

# The Readiness Is All: The Functionality of Memory-Based Text Processing

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The functionality of memory-based text processing can be described as making ready a range of information of potential relevance to readers' ongoing understanding of texts. In past research, we have demonstrated that a reunion between two characters renews the accessibility of information mutually known to them, making the information ready for incorporation into ongoing comprehension. In two new experiments, we demonstrate how quickly this accessibility fades away again when the text engages other topics. In the general discussion, we describe a series of phenomena that cohere with our conceptualization of the readiness function of memory-based processing.

In the short story "Selfishness" (Mattison, 1997), the narrator, Daisy, recounts an incident in which another character, Denny, is asked to go replenish the pita bread supply for his grandmother's Fourth of July picnic. He invites Daisy along:

Then his grandmother asked him to go and buy some pita bread. "Want to come?" Denny asked me. (p. 70)

They reach a convenience store, but their quest is in vain:

The place had no pita bread. We never found any. We went to Friendly's for iced coffee, and Denny made up stories about teen-agers in the other booths. (p. 70)

Denny spins his tales and reveals some of his criminal past to Daisy—the subject of pita bread is thoroughly abandoned. After what may be an interval of several hours, Daisy and Denny return to his grandmother's house:

By the time we returned to the picnic it was over. We walked up the driveway while Denny's grandmother strode toward us, her skirt swinging. "I gave them English muffins," she called. (p. 70)

By putting the words "I gave them English muffins" in the grandmother's mouth, the author of "Selfishness" has made what we believe to be a reasonable assumption about readers' memory processes: Although readers could not have predicted the exact utterance, "I gave them English muffins," they are quite likely to have been *ready* to read some resolution to the issue of the pita bread. Our purpose in this article is to define more specifically this type of *readiness* and to suggest how it arises as an important function of memory-based text processing.

We begin this article by framing our concept of readiness with respect to the classic concerns of text-processing research. We then review our own past research, which is compatible with this readiness perspective. We offer a pair of new experiments and then discuss the general functionality of memory-based processing with respect to readiness.

## INFERENCES AND READINESS

In most histories of text processing research, the agenda is firmly set by Sir Frederick Bartlett (1932) in his classic work *Remembering*. Bartlett described processes through which readers add elements from their own memories—inferences—to their text representations. In the intervening years, perhaps the majority of text processing research has concerned itself with delimiting the classes of inferences that readers draw with respect to appropriate texts. What has been clear from very early on is that readers draw far fewer inferences, on any given occasion, than their long-term memories would allow (e.g., Rieger, 1975). Presumably no one would claim, for example, that readers encode the inference that Denny's grandmother is less than 8-ft tall, although readers would be likely to agree to the truth of that claim. Although it seems relatively easy to rule out some inferences as likely concomitants to ordinary text processing, there has been far from perfect agreement on what classes of inferences should be ruled in (e.g., Graesser, Singer, & Trabasso, 1994; Greene, McKoon, & Ratcliff, 1992; McKoon & Ratcliff, 1992, 1995, 1998; Singer, Graesser, & Trabasso, 1994). To a great extent, our purpose in this article is to shift the agenda away from the all-or-none-ness that has dominated discussion in this area.

We believe, in particular, that the focus on all-or-none inferences is insufficient to capture the *fluidity* of the processing and representation of even minimally

complex texts. Consider, for example, our earlier claim about *pita bread*. Suppose we are correct to assert that readers of "Selfishness" would be *ready* to encounter a resolution to the pita bread issue. Should we count that as an inference? That is, should we claim "under such circumstances, readers infer that they are likely to encounter a resolution"? This claim would impute a goal directedness to this mental activity with which we would be quite uncomfortable. Rather, we wish to claim that the prior pita bread episode becomes available as a natural consequence of the way in which memory processes work on text representations. This is the essence of the *memory-based* approach to text processing. To us, the great strength of this approach is that it describes the way in which information availability waxes and wanes as a text unfolds. From this perspective—rather than debating classes of inferences—we can ask the more fundamental question, What information is available to the reader at each moment in time?

The central claim of the memory-based text processing approach is that each new piece of linguistic information is understood in terms of the information that it evokes from memory. This process has been labeled *resonance* (Lockhart, Craik, & Jacoby, 1976; Ratcliff, 1978) to capture its conceptualization as a fast, passive process by which cues in short-term memory interact, in parallel, with all information in long-term memory (cf. Gillund & Shiffrin, 1984; Hintzman, 1988; Kintsch, 1988; Murdock, 1983; Ratcliff, 1978; Ratcliff & McKoon, 1988). This fast, easy process allows access to all information in memory. However, the degree to which specific information in memory will be evoked depends on the strength of the association between the cue in short-term memory and the information in long-term memory. This variability in association strength yields a dimension of accessibility—or readiness—of particular pieces of information.

Thus, what we mean by *readiness* is that a certain range of information has—perhaps momentarily—become more accessible. We use the term *ready* because we can predicate it both of information and of readers. That is, we can say both that information in memory was ready to be used and that readers were ready to use it. If, for example, the pita bread quest was evoked by Daisy and Denny's return to the picnic, we would claim both that that information was ready and that readers were ready, as a consequence, to encounter a resolution. It should be clear, however, that this is in no sense a goal-directed process; information is made ready without regard to its utility to the reader. As a consequence, ready information is not privileged with respect to the readers' goals.

There are, in fact, two types of information that memory-based processing might make available. One type of information is knowledge that comes from outside the narrative world: This is the very familiar idea that text processing is guided by associations from concepts in the text to real-world knowledge (e.g., Barton & Sanford, 1993; Erickson & Mattson, 1981; McKoon & Ratcliff, 1989; McKoon, Ratcliff, & Seifert, 1989; Reder & Kusbit, 1991; Roth & Shoben, 1983; Seifert, McKoon, Abelson, & Ratcliff, 1986; Swinney, 1979), sometimes providing schema- or script-like information. Consider again this excerpt from "Selfishness":



The place had no pita bread. We never found any. We went to Friendly's for iced coffee, and Denny made up stories about teen-agers in the other booths. (p. 70)

To form a full picture of this scene, it helps enormously to know that *Friendly's* is an ice cream and food chain, quite common in the Northeast. For northeastern readers, it seems likely that the cue *Friendly's* had made ready, to some extent, the concepts of *booths* and, for that matter, *teen-agers* in those booths. For readers who were not familiar with *Friendly's*, it seems more likely that just some more general restaurant script would be made ready—and maybe *iced coffee*, rather than *Friendly's*, functioned as the more important cue to elicit that script. In either case, we would have to count on cues in the story evoking long-term memory structures external to the story to make appropriate information ready.

The second type of information made available is information from within the story (e.g., Albrecht & Myers, 1995; Albrecht & O'Brien, 1993; McKoon, 1977; McKoon, Gerrig, & Greene, 1996; McKoon & Ratcliff, 1980, 1992; O'Brien, Rizzella, Albrecht, & Halleran, 1998). This is the type of effect we see in the *pita bread* example. An important goal of research on within-story information has been to demonstrate the way in which memory functions to draw together relatively distant parts of texts. (We will make this goal concrete when we, shortly, review some of our own research in this tradition.) Despite this research focus, however, it is important to note that the scope of memory-based processing is very general and should predict access to information both within and without the narrative world.

We have suggested so far that the memory-based approach to text processing conceptualizes text representations as being quite fluid. Some range of information is made ready—with readiness being defined along a dimension of heightened availability—and that readiness changes quickly moment by moment. Depending on how texts unfold, ready information may or may not be sufficiently encoded into text representations to leave the types of residue we can measure in cognitive psychological paradigms. We turn now to a brief review of some of our own research efforts within the memory-based perspective.

## UNHERALDED PRONOUNS AND BEYOND

On a recent afternoon, one of us received a voice-mail message the entire content of which was "It's me. It's here." Neither instance of *it* functions in quite the way that pronouns are supposed to function: That is, neither of them have *linguistic* referents in the local environment. The first *it* at least has a fairly local referent; the caller's voice appropriately signaled his identity. The second *it*, however, is of a type we have labeled *unheralded pronouns* (Gerrig, 1986; Greene, Gerrig, McKoon, & Ratcliff, 1994). There is no information to provide a referent for this pronoun anywhere nearby. In fact, its referent resided in a conversation

that had transpired several hours before the voice-mail message. ("It" was a package that arrived in New York, quite tardily from California.) We offer this rather homely example of an unheralded pronoun to supplement the more literary examples we have presented on earlier occasions (Greene et al., 1994; McKoon et al., 1996). We also wish to illustrate how very unexceptional circumstances are in which speakers might use unheralded pronouns. In this case, presumably, the speaker was confident that the prior conversation would be sufficiently salient that the *it* in "It's here" would be attached to its appropriate referent.

Unheralded pronouns are an excellent phenomenon for a demonstration of readiness. Our research, in fact, was intended to demonstrate that the reunion of speaker and addressee—in this case, via a voice-mail message—would make ready the appropriate information so that the referent of the *it* was available even before it was spoken. To create unheralded pronouns in the laboratory, we wrote stories of the sort illustrated in Table 1. Each story introduced a pair of characters and an *outsider*. In Table 1, the outsider is the *cousin*. We will describe the purpose of the *outsider present* and *outsider absent* versions of the stories in just a moment. For now, it is important to note that the *she* in "Did she make the evening unbearable?" is unheralded. The referent is not in the immediate linguistic environment. Our prediction, however, was that memory-based processes would make the outsider available for easy *she* resolution.

We intended the outsider present and outsider absent versions of the story to demonstrate the fluidity of concepts in discourse representations. In the outsider present versions, the outsiders (e.g., the cousin) are "present" throughout the story. We would expect, therefore, that readers would always find the concept of the cousin relatively accessible. By contrast, in the outsider absent versions, the cousin is offstage for a while. Our prediction was that readers would find *cousin* relatively inaccessible for this period of time. However, cues in the reunion and pronoun sentences should bring *cousin* back into prominence. Our experiments (Greene et al., 1994; McKoon et al., 1996) produced several conclusions.

### Text Cues Produce Renewed Readiness

The outsider present and outsider absent versions of the stories allowed us to demonstrate the waxing and waning of the accessibility of the outsider. Participants in several of our experiments were asked to perform a word recognition task: At some point during a story, they saw a word like *cousin* and were asked to indicate whether it had appeared previously in the text. (We give precise details of this methodology later in Experiment 1.) The critical test points were immediately before the reunion sentence, after the reunion sentence, and after the pronoun sentence (see Table 1). Outsider present versions of the stories yielded response times that were more or less equivalent across test points; outsider absent versions yielded elevated response times before the reunion sentence, but those response times converged with outsider present performance at later test points. That is,

TABLE 1  
An Example Story: The Outsider Is the Cousin, Marilyn

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Introduction

Jane was dreading her dinner with her cousin, Marilyn.  
She complained loudly to her roommate Gloria.  
"Every time I go to dinner at my cousin's I get sick."  
Gloria asked, "Why did you agree to go?"  
Jane said, "Because I'm too wimpy to say no."  
Jane went off to have dinner.

Middle versions

Outsider present

When she arrived, Marilyn was just finishing the cooking. "You're in luck," she said, "we're having fried squid." Jane knew she was in for a wonderful evening. The two of them sat down to dinner. After dinner, they talked for a while, and then Jane left.

Outsider absent

Gloria decided to cook something nice for herself for dinner. "As long as I'm home alone," she thought, "I'll eat well." Gloria searched her refrigerator for ingredients. She found enough eggs to make a quiche. After dinner, she put the dishes in the dishwasher.

Conclusion versions

Pronoun version

Gloria was still up when Jane arrived home about midnight. (*reunion sentence*)  
Gloria asked Jane, "Did she make the evening unbearable?" (*pronoun sentence*)  
Jane chuckled and said, "I just want to get some sleep."

Allusion version

Gloria was still up when Jane arrived home about midnight. (*reunion sentence*)  
Gloria asked Jane, "Was the evening unbearable?" (*allusion sentence*)  
Jane chuckled and said, "I just want to get some sleep."

No-allusion version

Gloria was still up when Jane arrived home about midnight. (*reunion sentence*)  
Gloria asked Jane, "Do you want to go see a movie tomorrow night?" (*no-allusion sentence*)  
Jane groaned and said, "Talk to me about it in the morning."

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although the outsider had become relatively inaccessible in the outsider absent versions, cues from the reunion and pronoun sentences made the outsider equally available for both versions of the story. We interpret this result as suggesting the reunion makes the outsider ready to be a topic of renewed discussion.

### Readiness Is Not Goal Directed

An important aspect of our results is that *all* the information associated with cues in the text increases in accessibility. Cues in the pronoun sentences make ready not only the outsiders (e.g., *cousin*) but also other information in the introductory sections of the story. We provided evidence for this effect by demonstrating



facilitated recognition for targets such as *dreading* in Table 1. This finding reinforces the suggestion we made earlier that memory-based processing is not goal directed. Information is made ready only as a function of the associations among cues.

### Readiness Does Not Rely on the Pronoun

The memory-based perspective suggests that cues from the reunion section of the story make ready the outsider and other information. As such, the pronoun should not play any particularly critical role in bringing about the renewed availability of that information. To test that prediction, we wrote *allusion* endings for our stories. As shown in Table 1, the allusion endings did not have unheralded pronouns; they did not directly reference the outsider in any way at all. Yet, in direct comparisons, pronoun and allusion versions of the stories yielded comparable renewed accessibility for the outsiders.

### Memory-Based Processing Produces Associations in Long-Term Memory

Our results suggest that the introductory and reunion portions of the stories should be bound together in readers' text representations. To assess this prediction, we turned to a delayed recognition task. In this task, participants indicate whether a word in a test list had appeared in one of the stories they just read. (We give precise details later in Experiment 2.) If associations have been formed, we expect words in the introductory portions of the stories (e.g., *dreading*) to prime recognition performance for words from the reunion portion (e.g., *sleep*). This should be true whether participants read the outsider present version or outsider absent version. By contrast, we only predict associations between middle and reunion information for the outsider present versions. We obtained this pattern of results, suggesting that the memory-based processing approach successfully delimits both moment-by-moment processing and long-term memory representations.

This brief review indicates how empirical support for our theoretical ideas evolved as our research progressed. Our initial focus was on unheralded pronouns. However, as we pursued our research program, we were able to establish support for broader claims about the general fluidity of the accessibility of elements within text representations. In this article, we stress the functionality of this fluidity in making ready information to support comprehension. We now offer a pair of new experiments that focus on the functionality of readiness.

## EXPERIMENT 1

In reviewing our series of experiments, we have suggested that they provide evidence for a concept of readiness. That is, we have argued that memory-based processing increases the accessibility of information that is potentially relevant

to a text on a moment-by-moment basis. An immediate consequence of this idea is that ready information should fade away when it proves not to be relevant. We devised a pair of experiments to explore the fading of ready information.

Table 1 contrasts three endings for our unheralded pronoun stories. Each version has the same reunion sentence. We know from our earlier research that the outsider enjoys a reasonable level of accessibility after the reunion sentence and that accessibility is sustained by the *pronoun* and *allusion* sentences. By contrast, the *no-allusion* versions of the stories bring the two characters back together but then engage topics to which the outsider is not relevant. Although the outsider should be ready after the reunion sentence, we predict that the lack of an allusion will cause accessibility to fade. In this experiment, we tested participants on the outsider absent versions of the story with the no-allusion endings. This will allow for a direct comparison to our prior results (i.e., McKoon et al., 1996, Experiment 6).

## Method

**Materials.** The experimental materials consisted of 42 stories that ranged in length from 13 to 16 sentences (the same stories as were used in McKoon et al., 1996). The first section of each story (4–6 sentences) introduced two characters, referring to each of them with a proper name (e.g., Jane and Gloria). These two characters then discussed or interacted with a third character, who was designated by a social role (e.g., cousin, professor, bartender, or senator). We call this character the *outsider* character to distinguish it from the other two characters. After the introduction and discussion of the outsider character, the story described the two other characters (Jane and Gloria) parting company. For this experiment, we only used outsider absent versions of the materials. For these versions, the middle five or six sentences described actions of one of the two characters from the introduction. In these sentences, the outsider was not part of the action; the outsider was not mentioned or referenced either implicitly or explicitly. After this middle section, the story continued with a reunion sentence, in which the two original characters were brought back together (with no mention of the outsider character). The next sentence, the no-allusion sentence, engages a topic to which the outsider had no relevance. Except for the two main characters, this sentence did not refer either explicitly or implicitly to anything from the stories' introductions or outsider absent (middle) parts. A final sentence concluded the story, which was changed from the McKoon et al. stories to suit the change of topic. For each story, the test word was the social role of the outsider (e.g., *cousin*). Each story also had associated with it a sentence used for a true–false comprehension test.

We also used 26 filler stories (McKoon et al., 1996, Experiment 4). These varied in length from 8 to 13 sentences and described two or more characters interacting. These stories were similar in style to the experimental items but did



not follow the same sequence of events in the characters' interactions. Each filler story had three test words and one true-false sentence associated with it.

*Design and participants.* There were three conditions in the experiment: The test word was tested (a) immediately before the reunion sentence, (b) immediately after the reunion sentence, or (c) immediately after the no-allusion sentence. The three conditions were combined in a Latin square with three groups of participants (5 per group) and three groups of stories (14 per group). The individuals in both experiments described in this article participated for credit in an introductory psychology class at Northwestern University.

*Procedure.* In both experiments described here, the stories and test items were presented on a PC screen and responses were collected from the PC's keyboard. Each experimental session began with 30 lexical decision test items to give participants practice with the response keys on the keyboard.

After the lexical decision practice, the experiment proper began. Stories were presented in blocks of four stories, the 1st block containing only filler stories and the remaining 14 blocks each containing three experimental stories and one filler story. Each story was presented one sentence at a time. Participants were instructed to press the space bar when they finished reading a sentence. Pressing the space bar cleared the PC screen and either brought up the next sentence of the story or a test word. When a test word was displayed, it appeared alone on the screen in all capital letters. It remained on the screen until a response key was pressed: *Y* for "yes, the word had appeared in the story" or *N* for "no, the word had not appeared in the story." An incorrect response was followed by an error message: the word *ERROR* presented for 1,500 ms. Participants were encouraged to respond quickly and accurately to the test words; responses slower than 1,200 ms were followed by the message *TOO SLOW*. After each block of four stories, the true-false test sentences for those stories were presented. Incorrect true-false responses were followed by the error message, that is, *ERROR* presented for 1,500 ms. Except for the constraints mentioned, stories were presented in a random order, with a new random order used for every 2nd participant.

Each experimental story had only one test word. Each filler story had three test words, one tested in each third of the story (beginning, middle, and end). Correct responses to those tested in the first two thirds of the stories were half positive and half negative, and those tested in the final third were all negative.

## Results and Discussion

We calculated mean percentages of correct responses and response times for test words for each participant and each item in each condition. Means of those means are shown in Table 2. Analyses of variance (ANOVAs) were performed with both participants and items as random variables, and the significance level was

TABLE 2  
Response Times and Error Rates From Experiment 1 and Previous Research

	Experiment 1		McKoon et al. (1996, Experiment 6)	
	Response Time	Error Rate	Response Time	Error Rate
Before reunion sentence	861	8	884	8
After reunion sentence	798	5	836	9
After no-allusion sentence	861	7		
After pronoun sentence			824	8
After allusion sentence			829	9

Note. Response times are milliseconds. Error rates are percentages.

set at  $p < .05$ . We report standard errors on means calculated from the mean square error terms from the participants' ANOVAs.

We predicted that, as in our previous experiments, the reunion sentence would immediately increase the accessibility of the outsider character; however, the shift to the no-allusion sentence would allow the readiness of this character to fade away. As seen in Table 2, the data conformed to this pattern,  $F_1(2, 28) = 10.3$ , and  $F_2(2, 82) = 6.1$  (standard error of the response time means = 11.7). There was no significant effect on error rates ( $F_s < 1.0$ ; standard error of the means = 0.014). For comparison, Table 2 also provides data from Experiment 6 of McKoon et al. (1996). In that experiment, the topic is maintained, and the outsider remains accessible; only for the no-allusion ending does readiness fade.

Our interpretation of the data in Table 2—that readiness increases with the reunion sentence and fades with the no-allusion sentence—presupposes that this pattern is specific to information evoked by the reunion sentence. To demonstrate that this pattern of data is absent for information that should *not* be evoked by the reunion sentence, we repeated the experiment with a different test word, a test word from the middle part of the story (e.g., *refrigerator* for the story in Table 1). The response times for this test word (for 21 participants) were 888 ms, 865 ms, and 885 ms, for before the reunion, after the reunion, and after the no-allusion sentences, respectively. The differences in the response times were not significant,  $F_1(2, 40) < 1.0$ , and  $F_2(4, 54) < 1.7$  (standard error of the means = 13.8; differences in error rates—16%, 16%, and 17%, respectively, for the three test points—were also not significant). These data confirm our belief that the pattern of waxing and waning of accessibility is specific to information associated with the reunion sentence.

This experiment supports the view that memory-based processing increases the readiness of information but that ready information fades from accessibility when it proves to be irrelevant. This result adds another increment to our view of the ebb and flow of elements in the moment-by-moment representations of texts. As we summarized earlier, our original experiments were intended to dem-

onstrate how backgrounded text elements become accessible again when the text (i.e., in this case, the words of the reunion, pronoun, and allusion sentences) provides appropriate retrieval cues. In this experiment, we see information fading again as it proves to be irrelevant. Our second experiment turns from the short-term waxing and waning of information to long-term memory representations.

## EXPERIMENT 2

If the change of topic allows the readiness of, for example, *cousin* to diminish, how closely bound will the different portions of the text be in long-term memory? As we summarized earlier, our previous research revealed that elements from the introductory and reunion sections of each story were sufficiently related in long-term memory that words from the introductory section primed words from the reunion section—irrespective of which version of the story participants had read (e.g., outsider present vs. outsider absent). We demonstrated these associations for both the pronoun and allusion versions of the stories.

However, in Experiment 1 we showed that the outsider fades in accessibility when a topic is engaged to which the outsider is not relevant. In this experiment, we determine the consequences for long-term memory. We tested priming between the outsider and words from the conclusion part of the story with the allusion version of the conclusion and with the no-allusion version. Our prediction rests on the assumption that the irrelevance of the outsider to the no-allusion information becomes apparent only as that information unfolds in the conclusion of the story; as the conclusion is read, the outsider is still interacting in working memory and forming associations with the information in the conclusion. If so, then these long-term memory associations should show up in priming between the outsider and words from the conclusion. In fact, the size of the priming effect might be as large with the no-allusion conclusion as with the allusion conclusion that contains a reference to the outsider.

Alternatively, if the outsider were not a part of comprehension processes during reading of the no-allusion conclusion, then there would be no strong long-term memory associations among the outsider and the no-allusion conclusion parts of the story. The size of the priming effect between the outsider and words from the conclusion would drop to the baseline for priming among words of the same story. In a previous study with the same stories (McKoon et al., 1996, Experiment 7), the amount of baseline priming was 85 ms less than the amount of priming between the outsider and words from the allusion conclusion. Therefore, if the outsider is only associated at a baseline level with the no-allusion conclusion, the amount of priming should be about 85 ms less than with the allusion conclusion.

For this experiment, we used the allusion versions of the stories as well as the no-allusion versions. The allusion versions both allow us to replicate our



earlier findings and, as we have just suggested, provide a useful comparison for priming in the no-allusion cases. As a control condition, we used as primes words from different stories. If words from the conclusion sections have become associated with the outsider, we expect facilitation for primes from the same stories but not for primes from different stories.

## Method

**Materials.** We used 32 of the outsider absent stories from Experiment 1, in their no-allusion and allusion versions (see Table 1). For each story, the target word was the outsider's social role (e.g., *cousin*). For each target, there were two prime words, one from the allusion version of the conclusion and one from the no-allusion version. For example, for the story in Table 1, the two primes were *sleep* and *movie*. We also chose one test word from the middle part of each story to be used as a filler in the test lists. There were also 34 filler stories with the same characteristics as those used in Experiment 1, each with four test words.

**Procedure.** The experiment consisted of 17 study and test list blocks. The first was a practice block, with two filler stories to study and 24 test words. For the remaining 16 blocks, each study list was made up of two experimental stories and two fillers, followed by 26 test words. The four studied stories were presented in random order, except that an experimental story could not occur in the last study position.

Each study list began with an instruction displayed on the PC screen to press the space bar to begin the list. Then, after a 1-s pause, the four stories were displayed one at a time, for 28 s each, with a 1,500-ms pause between each. After the four stories, a row of asterisks (displayed for 2 s) signaled the beginning of the test list. Each word of the test list was presented individually; it remained on the screen until the participant made a response, pressing the *Y* key for "yes, the word had appeared in one of the stories just read" or the *Z* key for "no, it had not." A correct response was followed by a 100-ms pause and then the next test word. An incorrect response was followed by the word *ERROR* displayed for 2 s and then the next test word.

Within the test list, there were 14 positive test words—6 words from the experimental stories and 8 from the filler stories—and 12 negative test words (words that did not appear in any story in the experiment). The targets for the experimental stories were placed in random positions later than the fourth position, and their prime words were placed in the positions immediately preceding them. For each experimental story, there was also one other test word from the story that was placed in some randomly chosen position in the list later than the target. The random orders of words in test lists and stories in the study lists were changed for each 2nd participant in the experiment.

*Design and participants.* There were four conditions in the experiment, formed by crossing the story-ending factor (allusion vs. no allusion) with whether the prime word for a target was from the same story or from a different story. These four conditions were crossed with groups of participants (4 per group) and groups of stories (eight per group) in a Latin square design. Sixteen Northwestern University undergraduates participated in the experiment.

## Results and Discussion

Once again, we calculated means of means. We also excluded the slowest (approximately 5%) response times. We expected to find a priming relation between the outsider and cues from the story conclusions for both the allusion and no-allusion endings. The results presented in Table 3 confirm that prediction. Primes from the same story led to reliably shorter response times than primes from different stories,  $F_1(1, 15) = 5.2$ , and  $F_2(1, 28) = 11.2$  (standard error of the means = 16 ms). There was no significant effect of story version ( $F_s < 2.9$ ), and the interaction was not significant ( $F_s < 1.0$ ). In addition, there were no significant effects on error rates ( $F_s < 3.4$ ; standard error of the means = 0.03). As we suggested earlier, we know from previous studies (cf. McKoon et al., 1996, Experiment 7) that priming for allusion versions exceeds the within-story priming baseline. In this experiment, we show comparable priming for the no-allusion versions.

The results of this experiment suggest that, even while the outsider is waning in readiness, it still interacts in working memory with the concepts in the conclusions of the stories. As a consequence, an association still exists between the outsider and the no-allusion sentence. Therefore, although the readiness of the outsider is not particularly functional in the no-allusion conclusions, the memory-based reaccess of those concepts becomes a feature of the long-term memory representation. Given the ultimate shape of the story, this association is of dubious value. Consequently, the association would not be predicted by theories of text processing according to which information is only encoded if it is relevant to the goals of the readers or characters of a story or to the story's causal structure (e.g., Graesser et al., 1994; Singer et al., 1994).

TABLE 3  
Response Times and Error Rates From Experiment 2

	Prime Source			
	Same Story		Different Story	
	Response Time	Error Rate	Response Time	Error Rate
No-allusion condition	780	7	842	6
Allusion condition	767	8	820	12

*Note.* Response times are in milliseconds. Error rates are percentages.

## GENERAL DISCUSSION

This pair of new experiments provides an important addition to our earlier research. Experiment 1 throws light on the functionality of the information produced through resonance. Although the outsider became available following the reunion sentence, when the story provided no allusion to the outsider, readiness faded away. Experiment 2 demonstrated that, nonetheless, associations were formed between the introductory and reunion sections even before the readiness of the outsider could fade. We see from this latter result that not all links formed by memory-based processing will be useful (cf. O'Brien et al., 1998). In this case, a rather unnecessary juxtaposition of two disparate parts of the story is created.

In the remainder of this discussion, we are going to lay out an agenda for exploration of the concept of readiness within the memory-based perspective. Our aim is to broaden the base of phenomena beyond those that we and others have studied to date.

## Reunion Structures and the Question of Common Ground

Recall the story excerpts with which we began this article. Denny and Daisy take leave of Denny's grandmother on a quest to find pita bread. When, some period of time later, they return to the grandmother, her first remark is "I gave them English muffins." This portion of "Selfishness" has the same structure as our experimental stimuli: A topic is established (i.e., pita bread); over the intervening text, that topic (presumably) fades from discourse focus; when the characters return to a setting in which the original topic is relevant (i.e., they return to the grandmother's home), the general idea of bread (again, presumably) becomes accessible once more.

In light of this excerpt, we suggest that our stories represent one instance of a very general class of *reunion structures*:

- Characters interact.
- Characters separate.
- Characters reunite.

There is nothing particularly profound about this definition, which is exactly our point. We could almost certainly locate one or more reunion structures in virtually every complex narrative. The main claim we make here is that reunions produce readiness: Given appropriate cues in the reunion portion of a text, access is provided to the content of the prior interaction. If characters typically return to the content of their prior interactions, memory-based processes should generally create readiness for a useful, and appropriate, range of information.

This same analysis applies to real-life reunions. That is, we believe that the same mechanism makes a certain range of information available each time we



reunite (e.g., face-to-face, on the phone, via e-mail) with another individual. Again, this is not a particularly profound observation: The point is to illustrate the general functionality of readiness.

Given this general functionality, we believe that the study of reunion effects of various sorts will lead to interesting extensions of the memory-based processing approach. One such extension suggests that memory-based processes can make available not only knowledge known to multiple characters as they reunite but also knowledge known only to a single character (and the reader) as he or she reunites with a relevant scene of action. For stories such as the cousin story in Table 1, Lea, Mason, Albrecht, Birch, and Myers (1998) provided data suggesting that knowledge of the outsider by only one of the main characters (and the reader), at the point of reunion, was sufficient to increase the accessibility of the outsider. Under appropriate circumstances, quite minimal cues can promote readiness.

This analysis carries with it implications for how information known to readers and characters might be represented: Clark and Marshall (1981) gave the label *reference diaries* to the memory representations of the events that happened to an individual along with information about those other individuals who shared experiences of the events. It is this information encoded in reference diaries—the *common ground* between individuals—that makes possible the felicitous use of unheralded pronouns like those we studied in earlier work (Greene et al., 1994). The new suggestion that we take from Lea et al.'s (1998) work is that readers encode reference-diary-like information with respect to the individual characters they read about.

It is important to stress that reference diaries, as a construct, identify common ground as a collection of memory representations and not as a process. On this view, the effects that have been labeled as due to common ground are emergent properties of ordinary memory processes evoking appropriate representations. Consider, once more, the pair of utterances "It's me. It's here." Let us focus on the second utterance, "It's here." How might the *it* arise on the production side? We imagine that the identity of the target addressee (i.e., Person A) serves as a memory cue; this cue yields a sufficiently accessible referent—namely, *the package*—to allow the speaker to pronominalize. We do not need to imagine that the information is formally encoded as "known to A," only that Person A was encoded as a cue when the memory trace was created (e.g., Gillund & Shiffrin, 1984; Hintzman, 1988; Kintsch, 1988; Murdock, 1983; Ratcliff, 1978; Ratcliff & McKoon, 1988). On the addressee side, the process would run more or less in reverse. The speaker (Person S) would serve to cue Person A's memory. If Person S, acting as a cue, fails to produce a sufficiently salient referent, the speaker's unheralded pronoun will fail. To the extent that "common ground" seems to work pretty well, we suggest that it is because people serve as highly valid memory cues. This is the basis for our ongoing belief in the functionality of reference diaries as representations of information in memory.

This view of reference diaries and how they encode common ground contrasts sharply with the view proposed by Keysar and his colleagues (Horton & Keysar,

1996; Keysar, 1994). Horton and Keysar, for example, championed a "monitoring and adjustment" model of language production. According to this model, time constraints often disallow speakers to "take common ground into account": "While the initial plan does not take common ground into account, speakers do monitor and attempt to correct and revise utterances which violate common ground" (p. 111). By contrast, our account denies that common ground is something that speakers (or addressees) can or cannot take into account. That is, our perspective suggests that common ground is merely memory processes acting on representations. When, for example, Denny and Daisy finally return to his grandmother's picnic, ordinary memory cues evoke *pita bread*; we do not have to postulate a separate "adjustment" process. Of course, it is possible that, under some circumstances, "people as cues" to memory will not sufficiently evoke appropriate information; such circumstances might result in speakers producing utterances that are not understood by their addressees. In fact, because cognitive psychologists have reasonable expertise in creating memory illusions, we are quite certain that we could invent circumstances in which cues were arranged such that speakers and addressees would give the appearance that common ground, in the first pass, had been not properly taken into account. These circumstances, however, should confirm the underlying conceptualization of process and representation.

We began this section by noting the ubiquity of reunion structures in texts and in life. We illustrated, furthermore, that reunion phenomena point the way toward a memory-based processing account of common ground. Our overarching purpose has been to show the general utility of our concept of readiness. We turn now to a second class of narrative experiences that appear to be well served by a readiness analysis.

### Perspective and Participatory Responses

Consider another moment from "Selfishness." Denny is explaining to Daisy his concerns about the security of a friend's (Pekko's) frozen yogurt store:

"That store isn't secure. Have you noticed that?"

I [Daisy] admitted I hadn't.

"That little back window doesn't lock," he said. "I'm surprised because it's not an old building. I think that window was replaced at some point."

"What do you know about the back window?"

"I help," said Denny. "I've washed that window. Anybody could climb in that window." (p. 74)

Considerably later in the story—perhaps 9 months have passed—Pekko arrives at a barbecue and shares some bad news:

"When I got to the store this morning," he said, "it had been broken into."

Of course we asked questions and exclaimed, but he shook his head. "Nothing was taken. Nothing was broken. The back window had been pried up. The alarm was turned off. But there's something else."

"What is it, Pekko—would you tell us what it is, please?" I [Daisy] said sharply.

"The person who did it was Denny," he said. (p. 77)

The critical sentence here is "The back window had been pried up," which calls to mind the earlier discussion and, in particular, *Denny*. It seems important to this moment that *Denny* already be ready in readers' representations. How else, for example, can they understand the sharpness of Daisy's question? The information evoked from memory contributes to the tension of the moment. More formally, we claim that readiness affords readers a particular *perspective* on the moment. That is, the information yielded via memory-based processes gives readers a vantage point, from which subsequent events will be viewed, that would be unavailable to some of the characters in the story. We claim that textual cues often make ready information that defines readers' perspectives.

Note that we are not suggesting that, in this example, the idea of *Denny* necessarily intrudes on consciousness. Rather, in keeping with our earlier claims about readiness, we are suggesting that information relating *Denny* and the *back window* has become accessible once again in the text representation. We also believe it is worth noting how diligently the author established *back window* as a memory cue (cf. Albrecht & Myers, 1995). The experience of this passage would, of course, be subject to individual differences among readers. However, it seems quite likely that a reader who was reasonably attentive would have encoded the memory representations to enable the link from the *window* to *Denny*.

Let us take the role of memory-based processes in establishing perspectives one step further. We turn to *Hamlet* for a more classical example.<sup>1</sup> In the final moments of the play, the reader (or viewer) knows that Laertes and Claudius wish to bring about Hamlet's death and have devised an initial course of action and a fallback plan. They hope that Laertes will be sufficiently skilled in a duel with Hamlet to prick him with a poisoned sword. Should, however, Laertes's skill be lacking, Claudius will offer Hamlet poisoned wine. As the scene unfolds, Laertes *does* lack for skill; Claudius offers the wine (V, ii): "Stay, give me drink. Hamlet, this pearl is thine. Here's to thy health! Give him the cup." Hamlet responds, "I'll play this bout first; set it by awhile." A moment later Hamlet's mother, Queen Gertrude, picks up the wine:

Queen: The Queen carouses to thy fortune, Hamlet!

Hamlet: Good madam!

King: Gertrude, do not drink.

<sup>1</sup>*Hamlet* is also the locus of Shakespeare's endorsement of the memory-based approach to text processing. In Act V, Hamlet informs Horatio "the readiness is all."



Queen: I will, my lord; I pray you pardon me. [*Drinks.*]

What might happen in this interval? One good possibility is that the reader will emit the mental response, "Don't drink the wine!" We have called such noninferential mental contents *participatory responses* (or *p-responses* for short) to indicate that they arise as a consequence of a certain level of engagement on the part of the reader (Allbritton & Gerrig, 1991; Gerrig, 1993). How might this p-response come about? Our suggestion is that memory-based processes will make ready the information that Claudius has poisoned the wine (i.e., that the pearl must be poison). When, even so, Gertrude goes to drink the wine, readers *discover* that they are in possession of knowledge of which Gertrude is unaware (Gerrig, in press). That is, they are able to compare the consequences of their knowledge (i.e., no one should drink the wine) to Gertrude's intended action. The p-response—"Don't drink the wine"—is, presumably, intended as a mental accommodation to this discovery. We see in this example that textual cues again lead to a particular reader perspective, one that is informed by Claudius's intentions. The added feature is the reader's discovery, based on this perspective, of an important difference to what some characters know. Ready information plays a critical role in the readers' mental responses to the way the scene unfolds.

Directly after Gertrude drinks the wine, Claudius has an aside: "It is the poisoned cup, it is too late!" We can interpret this line as a way for Shakespeare to hedge his bets. Should the earlier textual cues fail for some viewers at some times, this line ensures that they will understand why the Queen subsequently swoons. The scene, however, plays out in a much less interesting way if one has not become aware of the poison in the cup before Claudius's aside. Furthermore, if memory-based processes have done their work, Claudius's aside seems clumsy. The moment may teach us something about Shakespeare's assessment of the variability of individuals' reception of his plays.

We intend this pair of examples from "Selfishness" and *Hamlet* to illustrate a final time both what it means for readers to be ready and the role that memory-based processes play in bringing about such readiness. A narrow research focus on inferences obscures many other aspects of the experience of narratives, including reunion phenomena, perspectives, and participatory responses. We have suggested that these phenomena do not require invocation of special reader goals. Rather, this article has provided further data and analysis to support the claim that simple, general memory processes provide the infrastructure of information that allows readers to be ready for a wide range of literary effects and everyday experiences.

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