

# Interactions between Ease of Bridging Inference Generation and Working Memory

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**Abstract.** Although research demonstrates that bridging inferences are generated at coherence breaks, increased reading times also occur two words after a coherence break. This processing delay could be related to the ease of generating bridging inferences. To explore the cause of this processing delay, participants read texts where the ease of generating an inference was manipulated by gradually decreasing the explicitness of an action. Reading times for target sentences that followed the critical sentences increased as explicitness decreased. This effect was more pronounced in readers with high working memory, a skill that is related to inference generation. These findings provide preliminary evidence that processing delays during bridging inference generation are affected by ease of generation.

## Introduction

Reading comprehension is a vital skill needed for success in the classroom and to navigate daily life. There are many processes that readers use to successfully comprehend a text (van den Broek, Lorch, Linderholm, & Gustafson, 2001). One of these processes, inferential processing, enables the reader to fill in missing information from the text (Singer, Halldorson, Lear, & Andrusiak, 1992). Bridging inferences, one specific type of inference, are generated at coherence breaks (Virtue, Haberman, Clancy, Parish, & Beeman, 2006) and are often coded into long-term memory (Kintsch, 1991). Reading times increase at these coherence breaks, likely because readers are generating and encoding these inferences into long-term memory. However, Daniel and Raney (2010) also found increased reading times occurred two words after a coherence break.

Another factor related to inference generation skills is working memory (Daneman & Carpenter, 1980; Just & Carpenter, 1992), which refers to an individual's capacity to mentally manipulate information during a given task. Those with higher working memory capacity are capable of holding more pieces of information in memory at once (Just & Carpenter, 1992) and have been shown to be more strategic in which inferences they generate or suppress (Linderholm & van den Broek, 2002). This study attempted to understand what causes the processing delay in Daniel and Raney's (2010) study and the effects working memory has on generation of these inferences. We hypothesized the ease with which readers generate an inference may result in a processing delay, such that the more explicit the inference is, the shorter the processing delay.

## Method

One hundred and three native English speaking participants read 48 seven-sentence texts (modified from Virtue et al., 2006). The first three sentences in each text established the content. Consider the following example:

*The two boys planned to meet on the playground after school. One of the boys was upset because the other boy teased him in class about his big ears. They looked at each other as they walked toward the playground.*

In the fourth sentence (the critical sentence), the explicitness of the action varied among texts to manipulate the ease of generating an inference. For the target inference *fight* in these texts, the explicit version stated the inference directly. The implicit strongly constrained did not state the inference, but made it very likely that the reader would generate the inference. The implicit weakly constrained sentence made it unlikely that the reader would generate the target inference. The fifth sentence (the target sentence) contained information that was consistent with the target inference.

Next, participants completed the reading span task of working memory (Daneman & Carpenter, 1980). Participants read sets of sentences that ranged from two to five sentences. Participants were asked to recall the last word of each sentence, and they were given a previous sentence from that set and asked to fill in two blanks. A participant's working memory score was calculated as the number of end words recalled when they correctly filled in the blanks.

## Results

A 3(Explicitness: Explicit vs. strongly constrained-implicit vs. weakly constrained-implicit) x 2 (Working Memory: High vs. Low, as determined by a median split) ANOVA was utilized. The dependent variable was the reading times per character for the target sentence. Reading times for target sentences increased as explicitness decreased,  $F(2, 202) = 33.49, p < .001, \eta^2 = .25$ . Reading times were longer for the implicit, weakly constrained texts compared to all other texts ( $ps < .001$ ). The difference between Implicit, strongly constrained and explicit was smaller than the difference between implicit, weakly constrained. Working memory interacted with the explicitness of the inference,  $F(2, 202) = 3.24, p = .04, \eta^2 = .03$ , such that the effects of explicitness were stronger for the high working memory group compared to the low working memory group.

## Discussion

Reading times for target sentences that followed the critical sentences increased as explicitness decreased. This confirms previous work that the ease with which an inference can be generated is related to processing time and whether the inference is encoded into long-term memory. This provides preliminary evidence that processing delays during bridging inference generation are affected by ease of generation. In addition, this effect was more pronounced in readers with high working memory. Previous work has found that readers with high working memory are better able to strategically allocate their resources toward generating coherence-based inferences, and avoiding inferences that do not help to establish coherence (Linderholm & van den Broek, 2002). The results from this study align with this view, as readers with higher working memory were more sensitive to the explicitness of the target inference and were therefore less likely to make inferences that did not initially help establish coherence.

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