Role of Context in Accessing Distant Information During Reading

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In 3 experiments, the authors investigated factors that influence accessibility of backgrounded goal information. Participants read texts consisting of 2 episodes. In the 1st episode, the goal was satisfied or unsatisfied. Following a statement of goal satisfaction or goal postponement, there was a 2nd unrelated episode. After completion of the 2nd episode, target sentences were presented that were consistent with the 2nd episode but were inconsistent with completion of the earlier unsatisfied goal. Participants noticed the inconsistency only when the conflicting information was separated by a few sentences or when the context of the goal had been reinstated. The results are consistent with the resonance model described by J. E. Albrecht and E. J. O'Brien (1993) and by J. L. Myers, E. J. O'Brien, J. E. Albrecht, and R. A. Mason (1994).

During comprehension, readers combine text information and general knowledge to produce a memory representation of the situation described by the text (Sanford & Garrod, 1981; van Dijk & Kintsch, 1983). The construction of the representation is an incremental and cyclical process in which the current clause or sentence is integrated with the memory representation that has been established to that point in the discourse (Garnham & Oakhill, 1992; van Dijk, & Kintsch, 1983). However, because of limited-capacity constraints, it is assumed that only a select portion of the evolving discourse model is available and updated on any given cycle (Fletcher, 1981; Fletcher & Bloom, 1988). There has been considerable research investigating what information is available for updating and what linguistic, pragmatic, and semantic cues influence the accessibility of this information. Although much of this research has examined factors influencing the accessibility of recently referenced, or local, information (e.g., Fletcher, 1981; Kintsch & van Dijk, 1978; McKoon, Ward, Ratcliff, & Sproat, 1993), there is a growing body of research that has investigated conditions in which more distant, or global, information is accessed (e.g., Albrecht & O'Brien, 1993; Huitema, Dopkins, Klin, & Myers, 1993; McKoon & Ratcliff, 1992; Myers, O'Brien, Albrecht, & Mason, 1994; O'Brien & Albrecht, 1992; Suh & Trabasso, 1993; Trabasso & Suh, 1993). The purpose of our experiments was to further investigate factors that may influence the accessibility of global information.

There are several conditions in which readers will access distant information. Most researchers agree that such information is more likely to be accessed when participants are engaged in special comprehension strategies, such as when a researcher reads a scientific report (McKoon & Ratcliff, 1992). There is also evidence that the experimental situation, including the texts and the nature of the experimental task, may encourage participants to access distant information and construct a global representation (O'Brien & Albrecht, 1992; Wilson, Rinck, McNamara, Bower, & Morrow, 1993). Finally, there is substantial evidence demonstrating that a break in local coherence increases the likelihood that readers will recruit global information (e.g., Klin & Myers, 1993; McKoon & Ratcliff, 1992; O'Brien, Duffy, & Myers, 1986).

Researchers who view comprehension as a problem-solving process (e.g., Bloom, Fletcher, van den Broek, Reitz, & Shapiro, 1990; Graesser, Singer, & Trabasso, 1994; Singer, Graesser, & Trabasso, 1994) have suggested an additional condition in which readers should use global information. These researchers propose that causes and goals that have been backgrounded are reactivated when a goal-satisfying statement is read (e.g., Bloom et al., 1990; van den Broek, 1990). This prediction follows because causes and goals often provide reasons for the actions described in a goal-satisfying statement. Reactivation of causes and goals is predicted to occur regardless of whether there is a break in local coherence.

The constructionist model provides the most complete account of reading as a problem-solving process (Graesser et al., 1994; Singer et al., 1994). The distinguishing feature of this model is the principle of search after meaning. The principle incorporates assumptions about the goals of the reader, the processes involved in constructing locally and globally coherent representations, and attempts on the part of the reader to provide explanations for text ideas. These assumptions provide the mechanism by which readers establish links to causal antecedents and superordinate goals. It is proposed that these connections are made by providing answers to why questions. Although it is often the case that there are causal antecedents for the current action in the local context, in the constructionist model the assumption is that readers will always search "generic and specific information sources for causal antecedents of explicit events, actions, and goals; the search occurs regardless of whether or not there is a break in local text coherence" (Graesser et al., 1994, p. 381).

There is growing support for the constructionist model (e.g.,
when they were inconsistent with the earlier description, were locally coherent by various definitions (Fletcher & Bloom, 1993). When the text is locally coherent, begins to place limits on what can be read. For example, Bloom et al. (1990) found that a goal that had been backgrounded was reactivated when participants read a goal-satisfying statement. More recently, Suh and Trabasso (1993) found that participants reactivated superordinate-goal information immediately following a statement satisfying a subordinate goal, but only when the superordinate goal was unsatisfied.

In contrast to the constructionist view, McKoon and Ratcliff (1992) proposed the minimalist hypothesis, which states that readers access distant information only when there is a break in local coherence or when information from long-term memory is easily available. The minimalist hypothesis has stimulated considerable debate (e.g., Singer, 1993; Singer et al., 1994). The source of this debate seems to be the difficulty in defining terms such as local coherence and easily available. Some researchers have interpreted these terms to mean that information provides local coherence or is easily available only if it is from the immediately preceding sentences, is in working memory, or is based on strong extratext associations. That such definitions are not adequate has been demonstrated in several recent experiments; Albrecht and O'Brien (1993), Huitema et al. (1993), Myers et al. (1994), and O'Brien and Albrecht (1992) have demonstrated that participants accessed backgrounded information about a protagonist, even when the texts were locally coherent by various definitions (Fletcher & Bloom, 1988; Kintsch & van Dijk, 1978). In these experiments, participants read texts that contained an elaborate description of a personal, physical, or emotional characteristic of the protagonist. This description was followed by a description of an episode unrelated to the targeted characteristic. Following that, participants read a sentence that was either consistent or inconsistent with the targeted characteristic. For example, one passage described the protagonist as a vegetarian and later described the same character ordering a cheeseburger. Participants took significantly longer to read the critical sentences that, participants read texts that contained an elaborate description of a personal, physical, or emotional characteristic of the protagonist. This description was followed by a description of an episode unrelated to the targeted characteristic. Following that, participants read a sentence that was either consistent or inconsistent with the targeted characteristic. For example, one passage described the protagonist as a vegetarian and later described the same character ordering a cheeseburger. Participants took significantly longer to read the critical sentences that were inconsistent with the earlier description, indicating that participants had accessed the distant information and had detected the inconsistency. Establishing the situations in which readers access distant information, even when the text is locally coherent, begins to place limits on what researchers may mean by easily available (O'Brien, 1994).

Albrecht and O'Brien (1993) explained their results within an essentially bottom-up framework. They assumed that concepts and propositions resulting from the parse of the currently read sentence, together with active elements from the previous processing cycle, serve as an input to the memory system (also see Huitema et al., 1993; Myers et al., 1994). This input primes contextually relevant information through a resonance process (e.g., Gillund & Shiffrin, 1984; Hintzman, 1986; Ratcliff, 1978; Ratcliff & McKoon, 1988). More specifically, elements in memory resonate to the input as a function of their strength and their degree of match to the input. The match of memory to input elements depends on previously established associations, overlapping features of concepts, and overlapping arguments of propositions. Resonating elements include those in the reader's knowledge base and inactive elements in the discourse representation. An element does not have to be directly activated by the input; presumably, as in Kintsch's (1998) construction-integration model, the activation process consists of a series of cycles so that discourse elements that are related to elements initially activated may in turn be activated. This process continues until the activation stabilizes. Those elements that are most activated enter working memory, and the reader attempts to integrate them with the current input.

An advantage of working within this framework is that it suggests several variables that should influence whether readers access backgrounded information and establish global coherence. First, the assumption that elements are recruited over several cycles implies that elements in richly interconnected sets of propositions are more accessible, given an input that is strongly related to an element within that set. This prediction is supported by data from studies of anaphoric reference to backgrounded antecedents (O'Brien & Albrecht, 1991; O'Brien & Myers, 1987; O'Brien, Plewes, & Albrecht, 1990) and memory (Black & Bower, 1980; Bradshaw & Anderson, 1982; Myers & Duffy, 1990; Myers, O'Brien, Balota, & Toyofuku, 1984; Trabasso & van den Broek, 1985). Second, if one assumes that the strength of an element in the discourse representation decays as a function of referential distance, the assumption that the degree to which an element resonates is a function of its strength implies that near targets are more likely to be activated by an input than distant ones. Finally, the role of trace overlap between the target sentences and backgrounded information plays a central role in the resonance model. Thus, manipulating the degree of trace overlap should have an impact on the extent to which backgrounded information is accessed. In this set of experiments, we varied both distance and the overlap of input with concepts related to the target (i.e., contextual overlap).

We used texts that consisted of two episodes. Two example passages from each experiment are presented in the Appendix. The first episode included a goal that was either unsatisfied or satisfied. In the unsatisfied-goal condition, the second episode interrupted achievement of the goal in the first episode. In Passage 1 in the Appendix, the goal was to confirm an airline reservation before midnight. The unsatisfied-goal condition in Passage 1 clearly indicated that the goal had not been satisfied and was being postponed by the second event through, for example, the following statements from Experiment 1: “Before she confirmed her reservation” and “Mary . . . would have to confirm her reservation later.” In the satisfied-goal conditions, the goal from the first episode was clearly completed, and the second episode was introduced. In Passage 1 (Experiment 1), this was accomplished by the statement, “After she confirmed her reservation.” Following completion of the second episode, two target sentences described actions that were consistent with the conclusion of the second episode but were inconsistent with the earlier unsatisfied goal. In all cases, these sentences were locally coherent based on several different definitions (Fletcher & Bloom, 1988; Kintsch & van Dijk, 1978; McKoon & Ratcliff, 1992). In Passage 1, the target sentences described Mary preparing for bed. This action was consistent with completing a long, hard night of work but was inconsistent with confirming the airline reservations. In all three experiments, the primary dependent measure was reading time on the target sentences. If participants access the backgrounded
goal information when the target sentences are read, they should notice that the target actions are incompatible with the protagonist’s original, unsatisfied goal. This should result in longer reading times for the target sentences when the goal is unsatisfied than when it is satisfied.

In Experiment 1, we manipulated the distance between the goal and the target sentences. There was no overlap between the target sentences and the earlier goal information. This situation provided a strong test of our position. If reactivation of the goal information is independent of trace overlap and distance, then participants should detect the inconsistency regardless of the distance separating the critical information. After it was established in Experiment 1 that participants did not detect the inconsistency when the goal had been backgrounded, we then investigated in Experiments 2 and 3 the effectiveness of context reinstatement as a means of reactivating backgrounded goal information.

Experiment 1

In this experiment, we manipulated two variables: goal satisfaction and the distance between the goal information in the first episode and the conclusion of the second episode. When the protagonist’s goal was unsatisfied, the actions described in the target sentences were inconsistent with completion of the first goal. In contrast, when the protagonist had achieved the goal, the actions described in the target sentences were consistent with both episodes.

There were two versions of the second episode that varied in length. In the close conditions, there were only a few sentences between the goal information in the first episode and the conclusion of the second episode. In these conditions, goal information was likely to be active when the target sentences were read. Therefore, participants should notice the inconsistency, which should result in longer reading times for the unsatisfied-goal condition than for the satisfied-goal condition.

In the distant conditions, there were several more sentences between the goal statement and the conclusion of the second episode. These additional sentences described the second episode in greater detail and served to background the goal from the first episode and establish a new focus. Because there were no local-coherence breaks and because there were no overlapping traces by which the goal could be reinstated, on the basis of the resonance model we predict that participants should not notice the inconsistency and that there should be no significant differences in reading times. Similarly, because the goal is not easily available under the conditions described by the minimalist hypothesis, this view led us also to predict that there should be no differences in reading times.

The constructionist model provides a different prediction for the distant conditions. Given the principle of search after meaning, participants should attempt to explain the actions in the target sentences. Although there was a causal antecedent in the immediately preceding discourse that would explain the action, the search principle implies that readers will go beyond this local cause and attempt to fit this action into the global chain of events (Graesser et al., 1994; Singer et al., 1994, p. 431). In the unsatisfied-goal condition, participants should notice that the target actions are incompatible with the earlier goal. This should produce longer reading times for the target sentences when the goal is unsatisfied than when it is satisfied.

Method

Participants. Fifty-two University of Massachusetts undergraduates participated in return for course credit. The data from 1 participant were dropped because that individual made more than 10% errors in responding to questions presented after the passage.

Materials. Twenty-four narrative texts were constructed. Each passage was composed of five sections: an opening, a goal section, a filler section, target sentences, and a conclusion. The opening section was four to six sentences in length. This section established the text situation and introduced the main character. The last one or two sentences of the opening section introduced the goal of the main character. In Passage 1 (Experiment 1) of the Appendix, the goal statement was “She needed to make an airline reservation tonight by midnight.” The opening was followed by the goal section, which was two to four sentences in length. There were two versions of this section: satisfied-goal and unsatisfied-goal versions. The satisfied-goal version explicitly stated that the main character had completed the goal and had started a second episode. The unsatisfied-goal version stated that the main character had not completed the goal and had postponed the pursuit of this goal until the completion of the intervening episode. The intervening episode was never a subgoal of the original goal; the only relationship between the goal and the intervening event was temporal, and the relationship was established in the story. The goal section was followed by a filler section. There were two versions of this section: distant and close. The distant versions were six to seven sentences in length. The close versions were two to three sentences in length and were constructed by eliminating three to four sentences from the distant filler. The filler section described the intervening episode and ended with a statement that clearly indicated that this episode had been completed. For example, in Passage 1, this was indicated by the statement: “Now, she was done with the ad.” At no point did the filler section refer to the goal. Two target sentences immediately followed the last sentence of the filler section. These sentences ranged in length from 36 to 41 characters, with a mean length of 38 characters. The sentences described actions that were consistent with the intervening episode but were inconsistent with the ad. At no point did the filler section refer to the goal. Two target sentences immediately followed the last sentence of the filler section. These sentences ranged in length from 36 to 41 characters, with a mean length of 38 characters. The sentences described actions that were consistent with the intervening episode but were inconsistent with the completion of the unsatisfied goal. The target sentences did not provide an explicit contradiction, but it was clear from the actions described in the target sentences that the goal episode was not going to be resumed in the immediate future. We included the second target sentence to detect possible spillover effects or possible delays in the processing of the inconsistent information. The passages ended with a conclusion section that was one to two sentences in length. A comprehension question about the passage was presented after each passage to encourage participants to read carefully. For example, the first passage in the Appendix had the following comprehension question: “Was Mary a television producer?”

Design. For each participant, the experimental texts were randomly assigned to the four conditions with two constraints: (a) Each participant saw six passages in each condition, and (b) across participants, each passage occurred in each condition an equal number of times. The order of the passages was the same for all participants.

Procedure. Each participant individually completed a session that lasted approximately 45 min. All materials were presented on a computer monitor controlled by an IBM-compatible 386SX microcomputer. Participants were instructed to place their right thumb on a line-advance key, their right index finger on a yes key, and their left index finger on a no key. Each passage began with the word READY.
Results and Discussion

In the experiments reported in this article, \( F_1 \) refers to tests against an error term based on subject variability, and \( F_2 \) refers to tests against an error term based on item variability. Results reported as significant are at the .05 level unless otherwise indicated. Planned comparisons were carried out with the Bonferroni procedure with a familywise error rate of .05. Outliers were eliminated with Tukey’s (1977) hinge criterion. In each experiment, this eliminated less than 3.3% of the reading times. We report reading times and analyses for both target sentences because previous research has demonstrated that the size of the inconsistency effect may vary considerably from Target Sentence 1 to Target Sentence 2 (e.g., Myers et al., 1994).

The reading times from Experiment 1 are presented in Table 1. There were no significant differences between Target Sentences 1 and 2 (\( F_s < 1 \)). Averaged over target sentences, reading times in the close conditions were significantly faster than the reading times in the distant conditions. This effect reached significance only in an analysis based on subject variability, \( F_1(1, 50) = 5.41, \text{MSE} = 36,255; F_2(1, 23) = 3.16, \text{MSE} = 33,894, p = .089 \). Simple effects tests revealed that this distance effect was significant following only the satisfied-goal conditions for both Sentence 1, \( F_1(1, 50) = 7.91, \text{MSE} = 53,934; F_2(1, 23) = 8.40, \text{MSE} = 22,725 \), and Sentence 2, \( F_1(1, 50) = 8.97, \text{MSE} = 70,206; F_2(1, 23) = 5.28, \text{MSE} = 48,462 \). Presumably, this effect reflects an end-of-episode wrap-up process in which readers integrate the current sentence with the preceding episode. More time is needed for this wrap up when the preceding episode is longer.\(^1\)

Averaged over both distance and target sentence, reading times were significantly slower for passages containing unsatisfied goals than for passages containing satisfied goals. This effect was significant in an analysis based on subject variability, \( F_1(1, 50) = 6.64, \text{MSE} = 100,178 \), and marginally significant in an analysis based on item variability, \( F_2(1, 23) = 3.89, \text{MSE} = 63,051, p = .061 \). A closer examination suggested that this effect of goal satisfaction was due to the close condition. This was corroborated by a significant Satisfaction x Distance interaction, \( F_1(1, 50) = 6.84, \text{MSE} = 49,238; F_2(1, 23) = 5.70, \text{MSE} = 20,198 \). Planned comparisons confirmed that reading times in the close condition were significantly slower following an unsatisfied goal for both Target Sentence 1, \( F_1(1, 50) = 6.91, \text{MSE} = 110,396; F_2(1, 23) = 5.15, \text{MSE} = 73,013 \), and Target Sentence 2, \( F_1(1, 50) = 7.07, \text{MSE} = 171,266; F_2(1, 23) = 9.43, \text{MSE} = 34,534 \). The difference was not significant in the distant condition (\( F_s < 1 \)).\(^2\)

The results of Experiment 1 are consistent with the resonance model; readers noticed the inconsistency only when the conflicting information was separated by a few sentences. In the close condition, the unsatisfied-goal information was still available when the inconsistent target information was read. In this case, participants detected the inconsistency and spent more time reading the target sentences. These results also provided a check on the materials by demonstrating that the target sentences were inconsistent with the earlier unsatisfied goal and that reading time was sensitive enough to detect the effect.

In the distant condition, the second episode was elaborated, establishing a clear, new focal event and serving to back up the goal information in the first episode. Because the target sentences were locally coherent and did not provide a cue by which to access the backgrounded goal information, participants did not notice the global inconsistency. These results replicate the findings of McKoon and Ratcliff (1992; Experiment 2). A full discussion of the relevance of the results to the minimalist and constructionist models is in the General Discussion.

The results from the distant conditions appear to be inconsistent with our previous findings that readers access global information even when the text is locally coherent (e.g., Albrecht & O’Brien, 1993; Huitema et al., 1993; Myers et al.,

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\(^1\) The distance effect in the satisfied condition was not expected. As suggested, one possibility is that there was an episode wrap-up effect. Implicit in this explanation is the assumption that the wrap-up effect in the distant-unsatisfied condition required as much processing time as understanding the inconsistency in the close-unsatisfied condition did. The current experiments did not directly address this issue.

\(^2\) A concern about using materials that contain inconsistencies is that participants may notice the pattern in the first few passages and develop specific strategies in reading the remaining passages. If participants engage in such strategies, then there should be a change in the magnitude of the inconsistency effect across the experiment. To rule out this possibility, for each experiment we completed a second item analysis that included order (first, second, third, or fourth quarter of the list) as a between-item variable. Across the three experiments, order did not interact with any other variable.
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1994). However, on the basis of the model we have outlined, the different results are accounted for by varying degrees of overlap between the target sentences and critical global information. In the Albrecht and O'Brien (1993) passages, there was considerable overlap between the information in the target sentences and the backgrounded description of the protagonist. For example, in a passage that described the protagonist ordering a cheeseburger, the backgrounded text elaborated on this character's eating habits. In the passages from Experiment 1, there was very little overlap between the target sentences and the earlier goal context. Generally, the only overlapping traces between these regions were through the protagonist. Because the protagonist was foregrounded throughout the passage, this character was associated with several actions and events. This was likely to reduce the effectiveness of the protagonist as a cue for any particular portion of the text. According to this interpretation, if additional unique overlap is introduced between the conclusion of the intervening episode and the goal event, readers should detect the inconsistency in the unsatisfied-goal versions. In Experiment 2, we directly tested whether establishing this type of overlap would increase the likelihood that readers would detect the inconsistency.

Experiment 2

In this experiment, we modified the materials in the following way. First, we introduced a specific goal context in the opening and goal sections. This was done by establishing a temporal relation between some object in the situation and the goal. In Passage 1, the context (the leather couch) and the goal were related by the statement, “She sat down on her leather sofa and looked through the telephone book.” As is evident in the example, the relation between the goal and the context was indirect and required the knowledge that looking through the telephone book was an action taken by the protagonist to achieve the goal of making the reservation.

We also inserted a context-reinstatement sentence at the end of the intervening episode. In Passage 1, the context-reinstatement sentence was, “Exhausted, Mary sat down on the leather sofa for a moment.” The context-reinstatement sentence provided additional conceptual overlap with the earlier goal context. On the basis of our explanation of the results of Experiment 1, participants should read the target sentences more slowly when the goal is unsatisfied than when it is satisfied.

Method

Participants. Forty University of Massachusetts undergraduates participated for course credit. Data from 1 participant who made more than 10% errors in responding to questions were dropped from the data analysis.

Materials. The distant versions of the passages from Experiment 1 were used in Experiment 2 with the following modifications. In the opening and goal sections, a temporal relation was established between the goal and some object in the situation described by the text. For example, in Passage 1, the goal of making an airline reservation was related to sitting on a leather sofa. This relation was indirect and often required other propositions from the goal section to establish a link to the goal. The contextual object was not an integral part of goal attainment but was consistent with the situation described by the text. For example, sitting on a sofa is not crucial to making airline reservations, but it is a typical situation for an occupant of an apartment. The specific object in each passage was designated as the context of the goal, or the contextual cue. The filler section followed the goal section. At no point in the filler section was the goal mentioned. Also, the contextual cue was not mentioned until the last sentence of the filler section, which was the context-reinstatement sentence. This sentence made reference to the earlier contextual cue but never made direct reference to the goal.

Because we used only the distant versions of the passages, there were only two conditions with 12 passages in each. Across participants, each passage was presented in each condition an equal number of times.

Procedure. The procedure was the same as that used in Experiment 1.

Results and Discussion

Reading times for Experiment 2 are presented in Table 2. As in Experiment 1, there were no significant differences between Target Sentences 1 and 2 (Fs < 1). Averaged across target sentences, reading times were significantly longer following passages that contained an unsatisfied goal than following passages that contained a satisfied goal, F(1, 38) = 13.10, MSE = 38,948; F(2, 1, 23) = 10.29, MSE = 37,849. Planned comparisons confirmed that this was true for both Target Sentence 1, F(1, 38) = 11.13, MSE = 62,288; F(2, 1, 23) = 10.84, MSE = 47,485, and Target Sentence 2, F(1, 38) = 5.01, MSE = 70,909; F(2, 1, 23) = 4.88, MSE = 57,682.

In contrast to the results from the distant conditions in Experiment 1, participants in Experiment 2 read the target sentences significantly more slowly when the goal was unsatisfied. These results suggest that the additional overlap provided by the context-reinstatement phrase was successful in reactivating the previously backgrounded goal. It is important to emphasize that the reactivation of the goal in these texts was not direct but was mediated by relations established earlier in the text. These results suggest that not only was the connection between the contextual-cue anaphor and its antecedent made but that establishing this connection also served to reactivate information that had been related to the cue.

Taken together, the results of Experiments 1 and 2 suggest that the presence of a phrase that reinstated the context of the goal in the first episode increased the likelihood that the goal information was also accessed and available for processing when the first target sentence was read. When the contextual cue was absent, there was no mechanism by which the global information could be reactivated. Presumably in this case, the

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Reading Times (in Milliseconds) for the Target Sentences as a Function of Goal Satisfaction in Experiment 2</th>
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<tbody>
<tr>
<td>Goal satisfaction</td>
<td>Target sentence</td>
</tr>
<tr>
<td>Sentence 1</td>
<td>1,946</td>
</tr>
<tr>
<td>Sentence 2</td>
<td>1,923</td>
</tr>
</tbody>
</table>
target sentences were understood primarily in terms of the second, more immediate episode.

Although these conclusions are consistent with the model we have described, the conclusions are based on between-experiment comparisons. Also, a closer examination of the materials revealed that in many cases the revised passages had a few more goal-relevant propositions than the original passages had. It is possible that the additional elaboration of the goals in the revised passages made this information more accessible. There is empirical evidence demonstrating that elaborated information is more easily accessed and reinstated than less elaborated information (O'Brien, Plewes, & Albrecht, 1990). Therefore, it is possible that a weaker context, like the episode-ending sentence in Experiment 1 (“Now, she was done with the ad”), could effectively restate the goal information. Although we certainly agree that elaborated information increases retrieval accuracy and speed (Myers, O'Brien, Balota, & Toyofuku, 1984), attributing the results of Experiment 2 to elaboration is at odds with the reinstatement interpretation we have provided. In Experiment 3, we tested directly whether the change in the pattern of results was due to reinstating the context of the goal or to increasing the number of goal-relevant propositions.

### Experiment 3

To test the reinstatement and elaboration hypotheses, we manipulated the presence of the context-reinstatement cue while maintaining the same degree of elaboration in the goal section. The reinstatement and no-reinstatement versions were identical up to the context-reinstatement sentence. In the context-reinstatement version, the reinstatement sentence was the same as the one used in Experiment 2. The no-reinstatement sentence did not include a reference to the earlier goal context. The no-reinstatement sentence for Passage 1 was, “Exhausted, Mary sat down for a moment.”

According to the reinstatement explanation, participants should read the target sentences more slowly when the goal is unsatisfied, but only when the context has been reinstated. In contrast, the elaboration explanation predicts that participants should read the target sentences more slowly when the goal is unsatisfied, regardless of whether the context is reinstated.

### Method

Forty University of Massachusetts undergraduates participated for course credit. The design and procedure were the same as those used in Experiment 1. The set of passages from Experiment 2 was used. The passages from Experiment 2 served as the context-reinstatement versions. The no-context-reinstatement versions were created by eliminating the context-cue phrase in the context-reinstatement sentence at the end of the filler section or, in some cases, by eliminating the context-reinstatement sentence altogether. Although there were slight differences between the reinstatement and no-reinstatement sentences, these sentences and the target sentences were always locally coherent as defined by argument overlap (Kintsch & van Dijk, 1978), by causal relations (Fletcher & Bloom, 1988), and by making sense with the immediately preceding discourse (McKoon & Ratcliff, 1992).

### Results and Discussion

Reading times for Experiment 3 are presented in Table 3. Unlike Experiments 1 and 2, participants read the second target sentence faster than the first target sentence. This effect reached significance only in an analysis based on subject variability, \( F(1, 39) = 6.20, MSE = 41,011; F(1, 23) = 1.23, MSE = 83,229, p = .27 \). However, because of this difference, analyses for Sentences 1 and 2 are presented separately.

<table>
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<tr>
<th>Target Sentence</th>
<th>Goal satisfaction</th>
<th>Reading times (in Milliseconds)</th>
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</thead>
<tbody>
<tr>
<td>No context reinstatement</td>
<td>Unsatisfied (U)</td>
<td>1,696</td>
</tr>
<tr>
<td></td>
<td>Satisfied (S)</td>
<td>1,710</td>
</tr>
<tr>
<td></td>
<td>Difference (U - S)</td>
<td>-14</td>
</tr>
<tr>
<td>Context reinstatement</td>
<td>Unsatisfied (U)</td>
<td>1,653</td>
</tr>
<tr>
<td></td>
<td>Satisfied (S)</td>
<td>1,610</td>
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<td></td>
<td>Difference (U - S)</td>
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<td></td>
<td>Satisfied (S)</td>
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<td></td>
<td>Difference (U - S)</td>
<td>+135</td>
</tr>
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</table>
were less likely to reactivate the goal information, and there were no significant differences in reading times.

We have suggested that context reinstatement, as used in Experiments 2 and 3, is the result of an automatic "low-level" resonance process. However, several researchers have demonstrated that reinstatement is often disruptive and requires additional attentional capacities (e.g., Kintsch & van Dijk, 1978; however, see Klin & Meyers, 1993). Thus, it is possible that the goal was reinstated as a by-product of a time-consuming, problem-solving process that was triggered by the search for an antecedent to the context-cue phrase. If this were the case, reading times for the context-reinstatement sentence should have been significantly slower than the reading times for the comparable no-reinstatement sentence. However, there was no significant difference between reinstatement and no-reinstatement sentences. In fact, the effect was numerically in the opposite direction (42 and 43 ms per character for the reinstatement and no-reinstatement conditions, respectively, F_{S} < 1.2). This result suggests that the context-reinstatement sentence was not disruptive and provides further support for the characterization of context reinstatement as an automatic low-level process.

**General Discussion**

These experiments were designed to further investigate the conditions in which readers access backgrounded goal information. In Experiment 1, participants detected the inconsistency between the unsatisfied goal and the target sentences only when this information was separated by a few sentences. Experiments 2 and 3 demonstrated that readers accessed backgrounded goal information only when there was an explicit cue that reinstated the context of the goal. These results are consistent with the findings of McKoon and Ratcliff (1992; Experiment 4), who showed that participants established connections between distant text ideas on the basis of argument overlap. They suggested that repeating the protagonist's name made earlier information about the protagonist available, which increased the likelihood that the new information would be directly connected to the distant information. In the present experiments, such connections to the protagonist did not produce sufficient activation of the goal information. If they had, there should have been a slow down in reading times following the distant unsatisfied-goal conditions in Experiment 1. As we suggested earlier, the important point may be the role of unique overlap. With the current materials, the protagonist was tied to almost every action in the text. Thus, the protagonist was a poor cue for retrieval of any one action. In contrast, by including the contextual cue, we provided unique overlap and a very good cue for the specific piece of information.

The results are consistent with the resonance model we described earlier. Within this framework, concepts and propositions in the discourse representation resonate in response to the currently processed contents of working memory. Factors that should influence this resonance process are the degree to which the goal has been elaborated, the strength of the relation between the goal and the context, how recently the goal has been referenced, and the conceptual overlap between what is currently in focus and the targeted episode. Thus, in the example of Passage 1, propositions derived from "Exhausted, Mary sat down on the leather sofa for a moment" activated earlier processed propositions about sitting on the leather sofa and looking through the telephone book. In turn, these propositions activated propositions about the goal of making the airline reservations.

In the no-reinstatement condition, the only trace overlap was between the no-reinstatement sentence and the information in the second episode. In this case, there was no means by which to access the inactive goal-context information. This reduced the likelihood that participants would reactivate the backgrounded goal.

The hypothesized resonance process presumably is similar to that by which people recognize individuals and objects in the world, even when they are not actively attempting to do so. Such "reminding" is influenced by how recently the target has been seen or thought about, the richness of the original encoding, the similarity of the encountered object to representations stored in memory, and the similarity of the current context to contexts in which the object was previously encountered. It would be surprising if such low-level processes did not continue to operate during reading and if they were not influenced by many of the same factors.

Like the construction-integration model (Kintsch, 1988), the resonance model describes comprehension as a process with two stages: a stage in which information is activated and an integration stage. However, the models differ in the information that is accessed in the first stage. In the construction-integration model, information from working memory and general knowledge are activated in the first phase (i.e., the construction phase). This means that explicitly mentioned discourse information that is no longer in working memory, but is relevant to the current topic, is not accessed in the construction phase. In contrast, the resonance model assumes that information that is in working memory sends a signal to general knowledge and to discourse-relevant information that is no longer active in memory. If there is sufficient overlap, the previously backgrounded information can be reactivated. More recently, Ericsson and Kintsch (1994) have also proposed that backgrounded episodic information may be reactivated in a relatively automatic fashion.

Although our experiments demonstrate that overlapping traces can play a role in reactivating backgrounded information, we are not suggesting that this is the only means by which backgrounded information can be accessed. It is certainly the case that pragmatic cues, such as temporal or location cues, can influence availability of backgrounded information (e.g., Anderson, Garrod, & Sanford, 1983). Also, narratives with clearly defined text structures may influence the ease with which backgrounded information can be accessed (e.g., Suh & Trabasso, 1993; Trabasso & Suh, 1993).

Although the current experiments were not designed to directly test the minimalist and constructionist positions, the results are relevant to both models because these results establish an additional condition in which backgrounded causes are accessed in the absence of a local-coherence break. The results are consistent with and extend the minimalist hypothesis in the sense that overlapping coherence provides a mechanism by which information from long-term memory may...
become readily available; when there is overlap, readers may access earlier information, but when there is no overlap, readers rely primarily on local information.

The results raise some important issues for the constructionist model (Graesser et al., 1994; Singer et al., 1994). If readers were searching for meaning and attempting to understand the current action within the causal sequence of events, then there should have been longer reading times following the unsatisfied goals in all conditions. However, if it was the case that a cause from the immediately preceding text was sufficient to halt the search after meaning, then it is unclear why including the contextual phrase resulted in longer reading times following unsatisfied goals. In either case, the issue becomes one of establishing the boundaries of the effort principle and determining what triggers and what stops the search for meaning.

In considering the relevance of our results for the constructionist position, one issue that arises is the role of the type of text used. Our texts introduced a clear change of topic to ground the goal. In the texts used in many constructionist studies (e.g., Long et al., 1992; Long & Golding, 1993; Suh & Trabasso, 1993), the text structure was such that there usually was a direct path back to the goal from the current position in the text, often by means of a subgoal. This may have reduced the probability that the goals were backgrounded in the same way the goals in our texts were backgrounded. Presumably, the same comprehension processes (i.e., resonance and integration processes) are evoked by both types of text. However, further research is needed to determine whether different processes may be evoked by the different types of texts or whether the same processes are evoked but to different degrees.

Finally, the results demonstrate the advantage of working within a framework like the one outlined earlier. Specifically, the framework generates research questions that go beyond a general statement about whether readers will or will not access global information to identify variables that directly influence this process. For example, our account of how readers maintain global coherence identifies the importance of the memory traces, the current sentence, and the overlap between them. Presumably, any one of these components can influence access to global information. Our results demonstrate that with the same memory traces, access to global information can be established or eliminated through the nature of the current sentence. O’Brien et al. (1990) have provided the complement situation by demonstrating that, with the same current sentence, access to backgrounded information can be facilitated through changes in the nature of the memory traces. Thus, within this framework, the problem shifts from identifying the categories of inferences that are drawn to identifying the inferential processes and factors that influence these processes.

References
Passage 1

Introduction. Mary was an advertising agent for a large firm in New York City. This evening, she was sitting at home working on a promotional piece for a blue jean company. This was her last project before she went on vacation. She needed to make an airline reservation tonight by midnight. If she didn't make the reservation tonight, she wouldn't get the special rate and might not even get a seat on the flight.

Unsatisfied goal. Before she confirmed her reservation, she received a call from her boss. Apparently, the blue jean company wanted her to go to New York City. This evening, she was sitting at home working on a promotional piece for a blue jean company. This was her last project before she went on vacation. She needed to make an airline reservation tonight by midnight. If she didn't make the reservation tonight, she wouldn't get the special rate and might not even get a seat on the flight.

Satisfied goal. After she confirmed her reservation, she received a call from her boss. Apparently, the blue jean company wanted her to go to New York City. This evening, she was sitting at home working on a promotional piece for a blue jean company. This was her last project before she went on vacation. She needed to make an airline reservation tonight by midnight. If she didn't make the reservation tonight, she wouldn't get the special rate and might not even get a seat on the flight.

Filler. She needed to decide on the colors for the layout. (She set a black and white line drawing of the ad on her desk. Then she pulled out several color swatches. At first, she tried several different shades of green and red. However, she knew that the company would not like these colors.) After much consideration, she selected royal blue and a light yellow. Now, she was done with the ad.

Target sentences. She was tired and decided to go to bed. She put on pajamas and washed her face.

Conclusion. She was certain she'd have no problem falling asleep.

Passage 2

Introduction. The senator's wife was preparing for a fund-raiser being held at their estate this evening. She told the groundskeeper all of the things he had to do to get the estate ready for the party. He

Unsatisfied goal. Before he even started to trim the bushes, the senator's wife reminded him that she wanted him to check out the estate's security system before anything else. He would have to trim the bushes later. The groundskeeper needed to fix the lock on the entrance gate.

Satisfied goal. Immediately after he finished trimming the bushes, the senator's wife reminded him that she wanted him to check out the estate's security system. Because the bushes were done, this was the last thing he had to do. The groundskeeper needed to fix the lock on the entrance gate.

Filler. (He walked out to the entrance gate and carefully studied the broken lock. He tried several different things to fix the lock. He knew he was pressed for time. So he drove to the hardware store and fixed the gate. Satisfied, he put away all of the tools.)

Target sentences. He was done and was ready to go home. The estate was now ready for the party.

Conclusion. He went and told his boss that the grounds were ready for the party.

The distant conditions were constructed by including the sentences in parentheses from the filler section.
she wouldn’t get the special rate and might not even get a seat on the flight. She sat down on her leather sofa and looked through the telephone book.

Unsatisfied goal. However, before she could confirm her reservation, she received a call from her boss. Apparently, the blue jean company wanted the ad done by tomorrow morning. Mary had to finish the project tonight and would have to confirm her reservation later.

Satisfied goal. Just after she confirmed her reservation, she received a call from her boss. Apparently, the blue jean company wanted the ad done by tomorrow morning. Mary had to finish the project tonight, and so she put away her reservation information.

Filler. She needed to decide on the colors for the layout. She set a black and white line drawing of the ad on her desk. Then she pulled out several color swatches. At first, she tried several different shades of green and red. However, she knew that the company would not like these colors. After much consideration, she selected royal blue and a light yellow. Now, she was done with the ad. Exhausted, Mary sat down on the leather sofa for a moment.

Target sentences. She was tired and decided to go to bed. She put on pajamas and washed her face.

Conclusion. She was certain she’d have no problem falling asleep.

Passage 2

Introduction. The senator’s wife was preparing for a fund-raiser being held at their estate this evening. She told the groundskeeper all of the things he had to do to get the estate ready for the party. He needed to trim all of the bushes in the front lawn of the estate. He knew that if the bushes didn’t look good, he could lose his job.

Unsatisfied goal. However, before he even started to trim the bushes, the senator’s wife reminded him that she wanted him to check out the estate’s security system before anything else. He would have to trim the bushes in the front lawn later. Now he needed to fix the lock on the entrance gate.

Satisfied goal. Immediately after he finished trimming the bushes, the senator’s wife reminded him that she wanted him to check out the estate’s security system. Because the bushes in the front lawn were done, this was the last thing he had to do. The groundskeeper needed to fix the lock on the entrance gate.

Filler. He walked out to the gate and carefully studied the broken lock. He tried several different things to fix the lock. He knew he was pressed for time. So he drove to the hardware store and looked for a similar lock. He bought a new heavy-duty lock and fixed the gate. Satisfied, he walked across the front lawn back to the tool shed.

Target sentences. He was done and was ready to go home. He put all of the tools in the shed.

Conclusion. The estate was now ready for the party. He went and told his boss that the grounds were ready for the party.

Experiment 3

Passage 1

Introduction. Mary was an advertising agent for a large firm in New York City. This evening, she was sitting at home working on a promotional piece for a blue jean company. This was her last project before she went on vacation. She needed to make an airline reservation tonight by midnight. If she didn’t make the reservation tonight, she wouldn’t get the special rate and might not even get a seat on the flight. She sat down on her leather sofa and looked through the telephone book.

Unsatisfied goal. However, before she could confirm her reservation, she received a call from her boss. Apparently, the blue jean company wanted the ad done by tomorrow morning. Mary had to finish the project tonight and would have to confirm her reservation later.

Satisfied goal. Just after she confirmed her reservation, she received a call from her boss. Apparently, the blue jean company wanted the ad done by tomorrow morning. Mary had to finish the project tonight, and so she put away her reservation information.

Filler. She needed to decide on the colors for the layout. She set a black and white line drawing of the ad on her desk. Then she pulled out several color swatches. At first, she tried several different shades of green and red. However, she knew that the company would not like these colors. After much consideration, she selected royal blue and a light yellow. Now, she was done with the ad. Exhausted, Mary sat down on the leather sofa for a moment.

Target sentences. She was tired and decided to go to bed. She put on pajamas and washed her face.

Conclusion. She was certain she’d have no problem falling asleep.

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