INDIVIDUAL DIFFERENCES IN PERSPECTIVE EFFECTS ON TEXT MEMORY

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Abstract: The present study examined whether a reader's working memory capacity modulates the effects of reading and recall perspectives on text memory. Participants were given a perspective from which to read a text. Recall was collected both immediately after reading with the same perspective and after a one week delay with a new perspective given as a recall cue. Readers' WM capacity was measured by the reading span test developed by Daneman and Carpenter (1980). The results replicated earlier findings that it is the encoding perspective that primarily constrains what can be recalled from a text. Readers with relatively high WM span showed a greater effect of the encoding perspective on text memory than low-span readers. The results suggest that working memory capacity might be better described as a reader's capability to control attention rather than as an overall pool of resources available.

Key words: Perspective effects, Text memory, Working memory, Reading span.

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The influence of reading and retrieval perspectives on text memory have been extensively studied since the well-known study by Anderson and Pichert (1978) (e.g. Anderson, 1982; Anderson, Pichert, & Shirey, 1983; Baillet & Keenan, 1986; Borland & Flammer, 1985; Borland, Flammer & Wearing, 1987; Flammer & Tauber, 1982; Kardash, Royer, & Green, 1988). Anderson and Pichert demonstrated that it is the perspective active during retrieval that determines what is recalled from a text, and that the perspective active at encoding appears to have little effect on memory. They had participants read a text from either the perspective of a potential homebuyer or a potential burglar. At retrieval, participants were given a perspective shift to the alternate perspective; participants recalled more information consistent with the retrieval perspective than the encoding perspective. The researchers proposed that the perspective active during reading has no effect on memory so that information both relevant and irrelevant to the encoding perspective is stored. They proposed that the perspective affects only retrieval by determining which of the stored information is selected for output in recall.

However, it was later shown that Anderson and Pichert’s somewhat surprising finding of a null effect for the encoding perspective was due to certain methodological factors (Anderson et al., 1983; Baillet & Keenan, 1986). Namely, Anderson and Pichert’s use of a short (about 20 minutes) retention interval, a short (373 words) text, and intentional memory instructions allowed subjects to retain sufficient memory of the text so that no effects of encoding perspective could be detected. For example, when Baillet and Keenan (1986) used a longer retention interval (1 week), longer texts (from 908 to 2,171 words), and incidental memory, they showed a significant effect of encoding perspective. In fact, while they also found an effect of the recall perspective, it was the encoding perspective that ultimately constrained what could be recalled. Thus, the new perspective given at recall did not increase the amount of material recalled; it only affected the omission of information – information not cued by the recall perspective was more likely to be omitted than information relevant to the recall perspective. In sum, it has been shown that although the retrieval perspective is capable of making some information more accessible for output, memory for text is constrained by the accessibility of information determined by the encoding perspective (Anderson et al., 1983; Baillet & Keenan, 1986).

Studies of individual differences in working memory suggest that capacity differences may modulate the extent to which the encoding and retrieval perspectives influence text recall (Di Vesta & Di Cintio, 1997; Lee-Sammons & Whitney, 1991). In an experiment by Lee-Sammons and Whitney (1991), participants were divided into low, medium, and high span groups on the basis of a working memory span (WMS) test developed by Turner and Engle (1989). Lee-Sammons and Whitney used a version (511 words) of the
Anderson and Pitchert story adopted from Kardash et al. (1988), a relatively short (about half an hour) retention interval, and intentional memory instructions. The results showed that across all span groups, readers recalled more material relevant to the recall perspective than relevant to the encoding perspective. However, for low-span readers, this finding was not due to recall of new, previously unrecallable information after the perspective shift: the low-span readers simply omitted significantly more information relevant to the reading perspective than relevant to the recall perspective. On the other hand, the memory performance of the high-span participants was relatively independent of the encoding perspective.

Di Vesta and Di Cintio (1997) used a short, 331 words long text of Pitchert and Anderson (1977), a short (about 15 minutes) retention interval, and intentional memory instructions. After the perspective shift at recall, low-span readers recalled more information relevant to the recall perspective than relevant to the initial reading perspective; this effect was due to omitting of information relevant to the initial reading perspective. Medium- and high-span readers, however, continued to recall more information relevant to the encoding perspective than relevant to the recall perspective even after the perspective shift.

In sum, the study by Lee-Sammons and Whitney (1991) suggests that low-span readers are more bound to the reading perspective than high-span readers in text recall, whereas the recall performance of high-span readers is relatively unaffected by the encoding perspective. The low-span readers also show an effect of the retrieval perspective, but this is due to higher rate of omissions for encoding perspective relevant information after the perspective shift. In contrast, the study by Di Vesta and Di Cintio (1997) suggests that the text recall of both the low- and high-span readers is affected by the perspective active at encoding. Their results are consistent with the Lee-Sammons and Whitney study in that low-span readers also show a retrieval effect by omitting information not relevant to the recall perspective.

The two studies (Di Vesta & Di Cintio, 1997; Lee-Sammons & Whitney, 1991) lend support to two different explanations for why and how the working memory capacity modulates the perspective effects. The results of Lee-Sammons and Whitney (1991) support the traditional, capacity constrained view of comprehension (Just & Carpenter, 1992). According to this view, readers have different capacities for executing the processing and storage demands of text comprehension. Thus, it is assumed that readers with a low working memory capacity compensate for their limited resources by selectively maintaining only the most pertinent, perspective-relevant information whereas readers with a high working memory capacity have enough resources available to maintain all the text information. According to this view, low-span readers show a stronger effect of the encoding perspective on text recall than high-span readers. Low-span participants recall more
perspective-relevant than perspective-irrelevant information, and if they show an effect of the retrieval perspective, it is due to omitting of encoding relevant information after the perspective shift – not due to recall of new, previously unrecallable information. The memory of high-span readers, on the other hand, are not constrained by the reading perspective, which means they recall as much perspective-relevant as perspective-irrelevant information.

More recently, it has been suggested (Engle, Kane, & Tuholski, 1999) that the individual differences observed in the tasks measuring working memory capacity (such as the reading span task by Daneman and Carpenter, 1980) might not reflect so much differences in the available overall capacity but instead, individual differences in the capability for controlled processing. According to this controlled attention view of working memory, high-span readers are better in allocating their attention to task-relevant information than low-span readers. This view is supported by results from Carpenter and Just (1989). They registered eye movements during a standard reading span task and observed high-span readers to spend more time in gazing at the to-be-remembered sentence-final words than low-span readers, 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. Further support for this view comes from a text processing study by Budd, Whitney and Turley (1995), which suggests that high-span readers have better control over their attentional resources during reading than low-span readers, and that high-span readers adapt their WM managing strategies to task demands, whereas low-span readers do not.

The results of Di Vesta and Di Cintio (1997) can be better explained by the controlled attention view. It may be assumed that high-span readers direct their attentional resources to encoding perspective relevant information more efficiently than low-span readers. This is then reflected as a greater effect of the encoding perspective on text recall for the high-span participants: they should recall more perspective-relevant than perspective-irrelevant information even after the perspective shift. Low-span readers, in contrast, show a smaller effect of the encoding perspective by recalling as much encoding perspective relevant as retrieval perspective relevant information. The purpose of the present study was to examine which one of these views, the capacity constrained view or the controlled attention view of the working memory, better explains the individual differences in perspective effects. Instead of using relatively short texts, short intervals between reading the text and recalling it, and intentional memory instructions as in the studies by Di Vesta and Di Cintio (1997) and Lee-Sammons and Whitney (1991), we used a longer text (878 words in Finnish, adopted from Baille
Keenan, 1986), longer retention interval (1 week) and incidental memory. The earlier studies on the perspective effects have shown that the use of short texts, short retention intervals and intentional memory instructions may bias the results to favor the retrieval effect; on the other hand, when using longer texts, longer retention intervals and incidental memory, the effect of encoding perspective is rather robust (Anderson et al., 1983; Baillet & Keenan, 1986). We wanted to make sure that the effect of encoding perspective had a chance to emerge – then we would be better able to distinguish between the individual differences in the observed effect.

A text used by Baillet and Keenan (1986), the Housewalk story, was translated into Finnish. Participants read the text with one of two perspectives and recalled it with the same perspective as at encoding and after a perspective shift to the alternative perspective. The readers' working memory capacity was measured by the reading span test developed by Daneman and Carpenter (1980). If the capacity constrained view of the comprehension accounts for the results, low-span readers should show a greater effect of the encoding perspective on recall than high-span readers; they should recall more perspective-relevant than perspective-irrelevant information even after the perspective shift. On the other hand, if the controlled attention view gives a more adequate fit of the data, high-span readers should show a greater effect of the encoding perspective than low-span readers: high-span readers should recall more perspective-relevant than perspective-irrelevant information even after the perspective shift at recall.

METHOD

Participants. Thirty-two students from the University of Turku and from the Christian Institute of Turku served as participants. The participants either fulfilled a course requirement or received a lunch coupon for participation.

Materials. The Housewalk text adopted from Baillet and Keenan (1986) was translated into Finnish - the language studied here. The Housewalk story was 878 words long and described a young couple touring three houses. The identity of the couple was unspecified in the text, which allowed one of two different perspectives (interior designer and burglar) to be assigned to the participants. Half of the participants were assigned the burglar’s perspective and were told that the couple touring the houses were burglars. Participants were instructed to imagine themselves as burglars and to decide which house they would rob. The other half of the participants were assigned to the interior designer’s perspective and told that the couple were interior designer students; these participants were instructed to imagine
themselves as interior designers and decide which house had 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 («Interior Design Students Study Classic Homes» or «Burglars Check 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, segments describing valuable and easily robbed objects were part of the burglar-relevant information set, whereas segments describing the decor of the houses were in the designer-relevant information set. The number of target segments in the two information sets was 11 for the burglar-relevant set and 17 for the interior designer-relevant set. The target segments were of variable length, from 2 words up to 2 sentences long. The different information sets were matched for the mean length of the segments (in words and characters) and for the mean frequencies of the words in the segments (frequencies were calculated from an unpublished newspaper corpus with the help of the WordMill database program of Laine and Virtanen, 1999).

*Design.* The first recall and the perspective shift recall were analyzed separately using a 2 (Relevance to Reading Perspective) x 2 (Reading Perspective) x 3 (WMS) design. The relevance to the reading perspective was a within-subjects factor and the reading perspective and working memory span (WMS) were inserted as between-subjects factors. The conditions of relevance to reading perspective were reading perspective relevant and reading perspective irrelevant. The two reading perspectives were interior designer and burglar. Three levels of the WMS were established: low, medium, and high. Because the assignment of participants to the reading span groups was done post hoc, there was a slight possibility that the distribution of participants to different WMS groups within the reading perspective conditions could be unbalanced. However, the distribution was relatively balanced: 4, 7, and 5 participants assigned to low-, medium, and high-span groups had received the burglar perspective. As for the designer condition, the distribution was 7, 5, and 4 participants in low-, medium, and high-span groups, respectively.

*Procedure.* Participants read the text on a computer screen at their own pace. Eight lines of text were presented on one screen; in all, there were 13 text screens. Before reading the text, the reading perspective was introduced in the instructions. After the participants had read the text, the reading-span test (Daneman & Carpenter, 1980) was administered. The reading-span test took approximately 15 minutes. It was succeeded by the first recall, where participants were given the reading perspective and the story title as the
recall cues. Despite the recall cues, the participants were instructed to write down everything they could remember of the text. The participants were allowed to leave whenever they were ready; the total time of the first session was about 1 h 15 min.

After one week, the participants returned for the perspective shift recall trial. This time, a new perspective was introduced by giving the other perspective as the recall cue to all participants. Participants were told that the new perspective was to help them in recalling the text and that they should try to write down everything they could remember. The participants were free to leave after completing the recall.

Reading span test. The reading span test developed by Daneman and Carpenter (1980) was administered after reading the text but before recalling it. Participants read aloud sets of unrelated sentences. After reading the sentences of a particular set, the participant was 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 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. A tertile split was used to assign the participants to low-, medium- and high-span groups (Di Vesta & Di Cintio, 1997; Lee-Sammons & Whitney, 1991). Eleven participants were assigned to the low-span group (scores 10-20), 12 to the medium-span group (scores 21-32) and 9 to the high-span group (scores 33-46).

RESULTS

Scoring

Two independent raters read and scored each participant’s recall protocols. The protocols were scored for the number of target segments mentioned in the recall protocol. The raters checked the consistency of ratings after scoring half of the protocols and inconsistencies were resolved through discussion. The intrarater error rate was 4.1%. The percentage of recalled target segments in proportion to the number of all target segments was used as a measure of the recall (Di Vesta & Di Cintio, 1997).
First Recall

For the first recall, the main effect of relevance to reading perspective was significant, \( F(1,26) = 27.05, p < .001 \), with more perspective-relevant than perspective-irrelevant material recalled. Moreover, there was a nearly significant Relevance to Reading Perspective x WMS interaction, \( F(2,26) = 3.21, p = .057 \), suggesting that there were differences between the WMS groups in how strong the perspective effect was in the immediate recall (see Figure 1). The differences between the span groups were examined by separate t-tests for each span group. Low-span readers did not show a perspective effect in the immediate recall, \( t(10) < 1 \), whereas medium- and high-span readers recalled significantly more perspective-relevant than perspective-irrelevant material, \( t(11) = 4.54, p = .001 \) for medium-span and \( t(8) = 4.81, p = .001 \) for high-span readers, respectively. As apparent from Figure 1, amount of relevant information recalled seems to increase as a function of span group, whereas amount of irrelevant information recalled is rather constant across the span groups. Of less interest is a WMS x Reading Perspective interaction, \( F(2,26) = 4.17, p = .027 \), reflecting that the low- and medium-span readers who read from the burglar perspective showed higher recall rates than those reading from the designer perspective, whereas high-span readers who read from the designer perspective showed higher recall rates than those reading from the burglar perspective. No main effect of WMS was observed, \( F < 1 \).

Perspective Shift Recall

In the perspective shift recall, the alternate reading perspective was given as the recall cue. Despite the new recall cue, the main effect of relevance to reading perspective was still significant, \( F(1,26) = 18.75, p < .001 \), indicating that information relevant to the initial reading perspective was better recalled than information irrelevant to the initial reading perspective (see Figure 1). The Relevance to Reading Perspective x WMS interaction was marginally significant, \( F(2,26) = 2.74, p = .083 \), suggesting that there were some differences between the span groups. The separate t-tests replicated the findings of the first recall: low-span readers did not show a perspective effect in recall, \( t(10) < 1 \), and medium- and high-span readers recalled more material relevant to the reading perspective, \( t(11) = 4.17, p = .002 \) for the medium-span and \( t(8) = 4.12, p = .003 \) for the high-span readers, respectively. The main effect of WMS was not significant, \( F < 1 \).
Figure 1. Percentages of encoding relevant and encoding irrelevant information recalled for first and perspective shift recalls as a function of working memory span.

To examine in more detail what information was recalled after the perspective shift, two additional measures were calculated. As in Baillet and Keenan (1986), the measures were the proportion of new information not present in the first recall but appearing in the perspective shift recall, and the proportion of information omitted from the perspective shift recall but present in the first recall. The percentages of new and omitted information in the perspective shift recall are presented in Table 1.

Table 1
Percentages of New Target Segments Recalled and Omitted Target Segments Following a Perspective Shift as a Function of Encoding Perspective Relevance and Working Memory Span.

<table>
<thead>
<tr>
<th></th>
<th>Encoding Relevant</th>
<th>Encoding Irrelevant</th>
</tr>
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<tbody>
<tr>
<td><strong>New Target Segments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-span</td>
<td>4.1</td>
<td>5.3</td>
</tr>
<tr>
<td>Medium-span</td>
<td>5.4</td>
<td>7.7</td>
</tr>
<tr>
<td>High-span</td>
<td>6.1</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>Omitted Target Segments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-span</td>
<td>15.7</td>
<td>9.9</td>
</tr>
<tr>
<td>Medium-span</td>
<td>14.3</td>
<td>6.7</td>
</tr>
<tr>
<td>High-span</td>
<td>18.3</td>
<td>4.5</td>
</tr>
</tbody>
</table>
The presence of the new recall perspective did not improve the retrieval of new information relevant to the recall perspective, F<1. The only effect the recall perspective had was on the omitted information. More information relevant to the reading perspective than relevant to the recall perspective was omitted, F(1,26) = 7.85, p = .009. The Relevance to Reading Perspective x WMS interaction was clearly non-significant, F<1, indicating that for all three groups, the information omitted following the perspective shift was more likely to be relevant to the encoding perspective.

In sum, the results are consistent with the earlier findings showing that the encoding perspective primarily constrains memory for text (Anderson et al., 1983; Baillet & Keenan, 1986). Moreover, the results support the controlled attention view of individual differences in working memory (Engle et al., 1999) and suggest that during encoding medium- and high-span readers allocate their attentional resources to perspective-relevant information more efficiently than low-span readers.

**DISCUSSION**

Our results replicated the earlier findings that when using a long text, long retention interval, and incidental memory, the encoding perspective primarily constrains what can be recalled of text (Anderson et al., 1982; Baillet & Keenan, 1986). As for the effect of the retrieval perspective, the readers were not able to recall significant amounts of new information after a perspective shift. Rather, the effect of the recall perspective appeared as a higher rate of omissions for information not relevant to the recall perspective.

The main purpose of the present study was to examine whether the readers' working memory capacity modulates the perspective effects, and to test two hypotheses: the capacity constrained view of comprehension (Just & Carpenter, 1992) and the controlled attention view of working memory (Engle et al., 1999). We found support for the controlled attention view: the reading perspective had a stronger effect on text memory for readers who score high in the working memory span test than for readers who score low in the test. According to this view, working memory capacity is described as the capability to controlled processing; high-span readers have the ability to control their attentional resources by applying activation to memory elements either by bringing information to focus, by maintaining it in focus, or by dampening or removing it from focus. The present data suggests that when reading from a specific perspective, high-span readers allocate their attention to perspective-relevant information more efficiently than low-span readers by bringing and maintaining relevant information in focus (see also Anderson, 1982 and Reynolds, 1992). It may be noted that this does
not seem to happen at the expense of attention paid to irrelevant information: the pattern of results demonstrates that the span groups differ in how much they recall information relevant to the encoding perspective, not in the amount of information irrelevant to the encoding perspective.

The capacity constrained view of comprehension predicted that low-span readers would use the reading perspective to compensate for their capacity deficit and consequently, would show a greater effect of the encoding perspective on text memory than the high-span readers. Our results clearly show that this is not the case – it is the high-span readers who show a greater effect of the encoding perspective.

Even though our data clearly support the controlled attention view of working memory, allocation of attention is here inferred indirectly from readers’ recall protocols. In future studies, on-line methods such as eye-tracking should be employed to examine how the reading perspective influences the attentional processes occurring during reading.

Author Note

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