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Perspective Effects on Online Text Processing

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The effect of a reading perspective on online text processing was studied by recording readers' eye movements during reading. Participants read an expository text about 4 countries with the goal of deciding whether one of the countries, designated by the experimenter as the reading perspective, would be a good new place of residence. The results showed better memory for perspective-relevant information and longer fixation times on perspective-relevant information. Individual differences in working memory were assessed with the reading span test. Results showed that the time course of the perspective effect varied with memory span: High-span readers showed a perspective relevance effect on initial reading of the target segments, whereas low-span readers showed the effect only in the later look backs.

Usually, when reading expository text, one is reading not just for the fun of it but for a specific purpose; for example, to find information regarding a question in which one is interested. In other words, one adopts a specific reading perspective from which one reads the text at hand. The purpose of this study was to examine how the perspective adopted by the reader influences the processing of expository text.

In this study, participants read an expository text that described four remote countries: Andorra, Anguilla, Pitcairn, and Honduras. Before reading, the participants were instructed to adopt a reading perspective. One half of the participants

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were told to imagine that they were research scientists and that they were going to work and live in Pitcairn for several years. They were instructed to read the text with the perspective of looking for the good and the bad sides of Pitcairn as a new home country. The other half of the participants were instructed to imagine that they were going to work and live in Honduras. Thus, for one half of the participants the information about Pitcairn was relevant, and the information about the other countries (including Honduras) was irrelevant. For the other half, information about Honduras was relevant, and information about the other countries (including Pitcairn) was irrelevant.

A large body of empirical evidence has shown that the information relevant to the reading perspective is recalled better than other information presented in text (e.g., Anderson, Pichert, & Shirey, 1983; Baillet & Keenan, 1986; Kaakinen, Hyönä, & Keenan, in press; McDaniel, 1984; McDaniel & Kerwin, 1987; Pichert & Anderson, 1977). These memory studies have shown that the memory representation is constructed around the reading perspective. However, they do not indicate whether or how a reading perspective influences online processing of text.

The scenario-mapping-and-focus model proposed by Sanford and Garrod (1981, 1998) is a suitable framework for understanding how the reading perspective might exert its influence. According to this model, the text information being processed at a particular moment is at the *explicit focus* (i.e., active in the working memory). Only a certain amount of text information can be in the explicit focus at once, and the explicit focus is capacity constrained. The text information in the explicit focus launches an automatic and fast-acting resonance process that activates readers' relevant knowledge structures in long-term memory. These knowledge structures are called *scenarios*. Scenarios often are schema- or script-type knowledge structures that offer a background data structure against which the text is interpreted. The scenario is maintained in the *implicit focus,* which is an activated part of the reader's long-term memory (cf. the long-term working memory proposed by Ericsson & Kintsch, 1995). During the course of reading, the information in the explicit focus is mapped onto the information in the implicit focus, that is, constantly interpreted against the relevant background knowledge being activated from the reader's long-term memory. Thus, the concepts activated in the reader's background knowledge can affect the processing of text already in the early phases of comprehension. The constructed memory representation is a trace of the connections between the text information in the explicit focus and the scenario maintained in the implicit focus.

A reading goal can act as a scenario that is used to interpret incoming text information (Sanford & Garrod, 1981). For example, in our study readers had a specific goal for reading: They wanted to find out about one remote country—either Pitcairn or Honduras. Before reading, knowledge structures that form the reading perspective were activated in the readers' long-term memories. The readers were probably interested in the country's climate, language, economic situation, and so

on. The reading perspective had to be maintained in the implicit focus during reading and, when the readers proceeded in the text, the incoming text information was interpreted against the reading perspective in the implicit focus and mapped to the evolving memory representation.

However, does encoding of relevant information to memory require extra processing time? According to what we call here the *encoding time hypothesis,* a reading perspective guides the readers to allocate additional processing time to perspective-relevant information, and this extra processing leads to better memory for relevant information (Anderson, 1982). Text information is constantly interpreted in light of the reading perspective active in the implicit focus. Only when encountered text information is relevant to the reading perspective is extra time invested to map that information to memory, that is, to construct the connections between the text information in the explicit focus and the background knowledge. In other words, text is read quickly through while readers check the relevance of text information to their reading perspective, and when relevant information is found extra processing time is used to map that information to memory.

This view was supported by Goetz, Schallert, Reynolds, and Radin (1983), who found that readers not only recalled more perspective-relevant than perspective-irrelevant sentences but also spent more time reading them. Also, Rothkopf and Billington (1979) told participants to look for answers to a set of questions while reading; information relevant to the questions attracted more and longer eye fixations and was better recalled than other text elements.

According to what we call the *effortless-encoding hypothesis,* encoding of relevant information to memory does not necessarily require longer processing time. Ericsson and Kintsch (1995) demonstrated that it is possible to quickly access information in the implicit focus, that is, knowledge activated in long-term memory. Because of the fast connections, mapping text information in the explicit focus to the activated part of long-term memory is not necessarily time consuming (see Ericsson & Kintsch, 1995; Kintsch, 1998). In other words, a reading perspective activates relevant knowledge structures in the readers' long-term memory, which are then readily available in the implicit focus. When perspective-relevant text information is encountered it is quickly connected to relevant knowledge structures and mapped to memory. Thus, the effortless-encoding hypothesis permits selective memory to occur in the absence of selective processing time.

Two studies conducted by Grabe (1979, 1981) lend support to the effortless-encoding hypothesis. He found that readers did not spend more time reading perspective-relevant segments than perspective-irrelevant sentences even though perspective-relevant text segments were recalled better than perspective-irrelevant text segments. Anderson (1982) also reported that perspective-relevant information did not involve longer reading times even though it was better recalled.

As is evident, the available data concerning the influence of a reading perspective on online text processing are contradictory. However, these studies suffer from

methodological restrictions. In Rothkopf and Billington's (1979) eyetracking experiment, fixation times had to be collected for rather large text segments (i.e., paragraphs), including both perspective-relevant and perspective-irrelevant information, and the fixation times had to be inferred from these global measures. In the other experiments a sentence reading time task, in which the texts are presented one sentence at a time, was used. With this method, the reader proceeds in the text by pressing a button: A new sentence appears while the previous sentence is erased from the screen. Thus, this method does not permit possible look backs to already-read sentences. Yet research has shown that look backs to previous sentences are an integral component of comprehension (Vauras, Hyönä, & Niemi, 1992).

The eyetracking technique we used in this study allows readers to look back and thus can provide important information not only about the processing time for relevant and irrelevant information in text but also about the time course of the possible perspective effect: whether the reading perspective influences the initial reading of relevant and irrelevant text segments or whether it exerts its influence later, as indexed by look backs. It also allows normal reading of text by not posing extra requirements on the reader, such as pressing a button after each sentence to advance the text.

The main goal of this experiment was to test the encoding time and effortless-encoding hypotheses by using eyetracking to record readers' fixation times on perspective-relevant and perspective-irrelevant text segments. If the data support the encoding time hypothesis, then we should observe better memory for the perspective-relevant than for the perspective-irrelevant information coupled with longer reading times for the perspective-relevant than for the perspective-irrelevant information in the text. On the other hand, if the data support the effortless-encoding hypothesis, then we should observe better memory for the perspective-relevant than for the perspective-irrelevant information in the absence of processing time differences between the perspective-relevant and perspective-irrelevant text segments.

In addition to the general effects of the reading perspective, we were interested in whether the readers' working memory capacity, as measured by the reading span task (Daneman & Carpenter, 1980), would modulate the perspective effect. The reading span task has been thought to reflect individual differences in the overall capacity that readers have available for executing the different processing and storage functions of reading (e.g., Just & Carpenter, 1992). A memory study conducted by Lee-Sammons and Whitney (1991) indicated that readers with a low working memory span (WMS) showed a greater effect of a reading perspective on text memory than did high-span readers. Lee-Sammons and Whitney proposed that because low-span readers have less capacity at their disposal than high-span readers do, they try to compensate for their capacity deficit and trade local coherence for global coherence, resulting in a more perspective-bound representation of the text.

We recently offered another view about the nature of individual differences in perspective effects (Kaakinen et al., in press). We found that it is actually the high-span, and not the low-span, readers who show a greater effect of a reading perspective on text memory. Along the lines of the controlled attention view of working memory (Engle, Kane, & Tuholski, 1999), we suggested that instead of (or in addition to) reflecting differences in the readers' overall processing capacity, the reading span task might tap readers' capability to strategically control their attentional resources during reading (Budd, Whitney, & Turley, 1995; Carpenter & Just, 1989). Because high-span readers are more strategic in allocating their attention, they might use a more selective reading strategy and, consequently, be more perspective bound in their recall than low-span readers are.

However, the evidence reported earlier is only indirect because no online measure of processing was used. The second goal of this study was to examine whether readers' WMS modulates the possible perspective effects in processing. If the processing capacity view explains the data, and low-span readers make more use of the reading perspective (Lee-Sammons & Whitney, 1991), then we should observe a greater perspective effect in fixation times for low-span readers than for high-span readers. On the other hand, if the controlled attention view of working memory is correct, and the high-span readers are better in strategically allocating their processing resources to relevant text information (Kaakinen et al., in press), then we should observe a greater perspective effect in fixation times for high-span readers than for low-span readers.

The goals of this study were to (a) assess the encoding time and effortless-encoding hypotheses as possible explanations for observed perspective effects on memory and (b) examine whether readers' WMSs modulate perspective effects.

METHOD

Participants

Sixty-four students from the University of Turku in Turku, Finland served as participants. The participants either fulfilled a course requirement or received a lunch coupon in return for their participation.

Apparatus

Eye movements were collected by the EYELINK eyetracker (SR Research Ltd., Toronto, 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. The cameras sample pupil location and pupil size at the rate of 250 Hz. Registration can be done either monocu-

larly or binocularly. We performed it for the selected eye (usually the right eye) by placing the camera and the two infrared lights 4- to 6-cm away from the eye. The resolution of eye position is 15 s of arc, and the spatial accuracy approximately 0.5°. Head position with respect to the computer screen is tracked with the help of a head-tracking camera mounted on the center 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 online from the eye position records. The compensation is more than 1° over the acceptable range of head motion.

Materials

The countries text was 798 words long and was written with the help of several geographic encyclopedias (see Table 1 for an example). The text introduced four

TABLE 1
Instructions Presented to Participants Before Reading and an Example of a Text Screen

Instructions

The following text introduces four remote countries: Pitcairn, Anguilla, Andorra, and Honduras. Imagine that you are a research scientist and you are about to leave for Honduras (Pitcairn) to conduct research. It is likely that your stay in this remote country will last for several years and that you need to live in Honduras (Pitcairn) permanently for that time. Read the following text so that you can decide what good sides and what bad sides there are in your new home country—conditions that would probably make you enjoy your stay or alternatively make you suffer.

If you have any questions, please ask them now. After that we calibrate the eyetracker, and the experiment begins. Remember that it is important that you try not to move in the chair during the experiment. Just to remind you of your task: What good and what bad sides are there to Honduras (Pitcairn) as your new home country?

Example of a text screen

Anguilla has an airport, which serves regular flights to neighboring islands and to the U.S. Pitcairn does not have such good connections. There is no airport or harbor on the island. The only way to get to Pitcairn is by taking a boat from Tahiti to its vicinity and then by rowing to the island, provided that the weather is good. Due to its bad connections, all mail to the island takes about 6 months.

Andorra does not have an airport or railways, but all traffic is routed to the highway passing through the country. Honduras is still a developing country what comes to ground traffic. *The road network is sparse, and the roads look more like cart tracks. Compared to the unsatisfactory conditions of ground traffic, air traffic in this mountainous country is fairly well developed.*

Note. Pitcairn-relevant target sentences are underlined, Honduras-relevant target sentences are italicized.

countries (Andorra, Anguilla, Honduras, and Pitcairn) and had a compare–contrast rhetorical structure. Consider, for example, the following excerpt: "Anguilla has an airport, which serves regular flights to neighboring islands and to the U.S. Pitcairn does not have such good connections." Here Anguilla's transportation conditions are contrasted with those of Pitcairn. The text was organized under six topics that were discussed one at a time, each subsumed under a different subheading (location and geography, climate, government, economy and transportation, and population and language). A description of all countries was given under each topic. The order in which the countries were introduced under the topics was counterbalanced across the text. All countries were considered unfamiliar to these Finnish participants in the sense that they did not have much prior knowledge about them except perhaps for the name and possibly their rough location. We assumed that because the countries are rather unfamiliar, the readers would need to read carefully the whole passage to learn which attributes go with each country.

The text was written so that two potential reading perspectives could be adopted for reading the text: the Honduras perspective and the Pitcairn perspective. We induced the reading perspective by instructing the participants to read the text so that they could decide the good and the bad sides of Honduras or Pitcairn as a new home country (see Table 1 for instructions presented to participants). Before reading, one half of the participants were instructed to adopt the Honduras perspective, and one half were instructed to adopt the Pitcairn perspective. There were two alternative titles for the text ("Honduras—A Remote Country" or "Pitcairn—A Remote Country"), which were delivered so that the title also focused on the assigned reading perspective.

The text included two sets of target sentences that were used in the analyses (see Table 1 for examples). The Honduras-relevant set contained sentences describing the conditions in Honduras, thought to be of high importance in deciding the good and the bad sides of Honduras as a place of residence (e.g., "it rains a lot, and dangerous hurricanes appear frequently"). Similarly, the Pitcairn-relevant set contained sentences describing the relevant conditions in Pitcairn (e.g., "Pitcairn's climate is mild, the average temperature is around 20 degrees Celsius"). Not all sentences in the text that were related to Honduras or Pitcairn were included in the target sentences: Only sentences that were thought to be crucial in deciding whether a country is a nice place to live were included (e.g., the sentences describing the history were thought to be not that important). If the reader adopted the Pitcairn perspective, the Honduras-relevant sentences were used as the irrelevant set in the analyses. In contrast, if the reader adopted the Honduras perspective, the Pitcairn-relevant sentences served as the irrelevant set.

Perspective relevance was clearly marked by the proper noun referring to the target country being included either in the target expression itself or in the preceding sentence. In all cases it was clear in the text what country was discussed. There

were nine target sentences in both Pitcairn-relevant and Honduras-relevant sets, and the sets were matched for the mean length (both in words and in characters) and for the mean frequency of words (frequencies were calculated from an unpublished newspaper corpus with the help of the WordMill database program of Laine & Virtanen, 1999). Because what was irrelevant information for one subject was relevant for another, across subjects the two information sets were identical; thus, our controls for length and frequency were simply to reduce within-set variability.

Design

For the analyses, we used a 2 (Relevance to Perspective) × 3 (WMS) × 2 (Country Perspective) mixed factors design. Relevance to perspective was a within-subject factor with two levels: relevant and irrelevant. The WMS and the country perspective were between-subjects factors. We established three levels of the WMS: low, medium, and high. The country perspective (Honduras or Pitcairn) was counterbalanced across participants. If the reader adopted the Pitcairn perspective, the Honduras-relevant sentences were the irrelevant set in the analyses. In contrast, if the reader adopted the Honduras perspective, the Pitcairn-relevant sentences served as the irrelevant set. Thus, the sentences that were relevant to one half of the participants were irrelevant to the other half, and thus potential confounding effects related to the items were counterbalanced.

Procedure

Participants read the text at their own pace from the computer screen while their eye movements were recorded. Eight lines of text were presented on one screen, and the participant proceeded to the next screen by pressing a button on a gamepad. In total, there were 17 text screens. A short practice trial preceded the text to adjust the participants to the eyetracking equipment and to present the instructions with which the reading perspective was introduced. Some participants asked whether their memory would be tested afterwards, and they were told not to worry about learning the text by heart but just to read the text so that they could decide the good and bad sides of the particular country mentioned in the instructions. After the participants read the text, we administered the reading span test (Daneman & Carpenter, 1980). The test took approximately 15 min. It was followed by the recall test, for which participants were given their reading perspective and the story title as the recall cues. The participants were instructed to write down everything they could remember of the text; this was stressed orally and in the written recall instructions. The participants were allowed to leave whenever they were ready; the total length of the session was about 1 hr.

Reading span test. We administered the reading span test developed by Daneman and Carpenter (1980) to participants between reading the countries text

and recalling it. Participants read aloud sets of unrelated sentences. After reading the sentences of a particular set, the participant was asked to recall the last word of each sentence in the set. The test began with sets of two sentences, and the set size increased as long as the participant successfully recalled the sentence-final words. Each set size was repeated three times. Testing was terminated when the participant failed to recall the sentence-final words of all three repetitions of a particular set size. A computer program was used to present the test items on a computer screen. A practice session with 10 sets of two sentences preceded the test. The test was scored for the total number of final words the participant recalled correctly. We used a tertile split to assign the participants to low-, medium-, and high-span groups (Lee-Sammons & Whitney, 1991). Nineteen participants were assigned to the low-span group (scores = 3–21), 23 were assigned to the medium-span group (scores = 22–33), and 22 were assigned to the high-span group (scores = 34–72).

RESULTS

Text Recall

Two independent raters read and scored one half of the 64 recall protocols. The recalls were scored for the correctly recalled ideas in the sentences. An exact word-to-word recall of the sentence was not required. The raters were not aware of the other rater's scoring, and they did not know the reading perspective the reader had adopted or the reader's WMS. The interrater error rate was 7.11%. Inconsistencies were resolved through discussion, and the rest of the protocols were scored by one rater. We used the percentage of correctly recalled target sentences in proportion to the number of target sentences in the information set as a measure of recall.

Readers recalled significantly more perspective-relevant than perspective-irrelevant information, $F(1, 58) = 180.28$, $p < .001$, $MSE = 0.03$ (see Table 2). Although there was a tendency for the high-span readers to show a larger perspective effect than the low-span readers, the Relevance to Perspective × WMS interaction was clearly not significant ($F < 1$). Also, the main effect of WMS failed to reach significance ($F < 1$).

Fixation Times

Eye fixations on target sentences were grouped into first-pass and look-back fixations. All fixations landing on a target segment during the initial reading of the sentence were defined as *first-pass fixations,* whereas fixations in which the participant turned back to a target sentence from a subsequent sentence are called *look-back fixations*. Total fixation time is the sum of all fixations made to the target sentence (i.e., first-pass fixations plus look backs). Thus, we derived three process-

TABLE 2
Mean Recall and Fixation Times and Standard Deviations of Perspective-Relevant and Perspective-Irrelevant Information as a Function of Working Memory Span Group

	Working Memory Span Group											
	Low Span				*Medium Span*				*High Span*			
	Relevant		*Irrelevant*		*Relevant*		*Irrelevant*		*Relevant*		*Irrelevant*	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Recall[a]	58.5	0.23	19.9	0.19	66.7	0.18	21.7	0.18	67.2	0.15	19.7	0.22
Total fixation time[b]	3,527	1,142	3,135	1,033	3,805	2,267	3,221	1,701	3,086	1,141	2,417	1,081
First-pass fixation time[b]	3,116	799	3,006	947	3,439	1,407	3,063	1,459	2,862	1,000	2,303	986
Look-back time[b]	411	501	129	230	366	1,137	158	328	223	284	113	172

[a]Percentage. [b]Milliseconds.

ing measures from readers' eye fixation patterns: (a) total fixation time, (b) first-pass fixation time, and (c) look-back time. The first-pass fixation time is an index of immediate processing of a particular sentence, and the look-back time indicates the effects that appear late in the processing.

First, we analyzed the global measure of processing to see if the reading perspective affected the total reading time for perspective-relevant and perspective-irrelevant text segments. Indeed, when one considers the total fixation times (see Table 2), one notices that significantly more time was spent on perspective-relevant information than on perspective-irrelevant information, $F(1, 58) = 25.60$, $p < .001$, $MSE = 330{,}017$. The Relevance to Perspective × WMS interaction was not significant ($F < 1$). Thus, all span groups showed a perspective effect of similar magnitude when the total fixation time was used as the processing measure. The main effect of the WMS was also not significant ($F < 2$).

The analysis of first-pass fixation times also reveals a significant main effect of relevance to perspective such that the perspective-relevant text segments attracted longer first-pass fixation times than did the perspective-irrelevant text segments, $F(1, 58) = 23.74$, $p < .001$, $MSE = 148{,}971$. More interesting, however, is the significant Relevance to Perspective × WMS interaction (see Table 2), $F(2, 58) = 3.72$, $p = .03$, $MSE = 148{,}971$. Pairwise t tests for each span group showed that the low-span readers did not show an effect of the reading perspective ($t < 1$), whereas the medium- and high-span readers fixated longer on perspective-relevant than on perspective-irrelevant sentences during the initial reading of the target segments, $t(22) = 3.32$, $p = .003$, $SE = 113.32$, for the medium-span readers and, $t(21) = 3.86$, $p = .001$, $SE = 145.03$, for the high-span readers. The main effect of WMS was not significant ($F < 2$).

Look-back times also showed longer fixations on perspective-relevant than perspective-irrelevant sentences, $F(1, 58) = 5.35$, $p = .024$, $MSE = 196{,}889$ (see Table 2). This time the Relevance to Perspective × WMS interaction was not significant ($F < 1$). As can be seen in Table 2, low-span readers show the perspective effect in their look backs, just like the medium- and high-span readers, even though they showed no perspective effect in their initial fixations. The main effect of WMS on duration of look backs was not significant ($F < 2$).

DISCUSSION

The main goal of this study was to assess the encoding time and the effortless-encoding hypotheses as possible explanations for perspective effects in text comprehension. In support of the encoding time hypothesis, the results show that better memory for perspective-relevant information was related to longer total fixation time spent on perspective-relevant than on perspective-irrelevant information. In other words, the results suggest that the reading perspective does affect the online

processing of text by guiding the readers to invest extra processing time on relevant information, which results in better memory for relevant than for irrelevant information (Anderson, 1982).

We argue that the reading perspective activates a set of concepts in long-term memory. Incoming information is then constantly interpreted in the light of the activated background knowledge (i.e., the reading perspective), and when readers encounter perspective-relevant information they invest extra effort to encode that information in memory (Sanford & Garrod, 1981). Extra processing time is required to construct connections between the text information and long-term memory. This extra effort is needed to build a link between a relevant feature (e.g., warm temperature) and the target country.

Our results do not lend support to the effortless-encoding hypothesis; however, it is possible that because the countries described in the text were relatively unfamiliar to the readers they did not have sufficient relevant background knowledge to allow fast and efficient encoding of relevant information to memory. Thus, it is possible that the effortless-encoding hypothesis might be supported if readers have ample prior knowledge related to the text contents. Additional research is needed to examine the perspective effects as a function of the familiarity of the text contents.

Another goal of this study was to examine whether the readers' WMSs modulate the observed perspective effects. We expected that the high- and low-span readers would differ in the size of the perspective effect. According to the capacity view of working memory (e.g., Just & Carpenter, 1992), we expected that low-span readers would show a greater effect of reading perspective than high-span readers, because low-span readers try to compensate for their capacity deficit (Lee-Sammons & Whitney, 1991). On the other hand, on the basis of the controlled-attention view of working memory (Engle et al., 1999), we assumed that the high-span readers might strategically allocate their attentional resources to relevant information more than low-span readers (Budd et al., 1995; Carpenter & Just, 1989; Kaakinen et al., in press). However, we found that the WMS seems to modulate the time course of the perspective effect but not the relative magnitude of the perspective effect. Although the high-span readers showed both immediate and delayed effects of the reading perspective, the low-span readers showed only delayed effects, as indexed by look-back fixations.

These findings can be interpreted in three ways. According to the capacity view of working memory (e.g., Just & Carpenter, 1992), the amount of available capacity readers have at their disposal sets limits to the processes that can occur during reading. It is possible that lower level processes use up the low-span readers' processing capacity and that they thus have little capacity left to execute higher level, goal-directed processes during first-pass reading of sentences. According to this view, low-span readers can invest extra effort in encoding the perspective-relevant information to memory only after extracting a meaning for the sentence. High-

span readers, in contrast, have enough capacity to also carry out goal-directed processing during the first-pass reading. The pattern of our results is compatible with this type of reasoning.

It has also been suggested that individual differences observed in the reading span task may tap readers' ability to strategically allocate attention (Budd et al., 1995; Carpenter & Just, 1989; Engle et al., 1999; for semantic strategies, see McNamara & Scott, 2001) in addition to (or instead of) the total amount of available capacity. Carpenter and Just (1989) registered eye movements during a standard reading span task and observed high-span readers to spend more time gazing at the to-be-remembered sentence-final words than low-span readers do but less time reading the sentence up to the final word, particularly as memory load increased. In other words, high-span readers strategically allocated relatively more time to task-relevant text elements and processed more superficially less relevant text elements (see also Engle, Cantor, & Carullo, 1992). These findings suggested that the WMS tasks may tap the strategic control of attention and that this controlled attention might be a critical factor in text comprehension.

According to the strategic-control-of-attention view, high-span readers are able to adopt efficient working memory management strategies and allocate their attentional resources to task-relevant information more efficiently than low-span readers are. In other words, it is possible that high-span readers adopt a specific strategy of allocating more resources to perspective-relevant than to perspective-irrelevant information during the first-pass reading of the target sentences and a strategy of processing the perspective-irrelevant information in a rather shallow manner (cf. the selective-attention strategy proposed by Anderson, 1982; Reynolds, 1992).

Finally, it has been suggested that high-span readers are faster at accessing information in long-term memory than low-span readers are (Ericsson & Kintsch, 1995). Perhaps high-span readers are faster in processing incoming relevant text information than low-span readers because they also have faster access to perspective-relevant information in the implicit focus of working memory. As a consequence, high-span readers can allocate extra attention to relevant sentences already during the first-pass reading. On the other hand, because low-span readers are slower in identifying relevant and irrelevant information in the text, they need to look back to relevant information to encode it to memory.

This study shows that one's reading perspective does affect the online processing of text, and it suggests that better memory for perspective-relevant than for perspective-irrelevant information is coupled with longer reading times for the perspective-relevant information. The results also suggest that WMS modulates the time course of the perspective effect. Readers with high WMSs showed a perspective effect in the first-pass reading, whereas the low-span readers showed only delayed effects. Possible explanations for this finding may be (a) the low-span readers' insufficient capacity to execute goal-directed processes during first-pass

reading, (b) the high-span readers' faster recognition of relevant and irrelevant information in text due to rapid access to elements in long-term memory, (3) the high-span readers' better ability to strategically allocate their attentional resources to relevant information, or some combination of these.

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