of relevant information to memory regardless of text genre.

These findings have important implications to educational practices. Assigning a comprehension perspective and activating students' prior knowledge should increase learning of perspective-relevant information not only from expository materials, such as textbooks (Lehman & Schraw, 2002) but also from narrative texts. For example, instructing students to adopt a historical character's perspective on historical events depicted in a text is likely to enhance history learning.

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