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# How Automatically Do Readers Infer Fictional Characters' Emotional States?

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## Abstract

We propose that reading stories, such as a narrative about a character who takes money from a store where his best friend works and who later learns that his best friend has been fired, stimulates readers to activate the knowledge of how the character feels when he finds out that his best friend has been fired from a job for something he did. In other words, we propose that readers infer fictional character's emotional states. In this article, we first review two series of laboratory experiments (Gernsbacher, Goldsmith, & Robertson, 1992; Gernsbacher & Robertson, 1992) that empirically tested this hypothesis by measuring participants' reading times to target sentences that contained emotion words that matched (e.g., *guilt*) or mismatched (e.g., *pride*) the implied emotional state. We then present a third series of laboratory experiments that tested how automatically such knowledge is activated by using a divided-attention task (tone-identification, per-sentence memory load, or cumulative memory load) and by comparing target-sentence reading time when the emotional state is explicitly mentioned versus only implicit.

Several years ago, one of our colleagues (Douglas Hintzman) announced a colloquium that was to be given by a leading reading researcher (Alexander Pollatsek) in the following way:

> I asked Dr. Pollatsek to explain "reading." He replied that it is a method that millions have used to gain enlightenment. Practitioners of this art ("readers," as Pollatsek calls them) adopt a sitting position, and remain virtually motionless for long periods of time. They hold before their faces white sheets of paper covered with thousands of tiny figures, and waggle their eyes rapidly back and forth. While thus engaged, they are difficult to arouse, and appear to be in a trance. I didn't see how this bizarre activity could bring knowledge. Pollatsek said that the knowledge actually comes from other minds, which he called "authors." During reading and perhaps afterward, the author has control over the reader's mind. As if all this weren't enough, it turns out that the author does not have to be nearby or even alive for this eerie communication to occur. I asked whether a reader's mind could be controlled by an author who lived thousands of miles away and had been dead for



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The experiments reported here were described in a presentation by Morton Ann Gernsbacher at the 26th International Congress of Psychology, August, 1996, Montreal, Canada, and at a workshop on Text Representation held at Utrecht University, July, 1997, Utrecht, The Netherlands.

> thousands of years, and Pollatsek just nodded as though it happened every day. “Suppose I stare at this piece of paper and jerk my eyes back and forth,” I said, grabbing a page from his desk. “Will that make me wise?” “No,” he replied, growing annoyed at my skepticism. “It takes many years of practice to become a proficient reader. Besides, that was written by a dean” (D. Hintzman, personal communication, October 15, 1984).

Hintzman’s introduction, though written tongue-in-cheek, of course, captures both the mystery and the simplicity of reading. By seemingly waggling one’s eyes across a page of squiggles, a reader’s mind is affected. As Zwaan, Langston, and Graesser (l995) so aptly stated, “Readers create, as it were, a microworld of what is conveyed in a text” (p. 292). We call this creation of mental microworlds *knowledge activation*.

What type of knowledge is activated in readers’ minds when they read, for example, a narrative? In reviewing the field of narrative comprehension research, Graesser, Millis, and Zwaan (1997) generated the following list of candidates: the referents of nouns and pronouns, the properties of objects, the causes and consequences of events and actions, the spatial relationships among entities, the goals and plans that motivate characters’ actions, and the characters’ emotions.

In our research, we have previously asked readers (of our articles and readers participating in our laboratory experiments) to read the following narrative:

> One night last week Tom went to visit his best friend Joe, who worked at the local7-Eleven to get spending money while in school. While Tom was visiting, Joe needed to go to the storage room for a second. While Joe was away, Tom noticed the cash register had been left open. Tom couldn’t resist the open drawer and quickly took a $10 bill. At the end of the week, Tom learned that Joe had been fired from the 7-Eleven, because his cash had been low one night.

We have used this narrative, and others like it, to explore whether a particular type of information becomes activated in readers’ minds when they read such narratives. In other words, we have used these narratives to examine whether readers draw a particular type of inference, as we equate inferencing with knowledge activation (Gernsbacher, 1990, 1991, 1995, 1997). The type of inferencing that we have investigated was inferring fictional characters’ emotional states.

We propose that reading the example narrative about Tom and Joe (presented earlier) stimulates readers to activate the knowledge of how someone feels when he finds out that his best friend was fired from a job—a job whose pay the best friend used for spending money while in college—and the reason the best friend was fired was most likely something the person did. In other words, we propose that when reading the example narrative, readers infer that the fictional character Tom experiences the emotional state of guilt. In this article, we first review two series of laboratory experiments (Gernsbacher et al., 1992; Gernsbacher & Robertson, 1992) that empirically tested this hypothesis. Then, we present a new series of experiments that specifically examined how automatically such inferences are drawn.

## SCIENTIFIC STUDIES OF READERS' INFERENCING OF EMOTIONAL STATES

We (Gernsbacher et al., 1992) began our empirical investigation of whether readers infer fictional characters' emotional states by writing 24 experimental narratives. Each experimental narrative was intended to stimulate readers to activate knowledge about a particular emotional state. We want to stress that our manipulation was accomplished implicitly—that is, without any explicit mention of emotion. Rather, the experimental narratives described concrete actions, but never was there any mention of emotion until a final "target" sentence.

Participants read the 24 experimental narratives and 24 nonemotional filler narratives sentence by sentence. Unknown to the participants, the last sentence of each experimental narrative was a target sentence. Each target sentence contained an emotion word that either matched or mismatched the emotional state that we predicted that readers would infer, for example, *guilt*, as in "It would be weeks before Tom's guilt would subside." We measured participants' reading time for each target sentence, and across three experiments, we manipulated the nature of the mismatch.

In our first experiment, the matching and mismatching emotion words were what we called *perceived converses*. One emotion word of a pair had a negative affective valence (for example, *guilt*), and the other emotion word had a positive affective valence (for example, *pride*). Because we hypothesized that readers activate knowledge about emotional states, we predicted that the target sentences would be read more rapidly when they contained matching as opposed to mismatching emotion words. The participants' mean reading times for the target sentences in the experimental narratives are shown in the two left-most bars in Figure 1. As illustrated, participants read the target sentences considerably more rapidly when they contained an emotion word that matched the emotional state implied by the narrative than when they contained an emotion word that mismatched the emotional state implied by the narrative.

In a second experiment (reported in Gernsbacher, 1994), the mismatching emotion words were opposite in their affective valence but were not perceived converses of the matching emotion words. For instance, in the narrative about Tom and the 7-Eleven store, the mismatching emotion word was *hope*. *Hope* has the opposite affective valence of *guilt*, but *hope* and *guilt* are not converses. The participants' mean reading times for the target sentences in this experiment are represented by the two middle bars in Figure 1. As illustrated, participants read the target sentences more rapidly when they contained matching as opposed to mismatching emotion words.

In a third experiment (Gernsbacher et al., 1992; Experiment 2) the mismatching emotion words had the same affective valence of the matching emotion words, although the mismatching emotion words represented emotional states that were less likely to occur than the states represented by the matching emotion words. For instance, the mismatching target word for the narrative about Tom and the 7-Eleven store that implied the emotional state guilt was *shyness*.

The two right-most bars in Figure 1 represent the reading times in this experiment. Participants again read the target sentences more rapidly when they contained matching as opposed to mismatching emotion words, as we found previously; however, when the mismatching emotion words shared the same valence as the matching emotion words, the target sentences were not read nearly as slowly. We suggested that these data support the hypothesis that readers activate knowledge about emotions during narrative comprehension; in other words, readers infer fictional characters' emotional states. Moreover, we suggested that the content of the narratives—not the target sentences—caused the activation of emotional knowledge. In a fourth experiment, we specifically tested that proposal.

In Gernsbacher et al. (1992; Experiment 3), we employed a different laboratory task. It was a task that comprehension researchers argue reflects only what is currently activated, rather than how easily a stimulus (such as a target sentence) can be integrated. The task is simply to pronounce a printed test word as rapidly as possible (Balota & Chumbley, 1984; Chumbley & Balota, 1984; Keenan, Golding, Potts, Jennings, & Aman, 1990; Lucas, Tanenhaus, & Carlson, 1990; Seidenberg, Waters, Sanders, & Langer, 1984).

Participants in the word-pronunciation experiment read the same narratives as participants in the reading time experiments. Unlike the reading time experiments, however, the experimental narratives in the word-pronunciation experiment were not followed by a target sentence that contained a matching or mismatching emotion word. Instead, at two different points during both the experimental and filler narratives, a test word appeared on the screen, and the participants' task was simply to pronounce the test word as rapidly as possible. One of the test words presented during each experimental narrative was a filler word that was unrelated to the narrative, but the other was an emotion word that matched or mismatched the implied emotional state. The emotion test word appeared immediately after participants read the main body of the narrative—the part of the narrative that did not contain the target sentence. The matching versus mismatching test words were perceived converses, for example, *guilt* and *pride*.

We found that test words were pronounced reliably more rapidly when they matched as opposed to mismatched the characters' implied emotional states. For example, after participants read the narrative about Tom and the 7-Eleven, they pronounced the word *guilt* more rapidly than the word *pride*. Therefore, this experiment demonstrated the powerful role that knowledge activation plays in readers' inferencing fictional characters' emotional states.

## SCIENTIFIC STUDIES OF READERS' ACTIVATION OF EMOTIONAL KNOWLEDGE

In a second series of laboratory experiments (Gernsbacher & Robertson, 1992), we further demonstrated the role that knowledge activation plays in readers' inferencing fictional characters' emotional states. In our previous experiments (i.e., Gernsbacher et al. 1992), all participants read 48 total narratives. Half (24) of the narratives were experimental, emotional narratives, and half (24) were nonemotional, filler narratives. In Gernsbacher and Robertson (1992), we manipulated the number of emotion narratives that our participants read in order to manipulate the amount of emotion knowledge that would be activated. In one experiment (Gernsbacher & Robertson, 1992; Experiment 1), we presented two density conditions: In the highdensity condition, 36 of the 48 narratives were emotional narratives, and only 12 were nonemotional, filler narratives. In the low-density condition, only 12 of the 48 narratives were emotion narratives, and 36 were nonemotional, filler narratives. The data we analyzed were reading times to the target sentences in a "common" set of 12 emotional narratives that occurred in both the high- and low-density conditions. Half the target sentences contained matching emotion words, and half contained mismatching emotion words. The matching and mismatching emotion words were perceived converses.

Figure 2 displays the participants' mean reading times. As in all our previous experiments, participants read the target sentences considerably more rapidly when they contained matching as opposed to mismatching emotion words. In this experiment, the effect maintained in both the low- and high-density conditions. Indeed, as illustrated in Figure 2, the density manipulation did not affect reading times for the matching target sentences, but it did affect reading times for the mismatching target sentences. The more emotion narratives the participants read, the faster they read the mismatching sentences.

We attributed this density effect to knowledge activation rather than sentence integration. Recall that the target sentences and experimental narratives were the same in the high- and low-density conditions; therefore, any difference in reading times must have been produced by factors outside the 12 experimental narratives and their 12 target sentences. We suggested that reading more emotional narratives more strongly activated readers' knowledge of emotional states.

This greater activation of emotional knowledge affected reading times to only the mismatching sentences because information about the matching emotional states was already highly activated by the content of the narratives. A counter explanation for the density effect, however, is that participants adopted a strategy. In the high-density condition, participants read more mismatching target sentences. Although participants also read more matching target sentences in the high-density condition, perhaps the higher incidence of mismatching sentences in the high-density condition encouraged participants to adopt a strategy for dismissing them or reading them less thoroughly.

In Gernsbacher and Robertson's (1992) second experiment, we performed a proportion manipulation to rule out this counter explanation. We manipulated the proportion of matching versus mismatching target sentences while holding constant the density of emotional narratives. We used the highest possible density of emotional narratives—all 36 narratives that participants read were emotional narratives. We presented three proportion conditions. In the 75% mismatching condition, the target sentences for 27 narratives contained mismatching emotion words, and the target sentences for the remaining 9 narratives contained matching emotion words. In the 50% mismatching condition, the target sentences for an equal number of narratives contained mismatching and matching emotion words. In the 25% mismatching condition, the target sentences for only 9 narratives contained mismatching emotion words, where as the target sentences for 27 narratives contained matching emotion words.

The data we analyzed were reading times to target sentences in a common set of 18 narratives that occurred in all three probability conditions. Half of the target sentences contained matching emotion words, and half contained mismatching emotion words. The matching versus mismatching emotion words were perceived converses. If participants' faster reading times to the mismatching target sentences in the high-density condition were due to a strategy, then the proportion manipulation should have invoked that strategy. That is, participants should have read the mismatching target sentences most rapidly in the 75% mismatching condition and least rapidly in the 25% mismatching condition. As illustrated in Figure 3, however, that is not what we observed.

As illustrated in Figure 3, in all three probability conditions, participants read the target sentences considerably more rapidly when they contained matching as opposed to mismatching emotion words. The proportion manipulation, however, did not affect the participants' reading times to either the matching or the mismatching target sentences, suggesting that the high-density effect in our previous experiment was not due to a strategy. Instead, we suggested that in the high-density condition, participants read the mismatching sentences more rapidly because more emotional knowledge had been activated.

## SCIENTIFIC STUDIES OF READERS' ACCESSIBILITY TO EMOTIONAL KNOWLEDGE

Our previous experiments support the hypothesis that readers activate knowledge about human emotions, in other words, that readers infer fictional characters' emotional states. How accessible is that knowledge? Does inferring fictional characters' emotional states consume cognitive capacity? A debate has raged within the text-comprehension literature about how "automatically" certain inferences are drawn (Graesser, Singer, & Trabasso, 1994; McKoon & Ratcliff, 1992, 1995). Some agitators of the debate have prescribed using time course data to adjudicate the issue, claiming that if an inference is not drawn within a magic time frame (e.g., 200 ms), then the information must not be readily accessible.

We chose instead to answer these questions by drawing directly on the attentional-capacity and memory-retrieval literature. Jacoby (1991) proposed a two-factor theory of recognition memory; one factor relies on automatic processes, and the other relies on more attentionally driven intentional processes. According to Jacoby, the more intentional use of memory should be hampered when attention is divided. In contrast, the more automatic retrieval from memory—akin to our sense of knowledge activation—has been empirically demonstrated to be invariant across full- versus divided-attention situations. Applying this distinction (as well as an entire literature on attentional capacity; e.g., Kahneman, 1973) to our empirical question of the accessibility of fictional characters' emotional states during reading, we proposed the following hypothesis: If readers' ability to activate knowledge about emotions is not compromised when they simultaneously perform a divided-attention task, we can assume that the information is relatively accessible.

## EXPERIMENT 1

In our first experiment, participants read our original 24 emotion narratives and 24 filler (nonemotional) narratives. We measured participants' reading times for target sentences that contained emotion words that matched versus mismatched the implied emotions. The matching versus mismatching emotion words were perceived converses. While reading half the emotion narratives and half the filler narratives, participants performed a tone-identification task: At seemingly random points during the narrative, although always after participants had finished reading a sentence, they heard a sequence of five tones; three of the five tones were of one pitch, and the other two were of another pitch. The participants' task was to identify whether the majority of the tones (i.e., three of the five) were the higher pitched tone or the lower pitched tone.

The concurrent tone-identification task was relatively attentionally demanding; on average, participants performed with only 87% accuracy when they performed it concurrently with reading, suggesting that their performance was not "at the ceiling." If activating knowledge about emotional states during narrative comprehension—in other words, if inferring fictional characters' emotional states—is a relatively effortful component of reading, then we should have observed a diminished difference between participants' reading times for target sentences that contained matching versus mismatching emotion words when participants had performed the tone-identification task during narrative comprehension.

### Method

**Participants—**Eighty native American English speakers participated to receive extra credit in an introductory psychology class. No one participated in more than one of the experiments described in this article.

**Materials—**The stimuli included the 24 experimental narratives from Gernsbacher et al. (1992; Experiment 1). Each narrative was paired with the narrative that implied its perceived converse emotional state. By this we meant that the matching and mismatching emotion words were opposite along one very important dimension, but they were almost identical along other dimensions. The dimensions along which they were almost identical were their intensity; duration; relevance to self versus others; temporal reference to events in the past, present, or future; and so forth. The dimension along which they were opposite was their affective valence. For example, the narrative about Tom, described earlier, implies that the fictional character will feel guilty. The narrative for which *pride* matched and *guilt* mismatched was the following:

> Paul had always wanted his brother, Luke, to be good in baseball. So Paul had been coaching Luke after school for almost two years. In the beginning, Luke's skills were rough. But after hours and hours of coaching, Paul could see great improvement. In fact, the improvement had been so great that at the end of the season, at the Little League Awards Banquet, Luke's name was called out to receive the Most Valuable Player A ward.

The paired narratives were identical along at least two dimensions: whether the narrative described an interpersonal versus a nonsocial situation and the gender of the protagonist.

Each experimental narrative was followed by a target sentence that contained either the matching emotional state (e.g., "It would be weeks before Tom's *guilt* would subside.") or a mismatching emotional state (e.g., "It would be weeks before Tom's *pride* would subside.").

The stimuli also included 24 nonemotional, filler narratives that were also used by Gernsbacher etal. (1992; Experiment 1). The filler narratives were written in the same style as the experimental narratives, but they were not intended to induce readers to represent a particular emotional state; they were intended to be neutral, for example:

> Today was the day Tyler was going to plant a garden. He put on his work clothes and went out to the shed to get the tools. The ground was all prepared so he began planting right away. It was a small garden, but then he didn't really need a large one. It was large enough to plant a few of his favorite vegetables. Maybe this year he'd plant some flowers, too.

A filler narrative preceded each experimental narrative.

The stimuli for Experiment 1 also included 96 sequences of tones used for the tone-identification task. Each tone sequence comprised five tones; three of the five tones in each sequence were at one frequency (either 675 Hz or 400 Hz), and the other two tones in each sequence were at the other frequency. We considered the 675 Hz tones "the high-pitched tones" and the 400 Hz tones "the low-:pitched tones." Therefore, each tone sequence comprised two high-pitched tones and three low-pitched tones or three high-pitched tones and two low-pitched tones. The 96 tone sequences were 12 repetitions of eight basic patterns. Four of the basic patterns comprised two high- and three low-pitched tones; half began with a high-pitched tone (*High-Low-High-Low-Low and High-Low-Low-High-Low*), and half began with a low-pitched tone (*Low-Low-High-High-Low and Low-High-Low-Low-High*). The other four basic patterns comprised three high- and two low-pitched tones; half began with a high-pitched tone (*High-Low-High-Low-High and High-Low-High-High-Low*), and half began with a low-pitched tone (*Low-High-Low-High-High and Low-High-High-Low-High*). All tones were approximately 170 ms long, and 90 ms intervened between tones; therefore, each tone sequence lasted approximately 1,120 ms.

During the experimental narratives for which participants also performed the tone-identification task, a tone sequence was presented before each of four sentences, which were randomly selected with the exception that a tone sequence never preceded the final (target) sentence. We avoided preceding the target sentence with a tone sequence because we did not want target-sentence reading time, which was our dependent variable, to be artifactually contaminated by whether the participants were performing the tone-identification task. Instead, we wanted to assess the effects of performing a secondary task on comprehension of the text preceding the target sentence. During the filler narratives for which participants performed the tone-identification task, a tone sequence was presented before each of three, four, or five sentences, which were randomly selected with the exception that a tone sequence always preceded the last sentence. We varied the number of tone sequences presented during the filler narratives so that participants would not assume there would always be four, and we always preceded the last sentences of the filler narratives because we had purposely avoided the last sentences, which were target sentences, in the experimental narratives; we also wanted to instill the seeming randomness of the location of the tone sequences further.

**Design—**We formed four material sets by varying (a) whether the emotion word in the target sentence matched or mismatched the emotional state implied by the narrative and (b) whether the participants performed the tone-identification task while reading the narrative. The following was true of each material set: Of the 48 total narratives (24 experimental and 24 filler narratives), participants performed the tone-identification task while reading half of each type (experimental and filler). Of the 24 experimental narratives, 12 of the narratives' target sentences contained matching emotion words, and 12 contained mismatching emotion words. Of the 12 experimental narratives for which participants concurrently performed the tone-identification task, half contained matching target sentences, and half contained mismatching target sentences. The narratives appeared in the same order in each material set. Twenty participants were randomly assigned to each of the four material sets.

**Procedure—**Participants were tested in groups of four or fewer in sessions lasting 40 to 50 min. Each participant sat in his or her own cubicle and wore a set of headphones. Participants read instructions from a computer monitor. The instructions stated that the experiment involved reading several short narratives, and the participants' task was to read each narrative at a natural reading rate. Participants practiced reading a narrative by pressing a key labeled *ADVANCE* to indicate when they were finished reading each sentence. To encourage their comprehension; the participants were required to write a suitable one-line continuation for some of the narratives, which they practiced during the instructions.

After becoming familiar with the reading task, participants received instructions on the tone-identification task. The instructions stated that the participants would hear a sequence of five tones, three of one pitch and two of another pitch, and that the participants' task was to identify whether the majority of the tones (i.e., three of the five) were the high-pitched tone or the low-pitched tone. Participants indicated their response by pressing either a key labeled *HIGH* or a key labeled *LOW*. Participants listened to an example tone sequence during the written instructions and then practiced on 10 additional tone sequences.

Finally, the participants were shown how the two tasks (reading sentences and identifying tones) would be interwoven, and they practiced doing both tasks during one narrative. During the instructional phase of the experiment, the participants were given feedback on the tone-identification task regarding whether they were correct, wrong, or did not respond within 7 sec.

At the beginning of each narrative, a recording of the word *ready* was heard over the headphones simultaneously with the printed word *READY*? appearing in the center of each participant's computer monitor. When the participants pressed the key labeled *ADVANCE*, the printed word *READY*? disappeared, and the screen was blank for 250 ms. Each sentence of the narrative then appeared on the participant's computer monitor, left justified and vertically centered. Participants read at their own pace, pressing the *ADVANCE* key when they were finished reading each sentence. Pressing the *ADVANCE* key caused the sentence they were reading to disappear, and 750 ms later, the next sentence appeared. If participants failed to press the *ADVANCE* key within 16 sec, the sentence disappeared automatically.

For narratives including the tone-identification task, a 750-ms pause preceded the presentation of a tone sequence. The tone sequence was then presented over the participants' headphones; participants were allowed 5 sec to respond by pressing either the *HIGH* or *LOW* key and 750 ms later the next sentence of the narrative appeared.

After the last sentence of each narrative, either the message *Please Continue the Story* or *READY*? appeared. If the *Please Continue the Story* message appeared, participants were instructed to write short continuations on a sheet of paper provided for them. They were allowed 15 sec to write each continuation. Participants wrote continuations for 12 experimental narratives and 12 filler narratives. Of the 12 experimental narratives for which the participants wrote continuations, half were narratives for which the participants performed the tone-identification task, and half were not; half contained target sentences with matching emotion words, and half contained target sentences with mismatching emotion words.

## Results and Discussion

If activating knowledge about emotional states during narrative comprehension—in other words, if inferring fictional characters' emotional states—is a relatively effortful component of reading, then we should have observed a diminished difference between participants' reading times for target sentences that contained matching versus mismatching emotion words when participants had also performed the tone-identification task while reading the narratives. Figure 4 displays the participants' mean reading times for the target sentences when they contained matching versus mismatching emotion words. The two left-most bars represent the participants' mean reading times for target sentences after they concurrently performed the tone-identification task, and the two right-most bars represent their target-sentence reading times when they had not performed the tone-identification task. As Figure 4 illustrates, participants read the target sentences considerably more rapidly when they contained matching as opposed to mismatching emotion words, minF' (l, 64) = 62.05, p < .0001. Most crucial for our investigation was the finding that this advantage was maintained both when the participants had performed the tone-identification task, minF' (l, 70) = 85.59, p < .0001, and when they had not performed the tone-identification task, minF' (l, 69) = 76.87,p < .0001.

This is not to say that performing the tone-identification task did not influence target-sentence reading times. As Figure 4 illustrates, performing the tone, identification task slowed participants' reading times for the subsequent target sentences, $F_1$(l, 79) = 8.5l, *p*< .005 and $F_2$(l, 23) = 6.34,*p* < .02, although this main effect of tone-identification task performance was only marginally significant by a minF' test, minF' (l,60) = 3.63, *p* < .06. More important, the effect of performing the tone-identification task did not interact with the matching versus mismatching effect (both *F*s < 1), suggesting that the participants' ability to activate emotional knowledge was not compromised by performing a divided-attention task. The lack of a significant interaction was not due to a lack of power. We had 99% power to detect a moderate effect size ($\omega^2$ = .06) and 90% power to detect $\omega^2$ of .025 (Keppel, 1991).

Across the board, participants were slower to read any type of target sentence when they had also performed the tone-identification task, suggesting that the tone-identification task fit our purpose for a divided-attention task; however, readers' ability to activate knowledge about emotions was not attenuated when they simultaneously performed a divided-attention task.

Perhaps the divided-attention task of identifying tones was not demanding enough. Although the across-the-board detriment in target sentence reading times was statistically reliable when both subjects and target sentences were considered a random effect, it was only marginally reliable using the minF' test, and it resulted in only a 5% (153 ms) increase in target-sentence reading time. In our second experiment, we sought to employ a more demanding divided-attention task.

## EXPERIMENT 2

For the divided-attention task in our second experiment, we employed a task used previously by Baddeley and Hitch (1974; see also Baddeley, 1986). At seemingly random points during a narrative, although always before participants began reading a sentence, they were shown a string of four consonants, for example, *CNJQ*. The participants' task was to remember the four consonants while reading the next sentence. After reading the sentence, they performed a quick recognition test. A test string of consonants was presented, for example, *TNJQ*, and the participants' task was to verify whether the test string matched the string they were attempting to remember while reading the sentence. During each experimental narrative, four different strings of to-be-remembered consonants were presented, always before participants read a sentence but not before participants read the target sentence.

Baddeley and Hitch (1974) demonstrated that narrative comprehension is more difficult when participants simultaneously perform such a concurrent "memory-load" task. We, therefore, proposed the following hypothesis: If activating knowledge about emotional states during narrative comprehension—in other words, if inferring fictional characters' emotional states—is a relatively effortful component of reading, then we should have observed a diminished difference between participants' reading times for target sentences that contained matching versus mismatching emotion words when participants had performed the memory-load task while reading the narratives.

### Method

**Participants—**Eighty native American English speakers participated to receive a cash payment.

**Materials—**The stimuli included the 24 experimental narratives and 24 filler narratives used in Experiment 1. The stimuli for Experiment 2 also included 96 consonant strings (e.g., *RSXH*) used for the memory-load task. Each string comprised four consonants. No letters repeated within a string, and the strings were not similar to any well-known acronyms. Every consonant of the alphabet was used in similar frequency across the set of 96 strings. We shall refer to these 96 consonant strings as *memory-encoding strings*. During the experimental narratives for which participants also performed the memory-load task, a memory-encoding string was presented before each of four sentences, which were randomly selected with the exception that a memory-encoding string never preceded the final (target) sentence. During the filler narratives for which participants performed the memory-load task, a memory-encoding string was presented before each of three, four, or five sentences, which were randomly selected with the exception that a memory-encoding string always preceded the last sentence.

Each memory-encoding string was tested with a memory test string. Half of the memory test strings were identical to their respective encoding strings; therefore, the correct response to those memory test strings was "yes." The other half of the memory test strings differed from their encoding strings by one letter (e.g., for the memory encoding string *VCYT*, the corresponding test string was *GCYT*); therefore, the correct response to those memory test strings was "no." The position of the nonidentical letter varied with equal frequency.

**Design—**We formed four material sets by varying (a) whether the emotion word in the target sentence matched or mismatched the emotional state implied by the narrative and (b) whether the participants performed the memory-load task while reading the narrative. The following was true of each material set: Of the 48 total narratives (24 experimental and 24 filler narratives), participants performed the memory-load task while reading half of each type (experimental and filler). Of the 24 experimental narratives, 12 of the narratives' target sentences contained matching emotion words, and 12 contained mismatching emotion words. Of the 12 experimental narratives for which participants concurrently performed the memory-load task, half contained matching target sentences, and half contained mismatching target sentences. The narratives appeared in the same order in each material set. Twenty participants were randomly assigned to each of the four material sets.

**Procedure—**The procedure (and instructions given to the participants) for the narrative reading task was the same as in Experiment 1. After becoming familiar with the reading task, participants received instructions about the memory-load task. They were told to remember a string of four letters and to indicate if a second string of letters was the same. They practiced on three strings of letters, pressing either a key labeled *YES* or a key labeled *NO* to indicate whether the memory test string was identical to the encoding string. Finally, the participants were shown how the two tasks (reading sentences and remembering letter strings) would be interwoven. Participants practiced doing both tasks during two narratives. During the instructions, participants were given feedback on the memory-load task regarding whether they were correct, wrong, or did not respond within 6 sec.

At the beginning of each narrative, a 250-ms tone was heard, and the word *READY?* appeared immediately afterward in the center of each participant's computer monitor. When participants pressed a response key, the *READY?* message disappeared, and the screen was blank for 500 ms. Each sentence of the narrative then appeared on the participant's computer monitor, left justified and vertically centered. Participants read at their own pace, pressing a key labeled *CONTINUE* when they were finished reading each sentence. Pressing the *CONTINUE* key caused the sentence they were reading to disappear, and 500 ms later the next sentence appeared. If participants didn't press the *CONTINUE* key within 16 sec, the sentence disappeared automatically.

For narratives during which participants also performed the memory-load task, each encoding string appeared for 1,250 ms centered on the computer monitor. A 500-ms pause intervened after the string disappeared before the next sentence of the narrative appeared. After participants pressed the *CONTINUE* key to indicate that they had finished reading that sentence, a 500-ms pause intervened before the test string appeared. The test string appeared centered on the computer monitor below four question marks. Participants were allowed 6 sec to respond to the test string by pressing either a *YES* or *NO* key.

After the last sentence of each narrative, either the message *Please Continue the Story* or *READY?* appeared. If the *Please Continue the Story* message appeared, participants were instructed to write short continuations on a sheet of paper provided for them. They were given 15 sec to write each continuation. Participants wrote continuations for 12 experimental narratives and 12 filler narratives. Of the 12 experimental narratives for which the participants wrote continuations, half were narratives for which the participants performed the memory-load task and half were not; half contained target sentences with matching emotion words, and half contained target sentences with mismatching emotion words.

## Results and Discussion

If activating knowledge about emotional states during narrative comprehension—in other words, if inferring fictional characters' emotional states—is a relatively effortful component of reading, then we should have observed a diminished difference between participants' reading times for target sentences that contained matching versus mismatching emotion words when participants had also performed the memory-load task while reading the narratives. Figure 5 displays the participants' mean reading times for the target sentences when they contained matching versus mismatching emotion words. The two left-most bars represent the participants' mean reading times for target sentences after they concurrently performed the memory-load task, and the two right-most bars represent their target-sentence reading times when they had not performed the memory-load task. As Figure 5 illustrates, participants read the target sentences considerably more rapidly when they contained matching as opposed to mismatching emotion words, $\text{min}F'(1, 39) = 27.16$, $p < .0001$. Again, crucial for our investigation was the finding that this advantage maintained both when the participants had performed the memory-load task while reading the narratives, $\text{min}F'(1, 70) = 66.03$, $p < .0001$, and when they had not performed the memory-load task while reading the narratives, $\text{min}F'(1, 70) = 44.98$, $p < .0001$.

Figure 5 also illustrates the effect of the memory-load task (which participants performed with an average 88% accuracy). Like performing the tone-identification task, performing the memory-load task slowed participants' reading times for the subsequent target sentences, and (unlike the tone-identification task) this main effect was significant by $\text{min}F'(1, 40) = 5.62$, $p < .03$. Also, like performing the tone-identification task, performing the memory-load task did not interact with the matching versus mismatching effect (both *F*s < 1). This finding again suggests that the participants' ability to activate emotional knowledge, as assessed by their reading times to the target sentences, was not compromised by performing a divided-attention task. Again, the lack of a significant interaction is not attributable to lack of power. In this experiment, there was again 99% power to detect a moderate effect size

($\omega^2$ = .06) and 90% power to detect $\omega^2$ of .025 (Keppel, 1991). The divided-attention task in this experiment (a memory-load task) increased target-sentence reading time by an average of 15% (387 ms), considerably more than the slow down created by the tone-identification task of Experiment 1; therefore, we assumed that the memory-load task of Experiment 2 was more demanding. Nonetheless, in Experiment 3, we sought to employ an even more demanding divided-attention task to investigate how automatically readers activate knowledge about emotional states during narrative comprehension.

# EXPERIMENT 3

For the divided-attention task in our third experiment, we modified the memory-load task we had employed in Experiment 2. At four seemingly random points during a narrative, although always before participants began reading a sentence, they were shown one consonant; their task was to remember all four consonants while they read the entire narrative. In other words, the memory load was cumulative. After reading the entire narrative, the participants' recognition of the entire consonant string was tested. Therefore, we called this task a *cumulative memory-load task*.

## Method

**Participants—**Eighty native American English speakers participated to receive extra credit in an introductory psychology class.

**Materials—**The stimuli included the 24 experimental narratives and 24 filler narratives used in Experiment 1. The stimuli for Experiment 3 also included 24 consonant strings for the cumulative memory-load task similar to those used in Experiment 2 (i.e., the strings comprised four unique consonants; the strings were not similar to any well-known acronyms, and across the 24 strings, individual consonants appeared in equal frequency). Only 24 consonant strings were needed for Experiment 3 because only one consonant string was presented during each experimental and filler narratives for which participants also performed the cumulative memory-load task, rather than the (on average) four consonant strings that had been presented per narrative in Experiment 2. During the narratives for which participants also performed the cumulative memory-load task, each of the four consonants of each memory-encoding string was presented before each of four randomly selected sentences. Each of the 24 memory-encoding strings was tested with a memory test string, constructed as described in Experiment 2 (e.g., half were identical to their encoding strings, and half differed by one letter, with the position of the nonidentical letter varying with equal frequency).

**Design—**We formed four material sets by varying (a) whether the emotion word in the target sentence matched or mismatched the emotional state implied by the narrative and (b) whether the participants performed the cumulative memory-load task while reading the narrative. The following was true of each material set: Of the 48 total narratives (24 experimental and 24 filler narratives), participants performed the cumulative memory-load task while reading half of each type (experimental and filler). Of the 24 experimental narratives, 12 of the narratives' target sentences contained matching emotion words, and 12 contained mismatching emotion words. Of the 12 experimental narratives for which

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participants concurrently performed the cumulative memory-load task, half contained matching target sentences, and half contained mismatching target sentences. The narratives appeared in the same order in each material set. Twenty participants were randomly assigned to each of the four material sets.

**Procedure—**The procedure (and instructions given to the participants) for the narrative reading task was the same as in Experiment 1. After becoming familiar with the reading task, participants received instructions about the cumulative memory-load task. They were told to remember four letters presented one at a time and to indicate if a test string of letters contained the same four letters. They were shown an example encoding and test string, and they practiced on two encoding and test strings, pressing either a key labeled *YES* or a key labeled *NO* to indicate whether the memory test string was identical to the encoding string. Finally, the participants were shown how the two tasks (reading sentences and remembering letter strings) would be interwoven. Participants practiced doing both tasks during one narrative. During the instructions, participants were given feedback on the cumulative memory-load task regarding whether they were correct, wrong, or did not respond within 6 sec.

The display and timing parameters for presenting the narratives, collecting the participants' reading times, presenting the memory-encoding strings, and testing the participants' recognition of the memory strings were similar to that of Experiment 3, with the following exceptions. For narratives including the cumulative memory-load task, each of the four letters of the narrative's encoding string appeared prior to one of four sentences in that narrative. Each letter appeared centered on the computer monitor for 550 ms. A 100-ms pause intervened after the letter disappeared before the sentence appeared. After participants pressed the *YES* key to indicate that they had finished reading the last sentence of the narrative, a 100-ms pause intervened before the test string appeared. The test strings appeared in the same way as they had in Experiment 2 (i.e., all four letters appeared simultaneously), and participants responded in the same way as they had in Experiment 2 (i.e., pressing either the *YES* or the *NO* key).

### Results and Discussion

If activating knowledge about emotional states during narrative comprehension—in other words, if inferring fictional characters' emotional states—is a relatively effortful component of reading, then we should have observed a diminished difference between participants' reading times for target sentences that contained matching versus mismatching emotion words when participants had also performed the cumulative memory-load task.

Figure 6 displays the participants' mean reading times for the target sentences when they contained matching versus mismatching emotion words. The two left-most bars represent the participants' mean reading times for target sentences when they were concurrently performing the cumulative memory-load task, and the two right-most bars represent their target-sentence reading times when they were not concurrently performing the cumulative memory-load task. As Figure 6 illustrates, participants read the target sentences considerably more rapidly when they contained matching as opposed to mismatching emotion words, minF′ (1, 48) = 29.54, $p < .0001$. And again, crucial for our investigation was the finding that this advantage was maintained both when the participants were performing the cumulative memory-load task, minF′(l, 46) = 30.54, $p < .0001$, and when they were not performing the cumulative memory-load task, minF′(l, 57) = 40.76, $p < .0001$. Figure 6 also illustrates the effect of the cumulative memory-load task (which participants performed with an average 81% accuracy). Like performing the divided-attention tasks of Experiment 1 and 2, performing the cumulative memory-load task of Experiment 3 slowed participants' reading times to the target sentences, minF'(l, 80) = 19.46, $p < .0001$. Also, as in Experiment 1 and 2, performing the cumulative memory-load task did not interact with the matching versus mismatching effect (both *F*s < 1), and the lack of a significant interaction was not due to lack of power (99% power to detect $\omega^2 = .06$ and 90% power to detect $\omega^2 = .025$; Keppel, 1991). Again, this finding suggests that the participants' ability to activate emotional knowledge, as assessed by their reading times to the target sentences, was not compromised by performing a divided-attention task, despite the fact that in Experiment 3, the divided-attention task increased target-sentence reading time by 25% (i.e., an average 583 ms). Because in this experiment the memory-load test occurred after the target sentence, given its definition as cumulative, we could investigate the effect of the matching versus mismatching manipulation on memory-load task performance. Participants responded more slowly, though no less accurately, to the memory-load test after reading mismatching target sentences (*M* = 2269 ms) than after reading matching target sentences (*M* = 2114, *F* = 5.331, $p < .03$). This modest effect on reading times and lack of an effect on accuracy rates suggests that the matching versus mismatching manipulation affected performance on the memory-load task slightly, in the direction one would expect (with slower responses following the mismatching target sentences). More generally, we felt confident concluding that the cumulative-memory load, divided-attention task had been demanding enough and rejecting the hypothesis that activating knowledge about emotional states is a relatively effortful component of reading. In the last experiment we report here, we pursued a slightly different approach.

## EXPERIMENT 4

In our fourth experiment, we again presented our 24 emotion narratives and 24 filler (nonemotional) narratives. We measured participants' reading times for target sentences that contained emotion words that matched versus mismatched the implied emotional states, and the matching versus mismatching emotion words were perceived converses. In this experiment, however, we added a manipulation that allowed us to assess directly the accessibility of readers' knowledge of fictional characters' emotional states. To half of the experimental narratives that each participant read, we added a first sentence. This first sentence explicitly stated the emotional state that heretofore (in our previous experiments) we had been conveying only implicitly. For example, for the sample narrative about Tom and Joe, we added the sentence "Tom was feeling so guilty" to the beginning of the narrative. This was undoubtedly one of our least subtle manipulations.

Therefore, in Experiment 4, half the experimental narratives began with an explicit statement about the character's emotional state, and then the narrative continued as it did before (e.g., "One night last week Tom went to visit his best friend, Joe, who worked at the local 7-Eleven to get spending money while in school. While Tom was visiting, …”). The other half of the experimental narratives began as they did in all of our previous experiments, including the three already presented here (e.g., “One night last week Tom went to visit his best friend, Joe, …”). We refer to the condition in which we added the explicit statement about the fictional character’s emotional state as the explicit form, and we refer to the condition that resembled our previous narratives as the implicit form. If readers activate knowledge about emotional states during comprehension—in other words, if readers infer fictional characters’ emotional states that are only implicitly given in a narrative—then a very strong prediction is that the difference in participants’ target sentence reading times for matching versus mismatching emotion words will be as great in the implicit form as it is in the explicit form.

## Method

**Participants—**Ninety-two native American English speakers participated to receive a cash payment.

**Materials—**The stimuli included the 24 experimental narratives and 24 filler narratives used in Experiment 1 with one change. One sentence that explicitly stated the main character’s emotional state was constructed for each experimental narrative. For example, for the narrative about Tom who stole money from the store where his best friend worked, the new sentence was “Tom was feeling so guilty.”

**Design—**We formed four material sets by varying (a) whether the emotion word in the target sentence matched or mismatched the emotional state implied by the narrative and (b) whether the explicit-mention sentence was present (the explicit form) or not present (the implicit form). When present, the explicit-mention sentence was always the first sentence of the narrative. The following was true of each material set: Of the 24 experimental narratives, 12 of the narratives were presented in the explicit form, and 12 were presented in the implicit form. Half of each type contained matching emotion words, and the remaining half contained mismatching emotion words. The narratives appeared in the same order in each material set. Twenty-three participants were randomly assigned to each of the four material sets.

**Procedure—**The procedure (and instructions given to the participants) for the narrative reading task was the same as in Experiment 3. There was no additional task. The display and timing parameters for presenting the narratives and collecting the participants’ reading time were the same as in Experiment 3. Furthermore, as in Experiment 3, participants wrote continuations for 12 experimental narratives and 12 filler narratives. Of the 12 experimental narratives for which the participants wrote continuations, half had been presented in the explicit form and half had been presented in the implicit form. Half of each type contained target sentences with matching emotion words, and half contained target sentences with mismatching emotion words.

### Results and Discussion

If activating knowledge about emotional states during narrative comprehension—in other words, if inferring fictional characters' emotional states—is a relatively automatic component of reading, then we should have observed the same magnitude of difference between participants' reading times for target sentences that contained matching versus mismatching emotion words when participants read the explicit versus the implicit forms of the narratives. Figure 7 displays the participants' mean reading times for the target sentences when they contained matching versus mismatching emotion words. The two left-most bars represent the participants' mean reading times for target sentences after they read the explicit forms of the narratives, and the two right-most bars represent their target-sentence reading times after they read the implicit forms of the narratives.

As Figure 7 illustrates, participants read the target sentences considerably more rapidly when they contained matching as opposed to mismatching emotion words, $minF'(l, 49) = 73.18$, $p < .0001$. This was the case both when the participants read the explicit forms of the narratives, $minF'(l, 77) = 59.78$, $p < .0001$, and when they read the implicit forms of the narratives, $minF'(l, 79) = 51.88$, $p < .0001$. Indeed, as illustrated in Figure 7, there was neither a main effect of nor an interaction with the explicit- versus implicit-form manipulation (all $F$s $< 1$). In other words, the difference in participants' target sentence reading times for matching versus mismatching emotion words was as great after reading narratives in their implicit form as it was after reading narratives in their explicit form. Again, the lack of a significant interaction was not the result of a lack of power. We interpreted the results of this experiment as strong support for our hypothesis that activating knowledge about emotional states during narrative comprehension is a relatively automatic component of reading.

## CONCLUSIONS

We previously demonstrated that readers infer fictional character' s emotional states in two series of laboratory experiments (Gernsbacher & Robertson, 1992; Gernsbacher et al., 1992) in which we measured participants' reading times to target sentences that contained emotion words that matched (e.g., *guilt*) or mismatched (e.g., *pride*) the implied emotional state. In this article, we presented a third series of laboratory experiments. These experiments tested how automatically such knowledge is activated by using an assortment of divided-attention tasks. In one experiment, while reading half the experimental narratives and half the filler narratives, participants performed a tone-identification task (i.e., they heard five tones, three of one pitch and two of another pitch, and their task was to identify whether the majority of tones were the high- or low-pitched tones). We found that the participants' ability to activate emotional knowledge was not compromised by performing the tone-identification task. In a second experiment, while reading half the experimental narratives and half the filler narratives, participants performed a memory-load task (i.e., they were presented a string of four consonants before various sentences, and their task was to remember the four consonants while reading the sentence). We again found that the participants' ability to activate emotional knowledge was not compromised by performing the per-sentence memory-load task. In a third experiment, while reading half the experimental narratives and half the filler narratives, participants performed a cumulative memory-load task (i.e., they were presented one letter of a string of four consonants before various sentences, and their task was to remember the four consonants while reading the entire narrative). We again found that the participants' ability to activate emotional knowledge was not compromised by performing the cumulative memory-load task. In a final experiment, we found that participants' ability to activate emotional knowledge was seemingly identical (according to their reading times for target sentences) when the emotional states were explicitly mentioned versus only implicit.

In summary, these experiments support the hypothesis that readers activate knowledge about human emotions, in other words, that readers infer fictional characters' emotional states. In this way, these experiments augment previous scientific studies of reading that have shown that readers activate knowledge about spatial relations (e.g., Glenberg, Meyer, & Lindem, 1987; Haenggi, Kintsch, & Gernsbacher, 1995; Morrow, Greenspan, & Bower, 1987; O'Brien & Albrecht, 1992; Rinck, Hähnel, Bower, & Glowalla, 1997; Rinck, Williams, Bower, & Becker, 1996), causal relations (Albrecht & Myers, 1995; Deaton & Gernsbacher, in press; Dopkins, 1996; Singer, Halldorson, Lear, & Andrusiak, 1992; Trabasso & Suh, 1993; van den Broek & Lorch, 1993), and temporal relations (Anderson, Garrod, & Sanford, 1983) during narrative comprehension.

These experiments also support the view that many of the processes and mechanisms involved in reading comprehension are general cognitive processes and mechanisms. We have proposed a simple framework, called the Structure Building Framework, that identifies a few of those general cognitive processes and mechanisms Gernsbacher, 1990, 1991, 1995, 1997). According to the Structure Building Framework, the goal of reading comprehension is to build coherent mental representations or *structures*. At least three component processes are involved. First, readers lay foundations for their mental structures. Next, readers developmental structures by mapping on new information when that information coheres or relates to previous information. When the incoming information is less coherent or related, however, readers employ a different process: They shift and build a new substructure. Thus, most representations comprise several branching substructures.

The building blocks of these mental structures are memory nodes. Memory nodes are activated by incoming stimuli. Initial activation forms the foundation of mental structures. Once memory nodes are activated, they transmit processing signals to enhance (increase) or suppress (decrease or dampen) other nodes' activation. Thus, once memory nodes are activated, two mechanisms control their level of activation: suppression and enhancement. Memory nodes are enhanced when the information they represent is necessary for further structure building; they are suppressed when the information they represent is no longer as necessary.

Previously, we have empirically explored the three processes involved in structure building: (a) laying a foundation (Carreiras, Gernsbacher, & Villa, 1995; Gernsbacher & Hargreaves, 1988, 1992; Gernsbacher, Hargreaves, & Beeman, 1989), (b) mapping information onto a foundation (Carreiras & Gernsbacher, 1992; Deaton & Gernsbacher, in press; Gernsbacher, 1991, 1994; Oakhill, Garnham, Gernsbacher, & Cain, 1992), and (c) shifting to build new substructures (Foertsch & Gernsbacher, 1994, 1997; Gernsbacher, 1985; Gernsbacher, Varner, & Faust, 1990).

We have also explored the two mechanisms that control these structure-building processes: suppression and enhancement (Faust & Gernsbacher, 1996; Gernsbacher, 1989, 1993; Gernsbacher & Faust, 1991a, 1991b, 1995; Gernsbacher & Jescheniak, 1995; Gernsbacher & Robertson, 1995, in press; Gernsbacher & Shroyer, 1989; Gernsbacher & St. John, in press). We have found that these general cognitive processes and mechanisms underlie many reading comprehension phenomena and that their efficiency underlies differences in adult reading comprehension skill (Gernsbacher, 1993; Gernsbacher & Faust, 1991a, 1995; Gernsbacher & Robertson, 1995; Gernsbacher, Varner, & Faust, 1990) and adult written composition skill (Traxler & Gernsbacher, 1992, 1993, 1995).

The current experiments focused on one of the central processes of structure building involved in reading comprehension: the cognitive process of mapping. According to the Structure Building Framework, once readers have laid a foundation for their mental structures, they develop those structures using the cognitive process of mapping. We envision the cognitive process of mapping as similar to creating an object out of papier mâché. Each strip of papier-mâché is attached to the developing object, augmenting it. Appendages can be built, layer by layer. Readers build mental structures in a similar way: Each piece of incoming information can be mapped onto a developing structure to augment it, and new substructures (such as appendages) are built in the same way.

What guides this mapping process? We have suggested that readers interpret various cues that the incoming information coheres with the previously comprehended information. Readers interpret these cues as signals or "instructions" to map the incoming information onto the structure or substructure that they are currently developing. Readers learn the cues of coherence through their experience with the world and their experience with language (Gernsbacher, 1996; Gernsbacher & Givón, 1995). Some coherence cues are explicitly provided in the text or discourse; for instance, anaphoric pronouns such as *she* and the definite article *the* are provided in the text or discourse. Yet, even for coherence cues that are explicitly provided in the text or discourse, readers must acquire knowledge of these cues in order to interpret them as signals of coherence. Other coherence cues are more implicit: They are not explicitly provided by the text or discourse; they arise through inferential processing. To interpret these cues, readers also rely on previously acquired knowledge; however, this knowledge is knowledge of the events and relations in the world, as well as the causes and consequences of those events and relations.

Thus, we argue that mapping, as well as reading comprehension in general, is knowledge-based, be it knowledge of the roles that different linguistic devices play (e.g., that the pronoun *she* refers to an animate female) or the knowledge of how fictional characters must feel following certain actions and events. In contrast to other models of reading comprehension, the Structure Building Framework does not distinguish between the type of knowledge that readers have acquired about language and the type of knowledge that readers have acquired about the real world that language describes. The crucial issue is that information—knowledge of various sorts—is activated during comprehension; indeed, we argue that comprehension is a quintessential act of using and acquiring knowledge, just as our colleague Hintz-man parodied in our opening quotation. The research we presented here suggested that, at the least, activating knowledge about fictional characters' emotional states during reading is relatively automatic.

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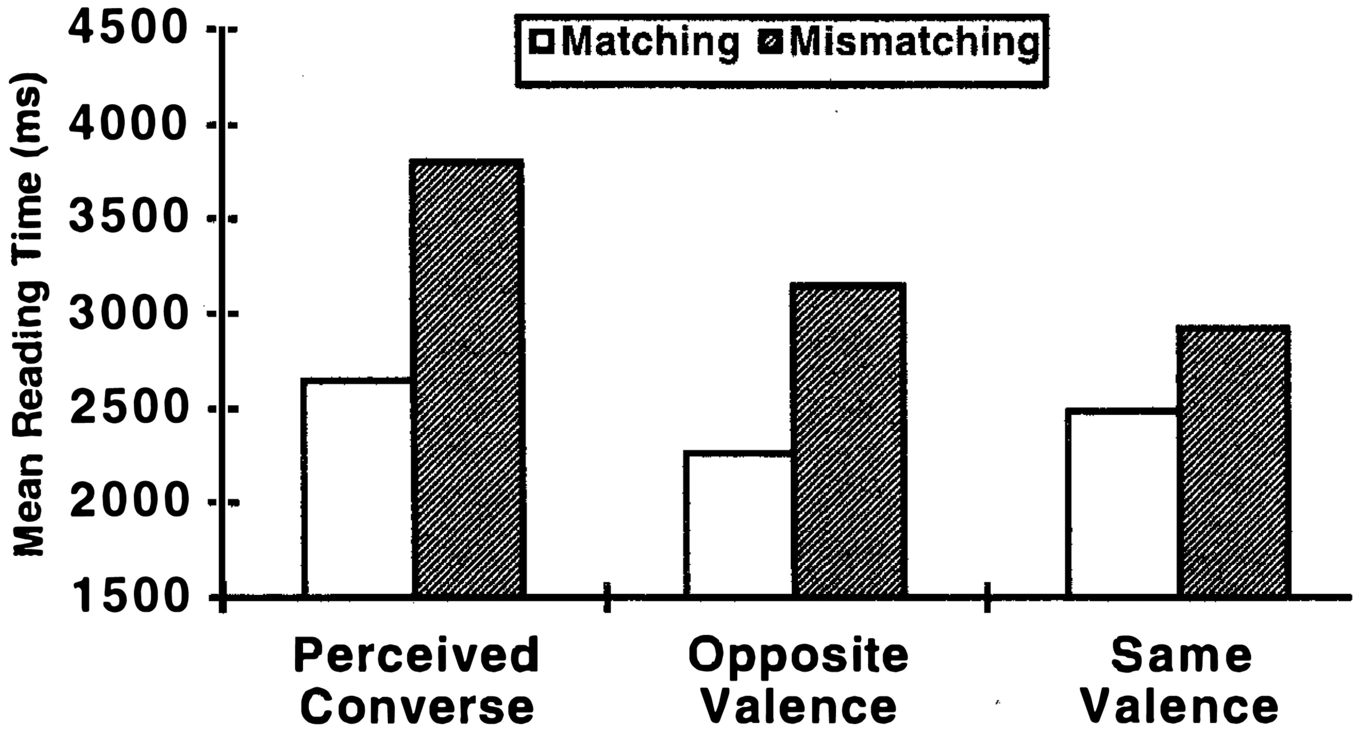


**FIGURE 1.**
Participants' mean reading times for target sentences in Experiments 1 and 2 of Gernsbacher et al (1992) and an experiment reported in Gernsbacher (1994).

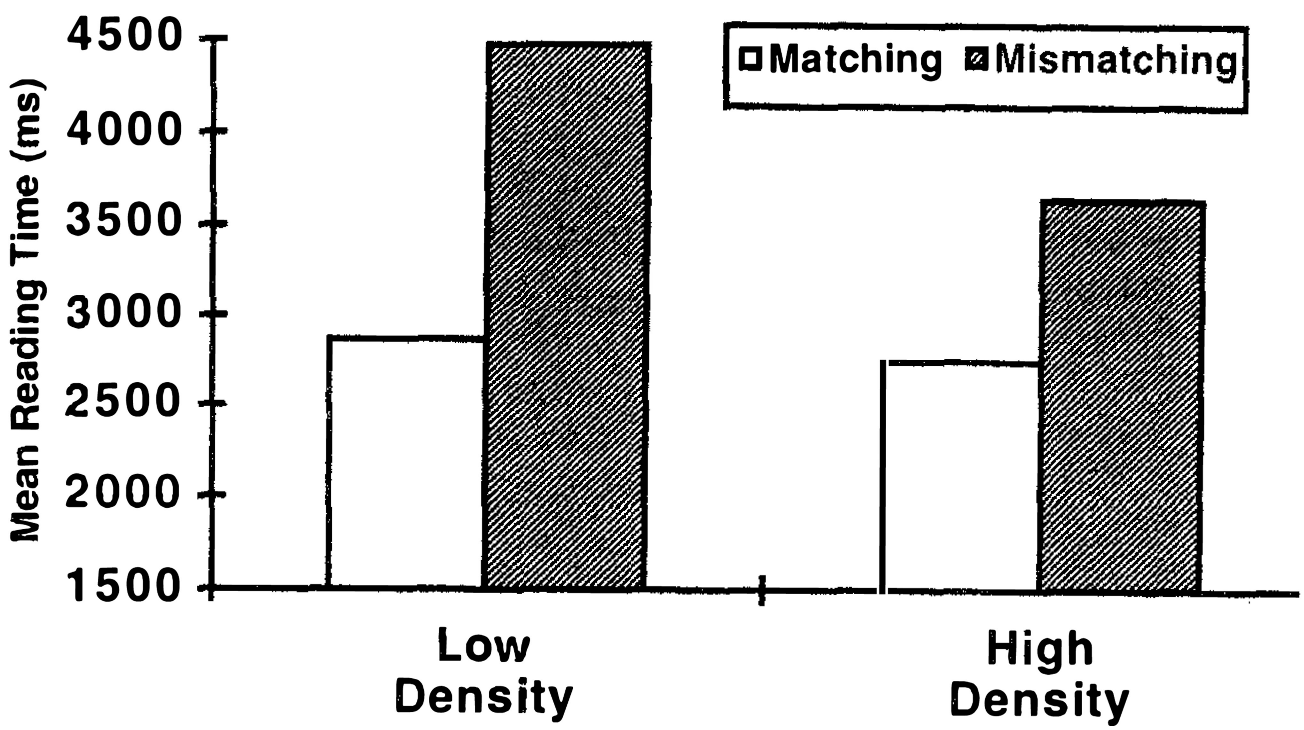


**FIGURE 2.**
Participants' mean reading times for target sentences in Gernsbacher and Robertson (1992) Experiment 1.

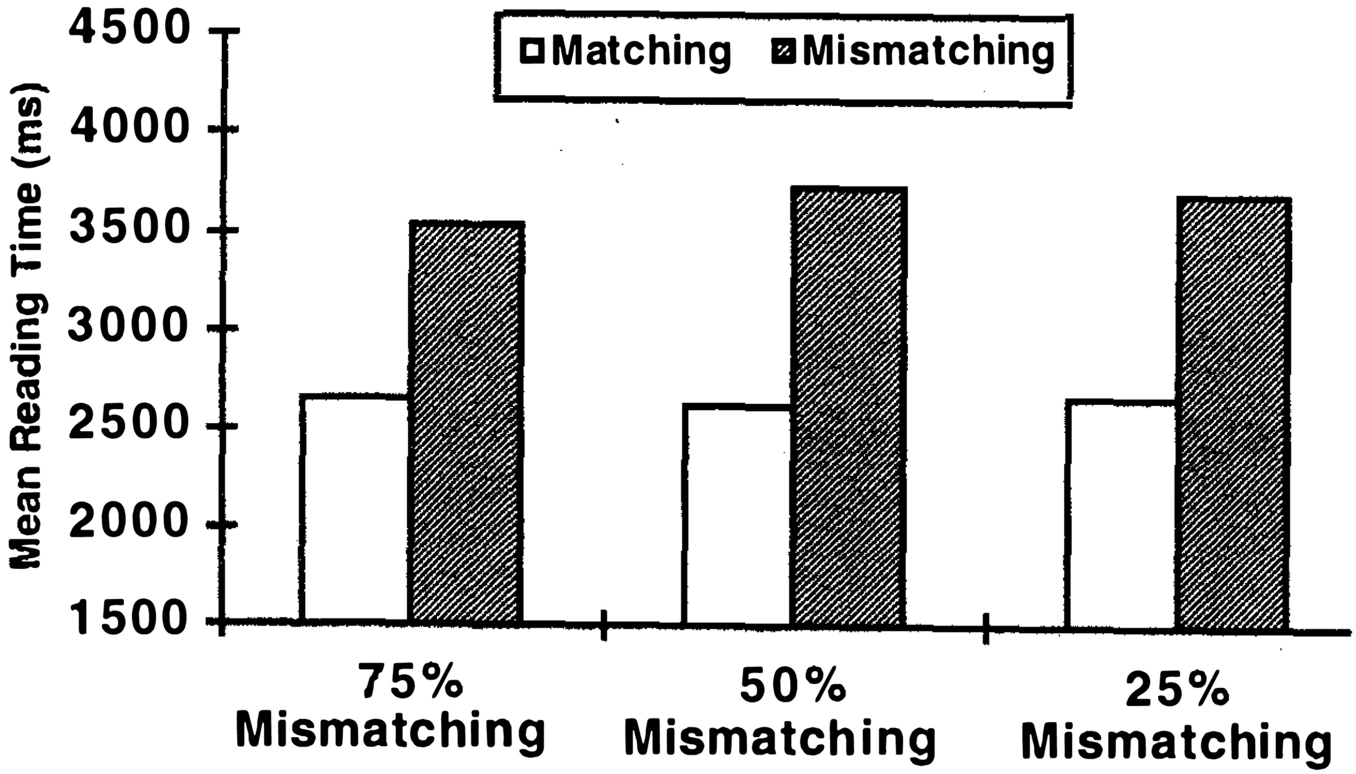


**FIGURE 3.**
Participants' mean reading times for target sentences in Gernsbacher and Robertson (1992) Experiment 2.

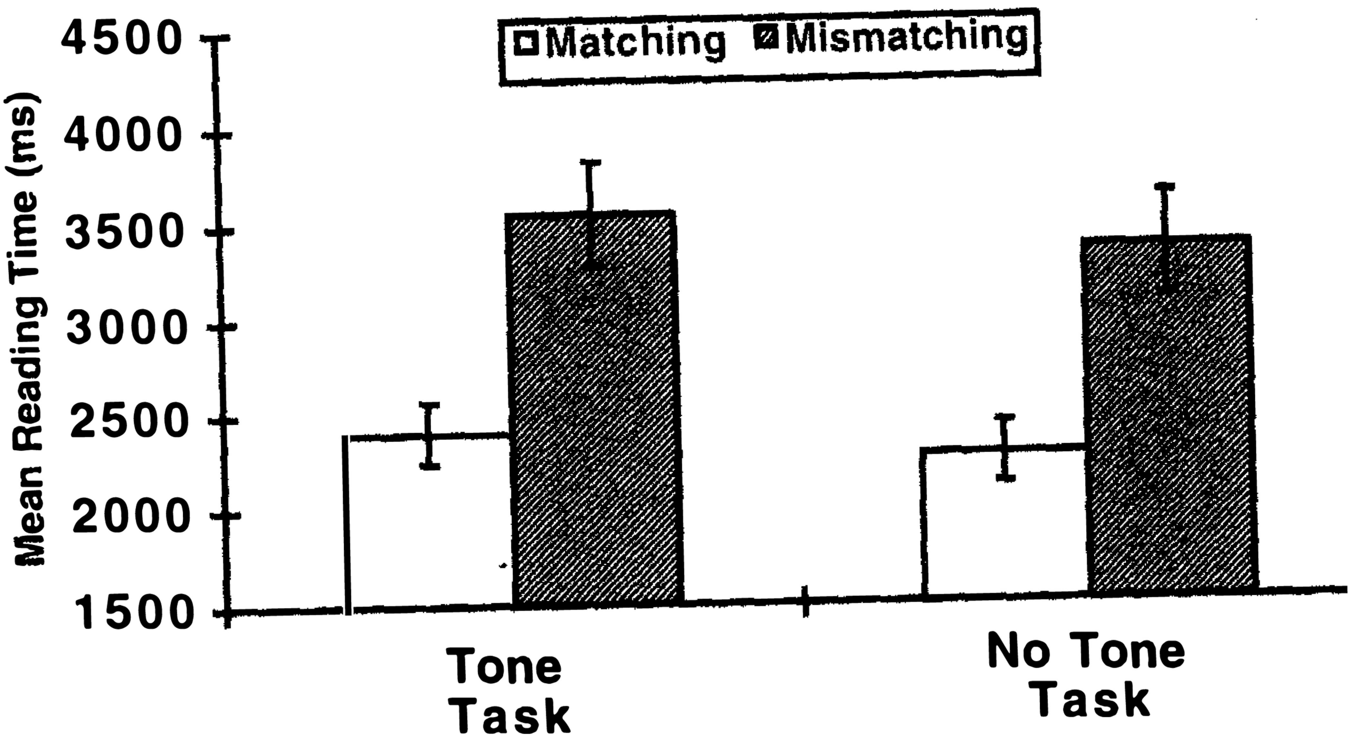


**FIGURE 4.**
Participants' mean reading times for target sentences in Experiment 1.

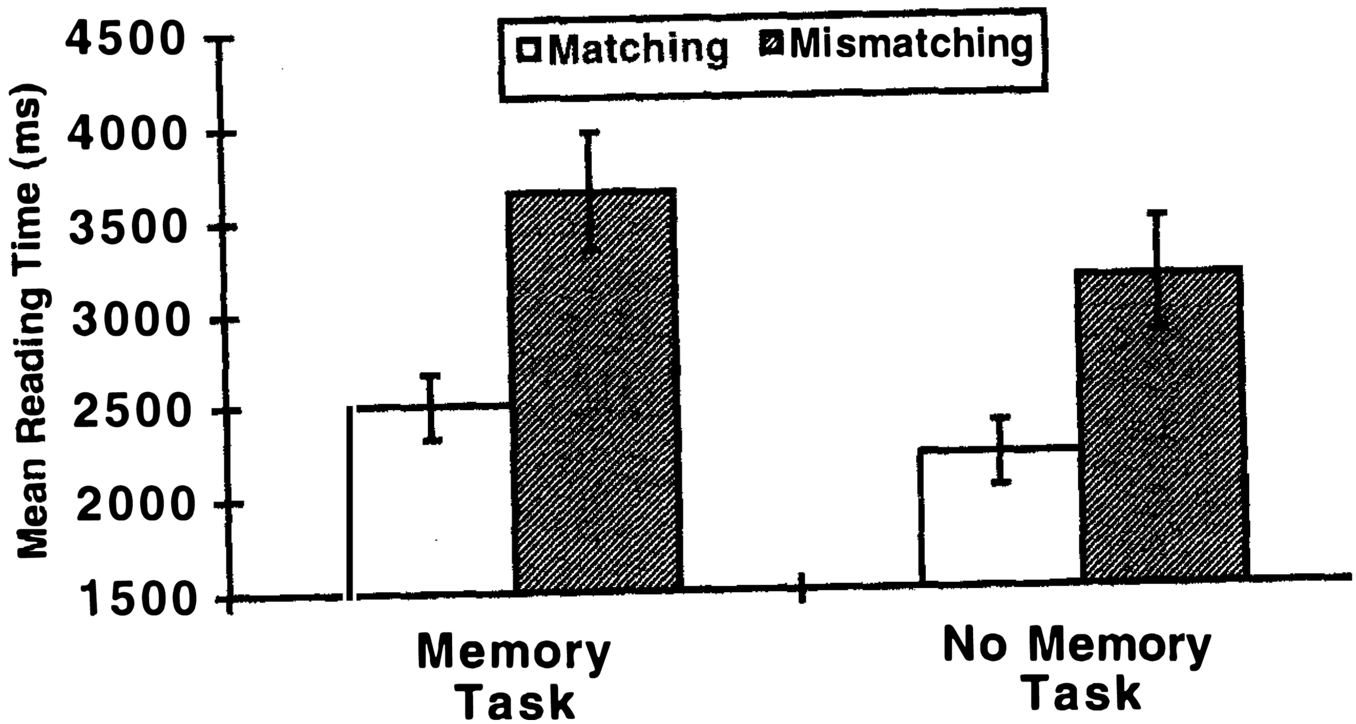


**FIGURE 5.**
Participants' mean reading times for target sentences in Experiment 2.

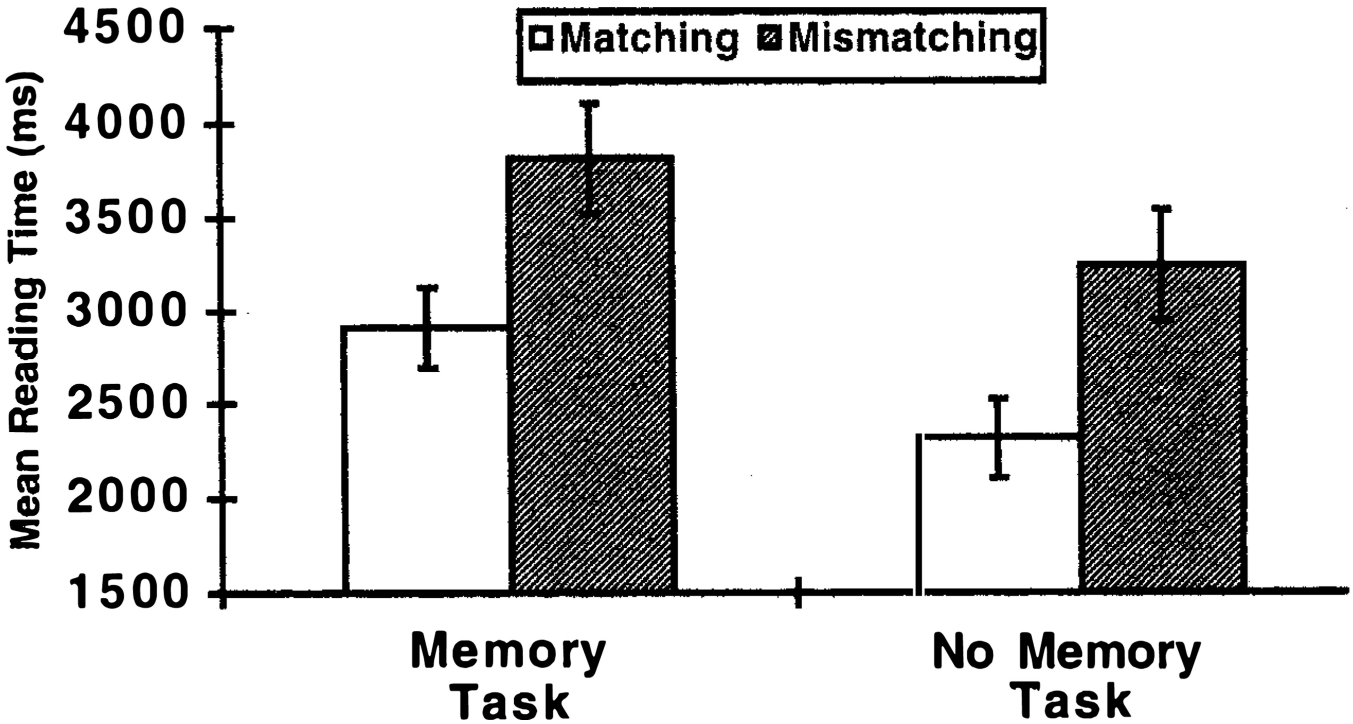


**FIGURE 6.**
Participants' mean reading times for target sentences in Experiment 3.

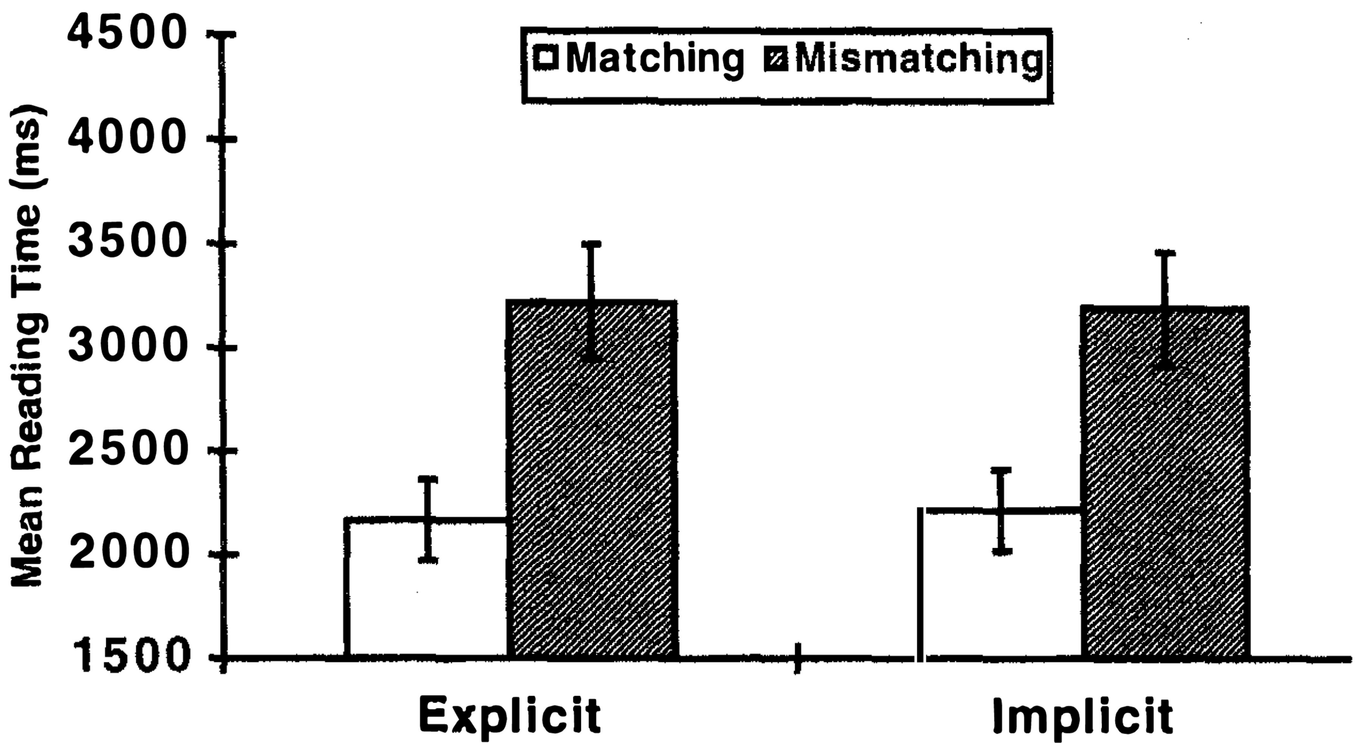


**FIGURE 7.**
Participants' mean reading times for target sentences in Experiment 4.