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Individual Differences in Working Memory Capacity and the Duration of Elaborative Inferences

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The general consensus among inference researchers is that elaborative inferences are made only under certain circumstances, such as highly predictive contexts, if they are made at all (e.g., Garrod, O'Brien, Morris, & Rayner, 1990; Graesser, Singer, & Trabasso, 1994; McKoon & Ratcliff, 1992; Murray, Klin, & Myers, 1993; Potts, Keenan, & Golding, 1988; van den Broek, 1994). In the present experiment we tested: (1) whether elaborative inferences within *moderately* predictive contexts were made during reading, and (2) whether individual differences in working memory capacity were associated with differences in the length of time the elaborative inferences were maintained. Three and four sentence length paragraphs were designed so that one particular outcome of the story was more likely than other potential outcomes. The outcomes were 70% probable given the context of the paragraphs, based on normative data collected prior to running the study. Typically, outcomes in other studies of elaborative or predictive inferences are between 90% and 100% predictable within the given context. In the present experiment, the final sentence of all of the paragraphs explicitly stated the inference readers may have made. There were four conditions: an Inference condition and a Control condition, with two possible times of test, Immediate or Delayed. Forty-four sets of paragraphs were created, with each set containing a version corresponding to each condition. In the Immediate condition (three sentences in length), the sentence explicitly stating the inference immediately followed the sentence which may have elicited the inference (sentence two). In the Delay condition (four sentences in length), there was a filler sentence related to the story between the eliciting sentence (two) and explicit statement of the inference (sentence four), which neither confirmed nor precluded the inference. A "word-based priming" Control condition was created using the relevant content words from the experimental paragraphs in a slightly different context so that they did not elicit the inference. Immediate and Delay conditions were created for the Control as well as for the Inference condition.

Forty-five subjects (eighteen male; twenty-seven female) participated in the experiment. Their ages ranged from eighteen to twenty-five years.

A moving window reading time paradigm was used, providing a measure of how long readers spent on each word of the paragraphs. The structure of the entire paragraph was on the screen as the subjects read. Dashed lines represented the letters in the words, with spaces between them. When subjects pressed the space bar a new word appeared and the previous word was replaced by dashed lines. Following one-

third of the paragraphs subjects answered comprehension questions designed to make sure they were paying attention to the content of the paragraphs.

Overall, the words in the final sentences of the Inference condition were read approximately 25 msec faster than the words in the Control condition. The effect seems to be driven by content words, specifically, the final content word of the sentence, which was read approximately 150 msec faster in the Inference condition compared to the Control. Therefore, it seems a highly predictive context is not necessary for elaborative inferences to be made during reading; elaborative inferences can be made in moderately predictive contexts as well.

In addition, readers with low working memory capacity (as measured by a variation of Daneman & Carpenter's (1980) reading span task) showed faster reading times for the Inference condition relative to the Control only in the Immediate condition; there was no reading time difference between the inference and control in the Delayed condition. Thus the low span readers seem to make the elaborative inference initially, however, they do not seem to have the inference active in memory following the intervening sentence. By contrast, readers with high working memory capacity read the words of the final sentence faster in the Inference condition than in the Control in both the Immediate and Delay conditions.

These data suggest that there is a relationship between working memory capacity and the duration of inferences in working memory. Perhaps one consequence of working memory capacity is how long items are held in working memory when the items (in this case the inference) are not supported explicitly by the context of the sentence. In the Delayed conditions of our paragraphs the intervening sentence neither supported nor contradicted the inference. It may be that the low span group did not have the working memory capacity to "waste" on keeping an inference in working memory when the intervening sentence did not confirm the inference. The high span group, by virtue of their larger working memory capacity, may have had enough to spare to keep the inference in working memory even though the intervening sentence did not confirm the inference.