Representation of Complex Goal Structures in Narrative Comprehension

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Abstract

This study inspected people's sensitivity to complex narrative goal structures. The stories described two characters' attempts to accomplish independent subgoals in order to achieve a joint main goal. In most conditions, the success of the first subgoal was manipulated. The next subgoal always succeeded, and a subsequent target region described the second character attempting to execute the main goal. The target region made no reference to the text ideas of the first subgoal, and it was causally coherent with the second subgoal. Target reading time was greater in the succeed condition than the fail condition (all experiments); and, in the target region, the time needed to recognize a word representing the manipulated subgoal was shorter in the succeed condition (Experiment 3). The results suggested that readers consolidated goal information at the target region in the succeed condition, which entailed the reinstatement of the first subgoal to working memory. The results, coupled with the absence of surface and semantic overlap between the target region and the subgoal 1 section of the stories, is proposed to favor the constructionist analysis of text comprehension over a strong version of the memory-based analysis.
Narrative goal structure

Representation of Complex Goal Structures in Narrative Comprehension

A central principle of contemporary theories of comprehension is that readers encode the surface features of texts, their idea content (or textbase), and the situations to which texts refers (Kintsch, 1988; Schmalhofer & Glavanov, 1986; van Dijk & Kintsch, 1983). One facet of text situation models that has received extensive scrutiny is narrative goal structure. Many narrative events are organized with respect to the characters' attempts to overcome a series of obstacles. There is considerable evidence that readers are sensitive to the relations between narrative actions and the goals that they serve.

Achieving progress in this realm has constrained researchers to focus on narratives with simple goal structures. Often, the protagonists in the story stimuli are faced with a main goal, the achievement of which requires that a short series of subgoals be fulfilled. When a particular subgoal fails, it is replaced with a counterpart subgoal. For example, to obtain a birthday present for her mother, a girl attempts to purchase one. If the attempt fails, then the girl instead makes a present (Suh & Trabasso, 1993).

The examination of such materials has clarified story comprehension, in a manner that will be detailed later. We observed, however, that many ordinary narratives require that readers coordinate complex relations among the goals and motivations of the characters. In one frequent arrangement, two characters independently try to solve respective subgoals that serve a single superordinate goal. In the movie Star Trek: First Contact, for example, two teams of characters travel back in time to achieve the joint goal of preventing aliens from destroying humanity. On the orbiting star ship, Captain Picard directs one team to defeat a group of the aliens which has invaded the ship. On Earth, Commander Riker coordinates the other team's efforts to ensure the success of a scheduled space flight that results in humanity's first contact with (good) aliens. Throughout the story, the two teams do not communicate with one another. Both subgoals must succeed for the main goal to be achieved.

This study was designed to determine whether people are sensitive to complex narrative goal structures. The general strategy was to present adult readers with narratives that conveyed such
arrangements, and to particularly scrutinize several measures of reading in a critical, target region of the stories. In this introduction, we review research concerning the processing of the goal situations underlying text, in the framework of competing theoretical analyses in this domain. Then, we specify the predictions for the experiments, with reference to examples of the present materials.

Comprehending Narrative Goal Structure: Theoretical Accounts

The present study addressed the intentionality and causality dimensions of text situation models. Intentionality refers to the interrelations of the goals, motives, and actions of narrative characters that are the focus of this investigation. The causal dimension is of concern because, for many purposes, cause is broadly defined to include relations of physical and motivational cause, as well as loosely defined enablements (Schank & Abelson, 1977; Trabasso, van den Broek, & Suh, 1989). According to these analyses, people's intentional actions are considered to be caused by the goals and motives that instigated them.

Two competing theoretical approaches to discourse comprehension are the memory-based (or resonance) processing analysis (e.g., O'Brien, Lorch, & Myers, 1998) and the constructionist analysis (e.g., Graesser, Singer, & Trabasso, 1994). It is useful to compare these formulations, with emphasis on the representation of text goal structures.

Memory-based text processing. The central distinctive principle of the memory-based analysis is that the current chunk of text (Kintsch & van Dijk, 1978) provides retrieval cues for preceding text ideas and relevant world knowledge. This principle stems from modern memory theory, according to which memory cues are evaluated with reference to the full contents of memory (Clark & Gronlund, 1996; Gillund & Shiffrin, 1984; Hintzman, 1988; Murdock, 1992). Following this analysis, the contents of the preceding text resonate (Ratcliff, 1978) to similar words and ideas in the current chunk (Gerrig & McKoon, 1998; Greene, Gerrig, McKoon, & Ratcliff, 1994; Myers & O'Brien, 1998). Those ideas that are activated by resonance processes participate in the computations of comprehension along with (a) the ideas of the current chunk; and (b) those text ideas that have been carried over in working memory from the previous cycle of comprehension (Fletcher, 1981;
Kintsch & van Dijk, 1978). During comprehension, the resonance of a text idea is regulated by its recency and degree of elaboration in the text, and by its similarity to the contents of working memory (Albrecht & Myers, 1995; O'Brien & Albrecht, 1991; O'Brien, Albrecht, Hakala, & Rizzella, 1995).

Some findings indicate that the resonance of a text idea is sufficient to make it available to the processes of comprehension. In one study (Gerrig & McKoon, 1998; see also McKoon, Gerrig, & Greene, 1996), the participants read about Jane and Gloria discussing Jane's upcoming dinner with her cousin, and then read about Gloria's activities when Jane went to dinner. The central measure was recognition time for a probe word designating the third character (e.g., cousin). In particular, a sentence describing the reunion of Gloria and Jane facilitated recognition judgements about cousin. This facilitation persisted even after a sentence which introduced a new topic.

Likewise, the participants of O'Brien, Rizzella, Albrecht, and Halleran (1998) read statements that bore different relations to a trait of the protagonist. For example, a statement about ordering a cheeseburger is (a) consistent with enjoying junk food, (b) inconsistent with being a vegetarian, and (c) bears a "qualified" relationship to having formerly been a vegetarian. Reading time was consistently longer in the qualified condition than the consistent condition at the target word (cheeseburger) and at a following word. What is important about this finding and that of Gerrig and McKoon (1998) is that ideas that are not germane to the current gist (vegetarian, cousin) are activated simply by virtue of surface or semantic similarity to the current text.

Other findings, in contrast, suggest that resonance may be both sufficient and necessary for a text idea that has been deleted from working memory (called a backgrounded idea) to participate in comprehension processing. In one study (Albrecht & Myers, 1995; see also Albrecht & Myers, 1998), people read that Mary sat on a leather sofa intending to make an air reservation. She then became sidetracked with some other activities. Later, the participants read that Mary went to bed, which may be construed as inconsistent with the goal of making a reservation. Indeed, reading time for the sentence about Mary going to bed was greater than in a control condition, but only when there was further reference to the leather sofa in that region of the story.
In this context, it is useful to distinguish between strong and weak forms of the memory-based analysis. For the present purposes, the main difference is that strong memory-based processing embraces the following principle: (a) Resonance is both sufficient and necessary for a backgrounded text idea to participate in comprehension processing. According to the weak memory-based position, resonance is simply sufficient for this purpose. Strong memory-based processing is captured by assertions such as that the reactivation of a backgrounded text idea requires contextual cues (Albrecht & Myers, 1998, p. 102) and that the higher processes that contribute to the maintenance of global coherence do not contribute to the initial reactivation of text ideas (Myers & O'Brien, 1998, p. 142).

The strong memory-based analysis might also be argued to assert the following:

(b) Constructionism, the competing theory, denies passive processing such as resonance.
(c) Constructionism entails the retrieval of antecedent text ideas in a strictly controlled, resource-consuming manner. These premises are less relevant to the present concerns, but will be addressed in the General Discussion.

Constructionist text processing. According to the constructionist analysis, readers engage in a search after meaning (Bartlett, 1932; Bransford, Barclay, & Franks, 1972; Graesser et al., 1994). Two assumptions of constructionism are particularly relevant to the representation of narrative goal structures. First, the reader is proposed to have a prevailing motive to explain text outcomes, be they physical events or the sort of intentional actions that serve people's goals. Second, the reader is assumed to construct text representations that are coherent at the situational level of processing in addition to the surface and textbase levels. The joint impact of these assumptions is that goal situations contribute to the representation of narrative text.

In the constructionist framework, causal and goal situation models of narratives are proposed to consist of story statements; connected in terms of the relations of physical, motivational, and psychological causes, and enablements (Trabasso & van den Broek, 1985; Trabasso et al., 1989; van den Broek, 1990). Consistent with this analysis, the importance ratings and recall of story statements vary with (a) the interconnectedness of the statements and (b) their appearance on the main causal
chain of the narrative (Trabasso, Secco, & van den Broek, 1984; Trabasso & Sperry, 1985). The
construction of text goal structures has been shown to affect the current contents of working memory
in comprehension (Bloom, Fletcher, van den Broek, Reitz, & Shapiro, 1990; Magliano & Radvansky,
2000). In addition, the connections that readers infer to exist among causally related ideas are reliably
stored in long-term memory (Dopkins, 1996).

Of particular relevance to the present study is the observation that readers are sensitive to goal
relations that span moderate text distances (Singer & Halldorson, 1996; Suh & Trabasso, 1993; van
den Broek & Lorch, 1993). In these studies, the goal conditions have been contrasted with control
conditions that have held constant the degree of superficial overlap between the current clause and the
antecedent material. This suggests that superficial similarity between antecedent ideas and the
current clause may not be necessary for the involvement of the antecedents in current comprehension
processes.

The distinctive assumptions of constructionist theory are augmented by uncontroversial
information processing principles (Graesser et al., 1994). The products of comprehension are
coordinated among memory stores including a limited-capacity working memory and long-term
memory. Comprehension is influenced by the convergence of activation from knowledge sources
including text itself, general knowledge, and the context of the discourse. For example, the concept
COUSIN may become activated either by the introduction of the associated concept, AUNT; or by the
mention of another character in a story already linked to the cousin. Connectionist principles that
favor the most highly interconnected text ideas determine which elements of comprehension are
ultimately represented in long-term memory (Graesser et al., 1994, p. 376; Rumelhart & McClelland,
1986; see also Kintsch, 1988; Magliano & Radvansky, 2000). The passive quality of converging
activation permits constructionism to address phenomena directly relevant to memory-based
processing.

Experimental Overview and Predictions

The present investigation was designed to show that readers are sensitive to complex goal
structures in narratives. We focused on texts in which two characters had to achieve independent subgoals in order to accomplish a joint main goal. The materials are illustrated in Table 1. The story began with an introduction of three sentences, which identified the characters' superordinate goal, such as meeting for lunch. The next four sentences described a character attempting to satisfy one subgoal, such as catching a bus (subgoal 1). The success of this subgoal was manipulated: Sentence 7 described either the success or failure of this subgoal. The next four sentences described the other character trying to achieve another subgoal (e.g., Pam has to complete a report -- subgoal 2), which, in Experiment 1, always succeeded.

**Insert Table 1 about here**

Next came a crucial target region of two sentences. In this section, the character who achieved subgoal 2 is portrayed as attempting to execute the main goal. In the present story, Pam is described as entering the restaurant. Two final sentences functioned as a story conclusion.

The predictions focused on the target region. In this regard, two of its features are important. First, the target region was referentially and causally coherent with the subgoal 2 section. Local incoherence generally initiates the search of the prior text (Haviland & Clark, 1974; Kintsch & van Dijk, 1978; McKoon & Ratcliff, 1992). Second, the target region did not mention any of the concepts of the subgoal 1 section. With this arrangement, a measured impact of the first subgoal on the processing of the target region could be attributed neither to a search initiated by local incoherence, nor to the resonance of the subgoal 1 region to the target concepts.

According to the strong memory-based account, resonance is a necessary condition for a backgrounded text idea to influence the processing of the current text. Therefore, the strong memory-based theory predicted no effect of the success of subgoal 1 on target reading time. Of course, the reader is assumed to encode those surface and situational representations that are supported by local coherence. The weak memory-based processing analysis states only that an antecedent region will resonate to the current one on the basis of surface and semantic overlap. Because the present materials were constructed to avoid such overlap, the weak memory-based position generated no
According to the constructionist view, readers will be aware of the relation between the target sentences and the developing narrative goal structure despite the absence of overlap between the target region and the subgoal 1 section. Constructionist predictions for the present paradigm were suggested by the findings of Long, Seely, and Oppy (1996). They reported that reading time was longer in the target region of a story when people had previously read a story summary that clarified the meaning of the target than when they had read a control summary. This suggested that, in the relevant-summary condition, reading the target region involved: (a) the resource-demanding retrieval of prior text ideas; and (b) the integration of the retrieved ideas, the current text, and the summary. This result, which we call a consolidation effect, is reminiscent of the finding that reading time is relatively high at the end of story episodes (Gee & Grosjean, 1984; Haberlandt, Berian, & Sandson, 1980). Long et al. (1996) interpreted their finding to be consistent with constructionism; although they noted that, in their materials, there was some surface overlap between their target region and the summary.

More specifically, consider the constructionist account of the reader's understanding of the target sentence, At 12:30, Pam walked into McDonald's. In spite of the local causal coherence of the text at this point, it is assumed that the reader will recognize this as an attempt to fulfill the main goal. That action, therefore, will be related to the goal situation representation. Invoking the goal representation provides access to the contributing subgoals. When subgoal 1 has succeeded, the determination that all of the subgoals have been satisfied results in the reinstatement of other related ideas (e.g., Long et al., 1996). Then, the relevant actions and (sub)goals may be integrated. Both reinstatement and integration are assumed to be demanding of cognitive resources. When subgoal 1 has failed, fewer ideas are reinstated, and integration is deferred. As a result, the constructionist analysis predicted that target reading time would be longer in the succeed condition than the fail condition.

The minimal inference hypothesis. According to this hypothesis, the only automatic
inferences that accompany comprehension in the absence of special reading strategies are those that contribute to the local coherence of the text and those that are based on information readily available either from earlier in the text or from general knowledge (McKoon & Ratcliff, 1992). Theorists have proposed that it is memory-based processes that regulate the ready availability of pertinent knowledge in text comprehension (Albrecht & Myers, 1995, p. 1465; Gerrig & McKoon, 1998; Rizzella & O'Brien, 1996, p. 1217). As such, the minimalist hypotheses generates the same predictions for the present circumstances as does the strong memory-based position. Therefore, we will not make further reference to the minimal inference hypothesis.

**Experiment 1**

**Method**

**Participants.** Forty-three University of Manitoba introductory psychology students participated in this experiment for course credit. All of the participants were native speakers of English.

**Materials.** The materials were derived from a pool of 18 experimental stories. One story was shown in Table 1 and another appears in the Appendix. Each story was 15 sentences long. The stories consisted of: an introduction which described two characters' joint main goal (three sentences), a subgoal 1 section (four sentences), a subgoal 2 section (four sentences), a two-sentence target region, and a two-sentence conclusion.

Several features of the form of the stories were based on previous investigations. A target region of two sentences has frequently been used in such studies (Hakala & O'Brien, 1995; Huitema et al., 1993). With regard to the subgoal sections, the length of four sentences was intended to ensure that the subgoal 2 section would purge subgoal 1 from working memory (Clark & Sengul, 1979; Dopkins, Klin, & Myers, 1993; Jarvella, 1971). Suh and Trabasso (1993) presented evidence that even goals that are currently unsatisfied do not reside in working memory during the processing of a relevant subgoal.

The success of subgoal 1 was varied by presenting different versions of the last sentence of
the subgoal 1 section. The alternate versions of the story of Table 1 describe Greg as either catching or missing the bus that was to take him to his lunch meeting.

For each story, a question intended to encourage readers to read for comprehension was composed. Across the 18 stories, the introduction, subgoal 2 section, and conclusion were queried by seven, six, and five questions, respectively. Half of the questions had yes answers and half had no answers. Examples of the comprehension questions are shown in Table 1 and the Appendix.

The story protagonist names were randomly sampled from the first names that had a frequency of 6 or higher in the norms of Battig and Montague (1969). The names were then randomly assigned to the experimental stories.

From these materials, two experimental lists were constructed. First, 16 stories were randomly chosen from the pool of 18. In list 1, half of the stories were randomly assigned to the subgoal 1 succeed condition, and the other half to the fail condition. The stories were then randomly assigned to list position, subject to the restriction that half of the items in each condition appear in each half of the list. In list 2, the condition assignments of the stories were reversed.

The lists also included 16 filler stories which were 10 to 16 sentences long (Klin, 1995). They were simple narratives with goal structures very different from the experimental materials. Each was followed by a comprehension question, half of which had the correct answer "yes." The filler stories were randomly assigned to list position, with the constraint that no more than three experimental stories should appear consecutively. The filler stories were identical in lists 1 and 2. The lists were preceded by four practice stories, one in each of the succeed and fail conditions, and two fillers.

Procedure. The data were collected with participant groups of one to four students. Each participant was tested in a separate closed room at a station consisting of a personal computer, keyboard, and a monitor that was positioned with its screen 22 cm from the near edge of the table at which the participant sat. The experimental events were programmed using the Micro Experimental Laboratory software (MEL; Schneider, 1988).
Each experimental trial was initiated with a message indicating that the participant could press the space bar of the computer keyboard, which functioned as a "ready" key. When the participant pressed the ready key, the first sentence of the story appeared on row 10 of the monitor. The participant was instructed to read the sentence in order to understand it, and then to press "ready" to view the next sentence. The second sentence replaced the first on the screen. The participant read the entire story in this self-paced way. The texts were displayed using the text insert feature of MEL, which limited the measurement accuracy of sentence reading time to one centisecond. If the participant did not respond within 10 s, the next sentence was automatically presented.

At the end of the story, there was an interval of 2.5 s. Next, a fixation point was presented at row 10, column 1, for 500 ms. Then, the comprehension question appeared. The participant had 6 s to answer the comprehension question "yes" or "no," using the "." and "x" keys of the computer keyboard, respectively. If no answer was made by the time limit, the participant was credited with an error. Participants were not given feedback about their accuracy. After a 3-s intertrial interval, the message to press for more text initiated the next trial. There was a rest period of 40 seconds halfway through the list, disregarding the practice items.

**Results**

The mean reading times are shown in Table 2. Reading times are presented for the first and last sentence of the subgoal 2 section (sentences 8 and 11 overall), and the two sentences of the target region. The subgoal-2 sentences were inspected to determine whether any reading time difference in the target region represented a continuation of differences before the target.

**Insert Table 2 about here**

The analysis comprised planned comparisons of the success variable at the four sentences of interest. This approach has been advocated when specific contrasts are of more theoretical relevance than overall main effects and interactions (Boik, 1993; Kirk, 1982; e.g., Singer & Halldorson, 1996). Participants (F1) and items (F2) alternately functioned as the random variable. An alpha level of $\alpha = .05$ was used throughout unless otherwise indicated. Differences among the means of the four
sentence positions were not considered to be important, because there were different sentences in each position. Likewise, the lists and verbal sets that were created for counterbalancing were of no theoretical interest. They were entered in the analyses, but their effects are not reported (e.g., McRae & Boisvert, 1998).

The planned comparisons revealed that reading time was 10.5 cs longer in the succeed condition than the fail condition at the second sentence of the target section, \( F_1(1,41) = 3.68, \text{MSE} = 608, \ p = .06, \ F_2(1,14) = 7.69, \text{MSE} = 108. \) There was no effect of subgoal success at any of the other three sentences, \( F_s < 1.9. \)

The proportions of correct answers to the comprehension questions were 81% and 85% in the succeed and fail conditions, respectively, \( F_s < 2.9. \)

**Discussion**

The main result was that reading time was longer at the second target sentence in the succeed condition than the fail condition. This outcome conforms with predictions, based on previous observations, that processing time is greater at those points at which the reader can consolidate the information derived from the text (Gee & Grosjean, 1984; Haberlandt et al., 1980; Long et al., 1996). In the present framework, a consolidation effect is consistent with constructionist principles of how people monitor relatively complex goal structures underlying narratives. Conversely, according to the strong memory-based analysis, the reader should not detect global goal relations in the target region.

It is useful to compare the reading time success effects at the four sentences for which we analyzed reading times. It is important that there was no effect of success at the first or last sentences of the subgoal 2 section: Had the success effect been uniform from the onset of the subgoal 2 section, it would have been difficult to attribute the target region success effect to the relations between the target region and subgoal 1. In this regard, the reading times of Table 2 raise the possibility that the success effect was emerging as early as the last sentence of the subgoal 2 section. However, that trend was not evident in Experiment 2.

Furthermore, the success effect did not appear at the first of the two target sentences.
Researchers have noted that effects of this sort sometimes appear beyond the first target sentence because (a) memory searches initiated by that sentence may extend until the reader has proceeded to the next sentence (Huitema et al., 1993, p. 1058), and (b) the activation of a backgrounded idea accumulates over time (Albrecht & Myers, p. 103). Another possibility, albeit speculative, is that there was no success effect at the first target sentence because that sentence signaled the attempt at the main goal only weakly. In the story of Table 1, for example, the first target sentence was *At 12:30, Pam walked into McDonald's*. This sentence clearly refers to an episode or situational structure distinct from subgoal 2 (Gernsbacher, 1990; Zwaan, Magliano, & Graesser, 1995), but it requires certain inferences to determine that Pam has arrived for her lunch meeting.

The target sentence from the example story could have not been phrased, "*At 12:30, Pam walked into McDonald's to meet Greg,*" because the target region would then have had surface overlap with the subgoal 1 section. In that event, the present data would still have borne on the reader's construction of complex goal representations, but they would not have distinguished between the constructionist and the strong memory-based analyses.

We subjected these phenomena to further scrutiny, in order to replicate this novel effect, and to perform an additional test of the consolidation hypothesis. Experiment 2 manipulated: (a) the success of one of the subgoals; and (b) the position, in the story, of the manipulated subgoal, namely, first (replication of Experiment 1) or second. When the manipulated subgoal was second, it should, independent of subgoal success, reside in working memory when the target is read. In this event, consolidation would require no extra reinstatement time when the manipulated subgoal succeeded. Therefore, the consolidation hypothesis predicted that the reading time disadvantage of the succeed condition would diminish or disappear when the manipulated subgoal was in the second position. In contrast, the strong memory-based hypothesis had no basis for predicting a reading time success effect for either position of the manipulated subgoal.

**Experiment 2**

**Method**
Participants. The participants were 65 individuals from the same pool that was sampled for Experiment 1.

Materials. The materials were identical to those of Experiment 1, with the exception that the manipulated subgoal section could appear first or second in the story. For the "lunch meeting" story, the episode about Greg managing or failing to catch the bus could appear before or after the account of Pam working on her report. It is noteworthy that we always manipulated the success of the same subgoal (e.g., catch the bus).

From these materials, four experimental lists were constructed. In the first list, the 16 experimental stories were randomly assigned in equal numbers to each of the four conditions obtained by crossing subgoal success and position of the manipulated subgoal. The remaining lists were derived by cycling the experimental stories across conditions, following a Latin-square scheme. All other characteristics of the lists, including half-list symmetry and the role of the filler and practice stories, were the same as in Experiment 1.

Procedure. The procedure was identical to that of Experiment 1.

Results

We discarded seven participants' data because of an error in labeling the response keys, and those of another because of a computer error. Therefore, the analyses were based on the data of 57 participants.

Reading times and comprehension question accuracy rates are presented in Table 3. Like Experiment 1, reading times are shown for the two sentences of the target region, plus the first and last sentences of the subgoal section that immediately preceded the target. It should be noted, however, that the subgoal section sentences were different ones when the manipulated subgoal appeared first as opposed to second.

Insert Table 3 about here

Planned comparisons revealed that when the manipulated subgoal was first, reading time at the second target sentence was 19.6 cs longer in the succeed condition than the fail condition,
The success effect did not approach significance at the other three sentence positions, $F_s < 1$.

When the manipulated subgoal appeared second, in contrast, success effects of magnitudes as great as 18.5 cs favoring the succeed condition were observed (Table 3). However, these effects reached significance at none of the four sentence positions, $F_s < 3.7$.

The reading times for each of the four sentences were also submitted to Success x Position (manipulated subgoal first or second) repeated-measures ANOVAs. Success and position were within-variables in both the participants-random and items-random analyses. The main effect of success approached significance only at the second target sentence, $F_1(1,53) = 3.83$, $MSE = 2,700$, $p = .056$; $F_2(1,12) = 3.84$, $MSE = 671$, $p = .074$. In addition, at the last sentence of the second presented subgoal section, there was a main effect of position, $F_1(1,53) = 122.7$, $MSE = 1,475$, $F_2(1,12) = 8.37$, $MSE = 5,678$. This reflected mean reading times of 266.4 cs and 323.6 cs when the manipulated subgoal was presented first and second, respectively. We do not assign any theoretical significance to this outcome, because the sentences that appeared in this position depended on whether the manipulated subgoal was presented first or second.

The mean answer accuracy for the comprehension questions was 89%. ANOVA was applied to these values, shown in Table 3, with the variables of success and subgoal position. No significant effects were measured.

**Discussion**

The manipulated-subgoal-first condition replicated Experiment 1: Reading time was greater in the succeed condition than the fail condition at the second target sentence but at none of the other sentences that we inspected. When the manipulated subgoal was presented second, in contrast, no success effect of reading time was detected at any sentence position. It is important that, at the second target sentence, the fail condition exhibited only a modest and nonsignificant reading time advantage of 5.3 cs. The overall result pattern strengthens the conclusion that people detect complex goal relations during story reading, and favors the consolidation hypothesis over the strong memory-based
analysis.

The results of Experiments 1 and 2 are also incompatible with the prediction of higher reading times in the fail condition than the succeed condition. Such a prediction might stem from the possibility that the second character's attempt, in the target region, to execute the main goal might be viewed as inconsistent with the failure of subgoal 1. Numerous studies have examined reading time in text regions that present situational inconsistencies, such as Mary going to bed when she has to make an air reservation. Reading time for such regions has regularly exceeded that in control, consistent regions (Albrecht & Myers, 1995; Albrecht & O'Brien, 1993; Hakala & O'Brien, 1995; Huitema et al., 1993; O'Brien & Albrecht, 1992). However, any inconsistency of the present target region with the preceding text was clearly insufficiently striking to generate such an effect.

When the manipulated subgoal was second, the reading times at the end of second subgoal and at target 1 revealed sizable, nonsignificant reading time disadvantages in the fail condition (see Table 3). These effects might reflect the reader's detection of the protagonist's problem when the manipulated subgoal fails. In that event, however, the first sentence of the second subgoal ought to have revealed a similar effect when the manipulated subgoal is first. However, Tables 2 and 3 do not reveal a well-defined outcome of this sort. Therefore, we offer no strong conclusions about the long reading times in the manipulated-subgoal-second, fail condition.

The success effect in Experiments 1 and 2 is, in the framework of the consolidation hypothesis, attributed to the reinstatement of the manipulated subgoal to working memory and the integration of the interrelated goal information of the current clause and prior text. The next experiment more directly inspected the working memory status of the manipulated subgoal. We used the measure of subgoal-word recognition time (e.g., Dopkins et al., 1993; McKoon et al., 1996). In this procedure, critical story sentences are followed by a probe word rather than by the next story sentence. The participant is instructed to indicate whether or not the word has appeared earlier in the current story. A fundamental assumption is that answer time will be faster for words representing story concepts that are currently in working memory than for those that are not.
In Experiment 3, the participants encountered the conditions of Experiment 1: The manipulated subgoal succeeded or failed, and it always was presented first. A probe word that we judged to represent that subgoal, such as bus for the "lunch meeting" story, was presented in one of three story positions: after the third sentence of the second subgoal section, or after the first or second target sentence. The consolidation hypothesis predicted faster recognition of the subgoal word in the succeed than the fail condition at the story target region. This prediction stems from the fact that consolidation at the target region in the succeed condition requires the reinstatement of the manipulated subgoal to working memory. The strong memory-based analysis, in contrast, predicted no recognition time difference between fail and succeed, for reasons similar to those pertinent to Experiments 1 and 2.

**Experiment 3**

**Method**

**Participants.** Ninety-six participants from the same pool that was sampled in Experiments 1 and 2 took part in Experiment 3.

**Materials.** The materials were derived from a pool of the 18 stories of Experiment 1 plus two additional stories. As in Experiment 1, the manipulated subgoal always appeared in the first position in its story. A probe word was selected for each story. The probe words were nouns that referred to the manipulated subgoal and that were stated explicitly in that section of the story. Some of the 20 stories were slightly modified to eliminate, from the second subgoal section, any allusions to the main goal. The comprehension questions of Experiment 1 were used again, and questions were composed for the two new stories.

To construct six experimental lists, 18 experimental stories were randomly selected from the pool of 20. For the first list, three stories were assigned to each of the conditions obtained by crossing subgoal success (succeed, fail) and the probe position (after the first target sentence; the second target sentence; and the second-last sentence of the subgoal 2 section). Each story was assigned a random list position. The five remaining lists were derived by cycling the experimental stories of list 1 across
the six conditions, following a Latin-square procedure.

Eighteen filler stories, the same as those used in Experiment 1, were likewise assigned to a list position, subject to the restriction that no more than three experimental passages appear consecutively. Six filler passages were assigned to each of three probe positions: namely, after the same sentences, relative to the ends of the stories, that were used for the experimental stories. For each filler story, a probe word was randomly sampled from the narrative stories of Zimny (1987), subject to the restriction it not appear in any filler or experimental story. The filler probe words differed significantly from the experimental probes neither in their number of syllables nor their word frequency (Kucera & Francis, 1967), \( F_s < 3.03 \). The filler materials did not vary across lists.

In total, each list consisted of three blocks of 12 stories, disregarding four practice stories that preceded the list. Each block included an equal number of experimental stories in each condition and an equal number of fillers of each probe position.

**Procedure.** The stories were read in the same manner as in Experiments 1 and 2. However, once during each story, the press of the ready key resulted in the display of a probe word rather than the next sentence. The probe word was presented in capital letters on row 10 of the screen. The probe was flanked by two sets of two spaces plus four asterisks, and the whole display was left-adjusted. The participants were instructed to indicate whether the probe word had occurred earlier in the story. They were encouraged to respond as quickly as possible without sacrificing accuracy. Responses were registered using the same "yes" and "no" keys that were used to answer the comprehension questions. There was an answer time limit of 6 s, and an error was registered if the participant did not reply by then. No accuracy feedback was provided concerning the recognition decisions. Recognition answer times of 2 s or greater were followed by the message, "too slow," displayed for 1 s.

Immediately after the recognition reply was made, story reading continued as usual. When the participant finished reading the story, the comprehension question was presented in the same manner as in Experiments 1 and 2. A rest period of 40 s followed each of the first two blocks of
Results

One participant reported using the wrong response key, and two others did not respond to the probe words. The analyses were based on the data of the remaining 93 participants.

Recognition times. Table 4 shows the mean correct recognition times for Experiment 3. Only recognition times within three standard deviations of the mean for each participant were subjected to analysis (e.g., Albrecht & Myers, 1995; O'Brien et al., 1998). This resulted in the elimination 1.1% of the observations. The overall mean recognition time was 1316 ms.

At each of three probe positions, the succeed and fail conditions were contrasted using planned comparisons. When the probe word followed the third sentence of subgoal 2 and the first target sentence, there were no effects of success, \( F_s < 0.42 \). After the second target sentence, the subgoal 1 probe word was recognized 54 ms faster in the succeed condition than the fail condition, \( F_1(1,87) = 4.97, \text{MSE} = 26,169, F_2(1,12) = 4.76, \text{MSE} = 6,849 \).

The recognition times were also submitted to a composite Success x Probe Position ANOVA. Both success and probe position were within-variables in both the participants-random and the items-random analyses. This ANOVA revealed no effects of theoretical interest.

Table 4 also presents the recognition accuracy percentages of Experiment 3. Planned comparisons revealed that the success effect was significant at none of the three probe positions; although the 6% advantage in the succeed condition in the first probe position was significant in the participants-random ANOVA only, \( F_1(1,87) = 11.75, \text{MSE} = 154 \). The accuracies were also submitted to ANOVAs of the same form as the recognition times. The participants-random analysis revealed a marginally significant effect of success, \( F_1(1,87) = 3.39, \text{MSE} = 230, p = .07 \); and a significant Success x Probe Position interaction, \( F_1(2,174) = 3.57, \text{MSE} = 224 \). However, neither of these effects approached significance in the items-random ANOVA.

Reading times. The reading times for the first and last sentences of subgoal 2 and the first and
second target sentences, all collapsed across probe position, are shown in Table 5. Only reading times for sentences that appeared before the probe word were inspected (e.g., Lea, Mason, Albrecht, Birch, & Myers, 1998). Planned comparisons applied to these values revealed that there was a success effect at the first target sentence only, $F_1(1,87) = 5.04$, $\text{MSE} = 956$, $F_2(1,12) = 6.39$, $\text{MSE} = 138$: Reading time was 11 cs greater in the succeed condition than the fail condition at this sentence.

**Insert Table 5 about here**

**Comprehension questions.** The mean accuracy rate for the comprehension questions was 91%. The values for each condition appear in Table 6. ANOVA applied to these scores revealed no significant effects of theoretical interest.

**Insert Table 6 about here**

**Discussion**

Experiment 3 was designed to evaluate the working memory status of the manipulated subgoal during the reading of collaborative-subgoal stories. The subgoal word was recognized over 50 ms faster in the succeed condition than the fail condition immediately after the second target sentence. At the other probe positions, there was no recognition time advantage in the succeed condition. These results favor the consolidation hypothesis over the strong memory-based hypothesis. They also further situate the contrast between the succeed and fail conditions at the second sentence of the target region.

Experiment 3 also refutes the possibility that, in the fail condition, subgoal 1 is retained in working memory throughout the reading of the subgoal 2 section and possibly beyond. In that event, recognition time would have been lower in the fail condition than the succeed condition in both the subgoal 2 and target regions. This working memory hypothesis is suggested by the current state strategy, according to which the most recent event on a narrative causal chain with causes but no effects is retained in working memory for further processing (Bloom et al., 1990; Fletcher & Bloom, 1988; see also Dopkins et al., 1993; Magliano & Radvansky, 2000). It might be argued that the failed subgoal has exerted no effects because the story does not describe the adoption of a replacement for
that subgoal.

The reading times of Experiment 3 were generally consistent with those of the prior experiments. Like other investigators (Lea et al., 1998), we inspected only those reading times that preceded the probe word. As a result, there was an appreciable reduction in the number of useful observations. At the second target sentence, for example, we could consider only the one-third of experimental trials on which the probe word appeared after that sentence. In spite of this, there was a significant target reading time disadvantage in the succeed condition, although it appeared at the first rather than the second target sentence. We advance no firm explanation for the latter difference from Experiments 1 and 2. We note, however, that when the manipulated subgoal section appeared first, reading time was likewise greater at target sentence 1 in the succeed than the fail condition in Experiments 1 and 2, by magnitudes of 7.7 cs and 2.9 cs respectively.

**General Discussion**

In contrast with the simple goal structures of previous studies, the present study inspected narratives in which two characters had to attain independent subgoals in order to achieve a joint main goal. The success of one of the subgoals, usually the first one, was manipulated. In all other respects, the two versions of the stories were identical. Both the measures of reading time and manipulated-subgoal-word recognition time indicated that, in a target region at which one character tried to execute the main goal, the readers were sensitive to this complex goal structure. This outcome demonstrates that readers monitor the interplay of goals in structures of this sort. We consider this finding to advance our understanding of these phenomena.

However, the design of these experiments also distinguished between constructionism, in the form of the consolidation hypothesis; and a strong form of the memory-based analysis of text processing. Both theories must address people's representation of goal situation models. According to the strong memory-based view, detection of causal and goal relations requires either that all of the contributing ideas already co-occur in working memory; or else that some of the critical ideas reside in working memory and, by virtue of surface and semantic-feature overlap, remind the reader of
backgrounded ideas. The present materials were designed to avoid such overlap. Furthermore, the manipulated-subgoal section of the story was separated from the target region by four sentences that did not refer to that subgoal (e.g., Albrecht & Myers, 1995; Hakala & O'Brien, 1995; McKoon & Ratcliff, 1992). Therefore, the strong memory-based analysis yielded the prediction that the success of the first subgoal would not affect processing in the target region. According to the constructionism, in contrast, readers are sensitive to goal relations, even in the absence of superficial overlap between critical regions of a story. In the present context, the constructionist analysis predicted that the success of the manipulated subgoal would affect the processing of the target region. The results supported this prediction.

The constructionist account states that, at the target region of the present stories, consolidation requires the reinstatement to working memory of the manipulated subgoal. This assumption received support from the low probe-recognition times in the succeed condition in the target region. In addition, consolidation depends on the coordination of the intentional actions, motives, goals, and subgoals conveyed by the story. Coordinating these ideas is proposed to increase the cognitive load, an assumption that is congruent with greater target reading time in the succeed condition than in the fail condition. It is important that these findings mesh with theoretical and empirical explorations of text processing in crucial episodes and at the ending of episodes (Gee & Grosjean, 1984; Haberlandt et al., 1980; Long et al., 1996).

There is a variation of the present analysis that merits consideration. As considered in the Discussion of Experiment 2, the second character's attempt, in the target region, to achieve the main goal might be viewed as inconsistent with the failure of the manipulated subgoal. This alternative was rejected, because it predicts longer target reading times in the fail condition than the succeed condition. However, it is possible that the hypotheses of consolidation in the subgoal-succeed condition and inconsistency detection in the subgoal-fail are both accurate, but that consolidation is more time-consuming than inconsistency resolution. This proposal could be evaluated by comparing the success and failure conditions with an appropriate subgoal-neutral condition. However,
constructing a suitable neutral condition is frequently a major challenge in the study of cognitive processes (Neely, 1977).

A possible objection to the logic of this study is that although there was no overlap between the target region and subgoal 1 region, those regions were indirectly connected. In the story of Table 1, for example, the concept chain McDonald's-Greg-bus connects those regions via the story introduction. We dispute this objection on three grounds. First, priming in item recognition is small with even one intervening item (e.g., McDonald's-GREG-bus) and is eliminated for activation chains that include more than one intervening item (McNamara & Diwadkar, 1996; Ratcliff, Hockley, & McKoon, 1985). Experiment 3, however, revealed a sizable facilitation effect of 54 ms. Second, the second subgoal region also bore indirect connections to the first subgoal (e.g., Table 1 shows that the second subgoal region mentioned "lunch"), but there were no success effects in the reading times or probe recognition times in the second subgoal region. Third, such an objection would render the strong memory-based position unfalsifiable. This is because all concepts in a text are typically interconnected, either directly or indirectly.

Reconciling Constructionist and Memory-Based Processing

Clear distinctions between the constructionist and memory-based analyses of discourse processing would advance understanding in this realm. Toward this objective, it is useful to examine several putative weaknesses of each theory. Memory-based theorists have advanced several claims about constructionism. First, it has been proposed (Albrecht & Myers, 1998; Gerrig & McKoon, 1998) that constructionism cannot address the result that antecedent text concepts are sometimes accessed when they are not situationally relevant to the current clause. This result is exemplified by the retrieval of an irrelevant character (e.g., cousin) when two other characters reunite (Gerrig & McKoon, 1996) or of an irrelevant trait of a character (e.g., vegetarian, O'Brien et al., 1998). This memory-based claim derives from strong assumption (b), mentioned in the introduction: "Constructionism denies passive processing such as resonance." As discussed earlier, however, constructionist formulations have explicitly embraced the role of passive processes, such as
converging activation (Graesser et al., 1994; Magliano & Radvansky, 2000; Singer, Graesser, & Trabasso, 1994). Therefore, the retrieval of situationally irrelevant concepts does not discount constructionism.

Second, constructionism has been proposed (Myers & O'Brien, 1998) to have difficulty explaining the finding that an early, elaborated cause of a father becoming angry ("lost keys") was activated even whether the text provided a later, plausible cause ("broken window"; Rizzella & O'Brien, 1998). However, Rizzella and O'Brien (p. 1217) themselves recognized that passive processes in a constructionist framework could account for the activation of a distal but highly elaborated cause. More challenging for the constructionist position is explaining Albrecht and Myers' (1995) finding that people's detection of an inconsistency between Mary needing to make an air reservation but then going to bed depends on surface overlap (e.g., leather sofa) between the two story segments. We speculate that going to bed might not be interpreted as the sort of goal-driven action that would engage the current goal structure.

Third, a feature of the strong memory-based analysis that was considered earlier was: (c) Constructionism entails the retrieval of antecedent text ideas in a strictly controlled, resource-consuming manner (Huitema et al., 1993, p. 1060; Myers & O'Brien, 1998; Rizzella & O'Brien, 1996, p. 1217). However, the distinction between automatic and controlled processes is not proposed to be central to constructionist theory (Graesser et al., 1994, p. 372; Singer et al., 1994, p. 430). The association of controlled processing with the constructionist theory may be due to Graesser et al.'s (1994) (a) consideration of the deliberate goals with which readers may approach texts, and (b) references to the effort involved in the search for explanation. On the first point, any comprehensive theory of text processing must address the special strategies that readers can consciously apply to text (Kintsch & Young, 1984; McKoon & Ratcliff, 1992; Schmalhofer & Glavanov, 1986). That is not to say, however, that all comprehension processes are controlled. On the second point, our own interpretation of Graesser et al.'s analysis is that the routine search for explanation that accompanies comprehension is not a conscious or overly resource-consuming process. In this regard, we consider
the search for explanation to exemplify the language strategies of van Dijk and Kintsch (1983). In contrast with other definitions of strategic processing (Neely, 1977; Schneider & Shiffrin, 1977), language strategies were described as addressing the fast and automatic processing often associated with language comprehension, and as being unavailable to awareness (van Dijk & Kintsch, 1983, Chapter 3). The search for explanation, viewed as such a strategy, would be more comparable to pronoun resolution in text comprehension than to intentional problem solving (van den Broek, 1990).

There are some ostensive flaws in the memory-based theory that likewise may be met with at least tentative replies. First, superficial overlap between the current clause and an antecedent text region may not be even sufficient to guarantee the reinstatement of the antecedent. Whereas McKoon and Ratcliff (1992) reported that the repetition of the protagonist's name resulted in access to distant antecedent ideas, Albrecht and Myers (1995) found that name repetition was inadequate in this regard. Albrecht and Myers, however, remarked that for backgrounded ideas to resonate, the current text must provide a distinctive cue. Insofar as the protagonist participates in many story episodes, it may not be distinctive. This is an outcome that is compatible with principles of memory. Second, Lutz and Radvansky (1997, Experiment 2) reported that access to an antecedent goal was not affected by the amount of text intervening between the current clause and the goal. This challenges the resonance principle that the further back a text idea, the less it will resonate to the current text. Myers and O'Brien (1998), however, replied that this finding can be accommodated by certain memory-based computational models.

The conclusion that we offer is that the constructionist and memory-based text processing analyses are complementary in their thrust. Constructionist formulations acknowledge the role of passive retrieval processes (Graesser et al., 1994), and memory-based analyses allude to the involvement of higher level processes (Albrecht & Myers, 1998; Myers & O'Brien, 1998; Rizzella & O'Brien, 1996). What distinguishes the theories most is that the memory-based analysis has provided an effective framework for studying passive retrieval processes in text comprehension whereas constructionism has promoted the understanding of the role of higher level processes.
References


Narrative goal structure


Jarvella, R.J. (1971). Syntactic processing of connected speech. *Journal of Verbal Learning and
Verbal Behavior, 10, 409-416.


Mandl, N. L. Stein and T. Trabasso (Eds.), Learning and comprehension of text. Hillsdale, NJ: Erlbaum.


Introduction

1. Philip and Andy wanted to go away for spring break.
2. They had saved up enough money to drive to Banff.
3. They both were avid skiers and were looking forward to the trip.

Subgoal 1

4. Philip needed to borrow a car for the trip.
5. He asked all of his friends but nobody could lend him one.
6. At the last minute, he asked his father if he could borrow the family car.
7. (a) Philip's father said the car had just been fixed, so he could take it. (succeed)
   (b) Philip's father said the car needed to be fixed so he couldn't take it. (fail)

Subgoal 2

8. Andy needed to book a hotel room in Banff.
9. He phoned the travel agent for some information on accommodations.
10. The travel agent told him that there were many cheap hotels.
11. Andy booked them into the Economy Inn for 35 dollars a night.
Narrative goal structure

Target Section

12. Andy packed his bag and waited out front.
13. Andy had also packed a lunch.

Conclusion

14. They planned to rent all their ski equipment in Banff.
15. The weather report said that Banff had just received 20 cm of new snow.

Comprehension Question

Did the men want to go skiing? Yes
This research was supported by a University of Manitoba Fellowship to the first author and by Research Grant OGP9800 from the Natural Sciences and Engineering Research Council of Canada to the second author. The data of Experiments 1 and 2 were presented at the meeting of the Psychonomic Society, Dallas, November, 1998. We are grateful to Karen McClure for her assistance in the preparation of this manuscript. Eric Richards is at the University of Waterloo. Please address correspondence to Murray Singer, Department of Psychology, University of Manitoba, Winnipeg, Canada R3T 2N2.
Footnotes

1. Humanity was saved.

2. We are grateful to Celia Klin for providing these materials.
Table 1

Sample Experimental Story

Introduction

1. Greg and Pam arranged to meet for lunch.
2. They had to talk about their coming divorce.
3. They decided to get together at McDonald's at 12:30.

Subgoal 1 Section

4. Greg had to take bus number 15.
5. To make it on time he had to catch the noon bus.
6. Shortly before 12:00, he hurried out, running to catch it.
7. (a) He jumped onto the bus just as it was pulling away. (succeed)
   (b) The bus door slammed in his face as it was pulling away. (fail)

Subgoal 2 Section

8. At 11:00 AM, Pam's boss asked her to type his year-end report for him.
9. She was worried that she could not finish it before lunch.
10. Surprisingly, she completed it just before lunch.
11. Pam handed in her report and left the office.
Target Section

12. At 12:30, Pam entered McDonald's.

13. McDonald's was very busy, and she had to wait for a table.

Conclusion

14. Pam had to wait five minutes to get a seat.

15. Pam wondered if she had made any mistakes in typing the report.

Comprehension Question

Did Pam finish her report? - Yes.
Table 2

Mean Reading Times (in Centiseconds) and Comprehension Question Accuracy (%) in Experiment 1

<table>
<thead>
<tr>
<th>Subgoal Success</th>
<th>Subgoal 2, Sentence 1</th>
<th>Subgoal 2, Sentence 4</th>
<th>Target 1</th>
<th>Target 2</th>
<th>Question accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</td>
<td>306.7</td>
<td>232.8</td>
<td>231.1</td>
<td>241.4</td>
<td>85</td>
</tr>
<tr>
<td>Succeed</td>
<td>302.7</td>
<td>240.2</td>
<td>238.3</td>
<td>251.9</td>
<td>81</td>
</tr>
<tr>
<td>Difference</td>
<td>4.0</td>
<td>-7.4</td>
<td>-7.7</td>
<td>-10.5</td>
<td></td>
</tr>
</tbody>
</table>
Table 3

Mean Reading Times (in Centiseconds) and Comprehension Question Accuracy (%) in Experiment 2

<table>
<thead>
<tr>
<th>Subgoal Success</th>
<th>Subgoal 2, Sentence 1</th>
<th>Subgoal 2, Sentence 4</th>
<th>Target 1</th>
<th>Target 2</th>
<th>Question Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</td>
<td>322.0</td>
<td>267.2</td>
<td>255.2</td>
<td>260.3</td>
<td>86</td>
</tr>
<tr>
<td>Succeed</td>
<td>328.0</td>
<td>265.6</td>
<td>258.1</td>
<td>279.9</td>
<td>91</td>
</tr>
<tr>
<td>Difference</td>
<td>-6.0</td>
<td>1.6</td>
<td>-2.9</td>
<td>-19.6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subgoal Success</th>
<th>Manipulated Subgoal First</th>
<th>Manipulated Subgoal Second</th>
<th>Subgoal Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</td>
<td>317.0</td>
<td>332.8</td>
<td>259.5</td>
</tr>
<tr>
<td>Succeed</td>
<td>317.3</td>
<td>314.3</td>
<td>264.8</td>
</tr>
<tr>
<td>Difference</td>
<td>-0.3</td>
<td>18.5</td>
<td>12.2</td>
</tr>
</tbody>
</table>
Table 4

Mean Correct Recognition Time (in Milliseconds) as a Function of Subgoal Success and Probe Position in Experiment 3

<table>
<thead>
<tr>
<th>Subgoal Success</th>
<th>Subgoal 2, Sentence 3</th>
<th>Target 1</th>
<th>Target 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fail</td>
<td>1309 (87)</td>
<td>1330 (88)</td>
<td>1345 (88)</td>
</tr>
<tr>
<td>Succeed</td>
<td>1294 (93)</td>
<td>1329 (91)</td>
<td>1291 (86)</td>
</tr>
<tr>
<td>Difference</td>
<td>15 2 (-6)</td>
<td>1 (-3)</td>
<td>54 (2)</td>
</tr>
</tbody>
</table>

Note. Accuracy percentages in parentheses.
Table 5

Mean Reading Times (in Centiseconds) as a Function of Subgoal Success in Experiment 3

<table>
<thead>
<tr>
<th>Subgoal</th>
<th>Sentence</th>
<th>Sentence 4</th>
<th>Target 1</th>
<th>Target 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subgoal 2,</td>
<td>Fail</td>
<td>302.5</td>
<td>255.2</td>
<td>247.2</td>
</tr>
<tr>
<td>Subgoal 2,</td>
<td>Succeed</td>
<td>306.2</td>
<td>259.0</td>
<td>258.0</td>
</tr>
<tr>
<td></td>
<td>Difference</td>
<td>-3.7</td>
<td>-3.8</td>
<td>-10.8</td>
</tr>
</tbody>
</table>
### Comprehension-Question Accuracy (%) in Experiment 3

<table>
<thead>
<tr>
<th>Subgoal</th>
<th>Success</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Subgoal 2,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sentence 3</td>
</tr>
<tr>
<td>Fail</td>
<td>91</td>
<td>88, 94</td>
</tr>
<tr>
<td>Succeed</td>
<td>90</td>
<td>89, 91</td>
</tr>
<tr>
<td>Difference</td>
<td>1</td>
<td>-1, 3</td>
</tr>
</tbody>
</table>