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Do Readers Mentally Represent Characters' Emotional States?

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Abstract

Subjects read stories that described concrete actions, such as a main character stealing money from a store where his best friend worked and later learning that his friend had been fired. Following each story, subjects read a target sentence that contained an emotion word that either matched the emotional state implied by the story (e.g. *guilt*) or mismatched that emotional state. In Experiment 1, target sentences were read more slowly when the mismatched emotion words were the perceived opposites of the emotional states implied by the stories (e.g. *pride*). In Experiment 2, target sentences were read more slowly when the mismatched emotion words shared the affective valence of the implied emotional state; therefore, readers must represent more than simply the affective valence of the emotional states. Instead of reading target sentences that contained matching versus mismatching emotion words, subjects in Experiment 3 simply pronounced matching versus mismatching emotion words. Mismatching emotion words were pronounced more slowly. These experiments suggest that readers form explicit, lifelike, mental representations of fictional characters' emotional states, and readers form these representations as a normal part of reading comprehension.

INTRODUCTION

When we read, we often feel that we are developing elaborate, perhaps lifelike, mental representations. If we did not form these rich, lifelike, mental representations, we would never be disappointed by movie adaptations of novels we have read. How many times have our mental representations of a certain character clashed with that character's on-screen appearance? Perhaps we envisioned him as tall with fair colouring, yet the movie director cast someone much shorter and darker.

Experiences like this suggest that while we read text, we form more than a verbatim representation of the words, or a propositional representation of the sentences (a representation of the truth value of each sentence). Some psycholinguistic theories account for this introspection.

For example, according to van Dijk and Kintsch (1983, pp. 11–12), language comprehension involves building a *situational model*. "A situational model is the cognitive representation of the events, actions, persons, and in general the situation that a text is about". Similarly,

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according to Johnson-Laird (1983, p. 245, our italics), language comprehension involves building what he calls a "*mental model* [that] goes beyond the literal meaning of the discourse because it embodies inferences, instantiations, and references".

Constructing these situational mental models is tantamount to successful comprehension. Indeed, van Dijk and Kintsch (1983, p. 337) suggest that "if we are unable to imagine a situation in which certain individuals have the properties or relations indicated by the text, we fail to understand the text itself". And Bower and Morrow (1990) propose that constructing "mental models of the situation that a writer or speaker is describing … is the basis of language comprehension".

In addition to these theories (and our intuitions), we need laboratory data that demonstrate that readers form mental situational models of the text. Some memory-for-text experiments do just that. For example (Garnham, 1981). subjects can easily remember whether they read:

(1) The hostess received a telegram *at* the furrier's.

as opposed to:

(2) The hostess received a telegram *from* the furrier.

In contrast, subjects have difficulty remembering whether they read:

(3) The hostess bought a mink coat *at* the furrier's.

as opposed to:

(4) The hostess bought a mink coat *from* the furrier.

Presumably, this difficulty occurs because readers form rich mental representations of the situations expressed by sentences: Buying a coat *at* the furriers is similar to buying a coat *from* the furrier. But receiving a telegram *at* the furriers differs from receiving a telegram *from* the furrier.

This memory-for-sentences experiment, therefore, suggests that readers form rich situational models. This finding confirms our intuitions, and supports van Dijk and Kintsch (1983), Bower and Morrow (1990), and Johnson-Laird's (1983) theories. However, such results are observed only after readers' memories have had a chance to fade. Readers do not confuse sentences like (3) and (4) unless they are tested much later. Up to an hour or so after reading sentence (3) or (4), readers can easily remember whether the hostess bought a mink coat *at* versus *from* the furrier.

Some theorists suggest that such confusions are not made earlier because initially readers can rely on a verbatim representation of the text. But when readers' verbatim representation fades, they can rely only on their longer-lived situational-model representation. Perhaps this is so, but we want to know whether readers form situational models *while* they are comprehending text. Some online experiments do just that.

Consider an experiment that investigated readers' tendency to adopt the narrator's spatial point of view. Narrator's spatial point of view is where the narrator is located relative to the action. For instance, sentence (5) locates the narrator *inside* the lunchroom.

(5) The door to Henry's lunchroom opened and two men *came* in.

In contrast, sentence (6) locates the narrator *outside* the lunchroom.

(6) The door to Henry's lunchroom opened and two men *went* in.

Now consider sentence (7).

(7) Bill was sitting in the living room reading the evening paper.

If readers adopt the narrator's point of view, then after reading sentence (7), readers should be located inside the living room. Furthermore, if readers' situational models capture this spatial point of view, then sentences that are consistent with this point of view should be easier to read than sentences that are inconsistent with this point of view. For example, sentence (8) should be easier to read than sentence (9).

(8) Before Bill had finished the paper, John *came* into the room.

(9) Before Bill had finished the paper, John *went* into the room.

Indeed, sentences like (8) that match the narrator's point of view are read faster than sentences like (9) that do not match with the narrator's point of view (Black, Turner, & Bower, 1979). Such reading-time data suggest that readers form rich situational models that capture the narrator's spatial point of view, and they form these models *during comprehension*.

Consider another experiment. While reading a story about John, who was training for a marathon race, subjects read:

(10) After doing a few warm-up exercises, John put *on* his sweatshirt and went jogging.

After reading sentence (10), the readers' situational model should include John, and John should be wearing his sweatshirt. A different situational model would be formed by subjects who read:

(11) After doing a few warm-up exercises, John took *off* his sweatshirt and went jogging.

The situational model induced by sentence (11) contains John, but without his sweatshirt. Now, consider what happens if both the subjects who read sentence (10) and the subjects who read sentence (11) read:

(12) John jogged halfway around the lake without too much difficulty.

One group of subjects has a situational model of John, halfway around the lake with his sweatshirt on; the other group of subjects has a situational model of John, halfway around the lake, but his sweatshirt is back on the other side.

If both groups of subjects are asked whether the word *sweatshirt* occurred in the story, both groups should answer "yes" (because both groups read a sentence that contained the word *sweatshirt*). However, those who read that John took off his sweatshirt are slower to answer "Yes" than those who read that John put on his sweatshirt. This difference suggests that

readers form rich mental representations of the situations expressed by sentences: For those subjects who read that John left his sweatshirt on the other side of the lake, John's sweatshirt is farther away in their situational models, and, therefore, it is harder to verify the word sweatshirt (Glenberg, Meyer, & Lindem, 1987).

Do Readers' Situational Models Represent Emotional States?

Both the reading-time experiment and the word-verification experiment that we just described suggest that readers form lifelike situational models of the events and settings of stories while they are reading those stories. However, these experiments suggest only that readers include spatial information in their situational models; perhaps spatial or visual information is particularly well suited for representation in situational models. In the experiments we report here, we investigated whether readers' situational models also capture a particular type of non-spatial information—information about a fictional character's emotional state.

Consider a story about Tom. One night Tom goes to buy a soft drink at a 7–11 convenience store. Tom's best friend, Joe, works at the 7–11 to make money for college. While Tom is in the store buying his soft drink, his friend Joe must momentarily go to the storage room. While Joe is away, Tom notices the drawer to the cash register was left open, and Tom quickly takes a ten dollar bill.

While reading this text, readers might form all types of mental representations. Perhaps they form a spatial layout of the store that captures the relations among the storage room, the cash register, and the door. Perhaps they form a graphic image of Tom as he quickly slides the ten dollar bill out of the open cash register drawer. Such spatial relations and visual images might be part of readers' situational models.

The experiments reported here investigated whether another part of readers' situational model is a representation of Tom's emotional state. For instance, what if the next sentence was (13)?

(13) Later that week, Tom learned that Joe had been fired from the 7–11 because his cash had been low one night.

After reading sentence (13), readers' situational models might include Tom feeling a particular emotion-*guilt*. If readers' situational models represent emotional states, then guilt is surely the emotional state that should be represented. And, if readers' situational models represent emotional states, then sentence (14) should be relatively easy to read because it matches readers' situational models.

(14) It would be weeks before Tom's guilt would subside.

In contrast, sentence (15) should be harder to read because it mismatches readers' situational models.

(15) It would be weeks before Tom's pride would subside.

We tested this prediction in the experiments we describe here. We wrote several short stories. Each story presented one primary character who was often involved with a

secondary character. For example, one of the stories involved the primary character, Tom, and the secondary character, Joe, who was Tom's best friend.

Each story was intended to induce readers to represent a different emotional state. But, importantly, each emotional state was implied; there was no explicit mention of any emotion. Instead, the stories described concrete actions, such as Tom going to the 7–11, Joe leaving the room, Tom taking the ten dollar bill, and Tom learning that Joe had been fired. The stories also characterised relationships; for example, Joe was explicitly introduced as Tom's best friend. And the stories described settings. Sometimes, the stories mentioned the characters' goals. But there was never any mention of the characters' feelings (except during the final experimental sentences as we describe next).

Each story was six to nine sentences long, for example:

> Joe worked at the local 7–11, to get spending money while in school. One night, his best friend, Tom, came in to buy a soda. Joe needed to go back to the storage room for a second. While he was away, Tom noticed the cash register was open. From the open drawer Tom quickly took a ten dollar bill. Later that week, Tom learned that Joe had been fired from the 7–11 because his cash had been low one night.

In our first two experiments, an additional sentence occurred after the main body of each story. This additional sentence was our target sentence, and it contained an emotion word, for example, *guilt* in sentence (16) or *pride* in sentence (17).

(16) It would be weeks before Tom's *guilt* would subside.

(17) It would be weeks before Tom's *pride* would subside.

We manipulated whether the emotion word in the target sentence matched the actions, relationships, settings, and goals described in the story, as it does in sentence (16), or whether the emotion word mismatched, as it does in sentence (17). In other words, we manipulated whether the emotion word described the emotional state that we hypothesised that readers would represent in their situational models.

In the first two experiments, we measured how long subjects needed to read each story's target sentence. If readers form rich, lifelike, situational models that include information about characters' emotional states, then target sentences in which the emotion word matches the emotional state implied by the story should be read faster than target sentences in which the emotion word mismatches that state. Across the two experiments we varied what we meant by mismatch so that we could explore how explicitly readers represent emotional states in their situational models.

EXPERIMENT 1

In our first experiment, the mismatching emotion words were, in laypersons' terms, the "perceived complementary opposites" of the matching emotion words. By this we meant that the matching and mismatching emotion words were opposites along one important dimension, but they were almost identical along other dimensions. The dimension along which the matching and mismatching emotion words were opposite was their affective

valence: One emotion word was negative, and the other was positive. For instance, *guilt* has a negative affective valence; *pride* has a positive affective valence.

Emotional states differ along dimensions other than their affective valence. For instance, they differ in their intensity, duration, relevance to self versus others, temporal reference (to events in the past, present, or future), and so forth (Frijda, 1986). Defining the fundamental dimensions of emotional states has led to a lively debate among emotion researchers (Ortony, Clore, & Collins, 1988; Scherer, 1984). Although we were aware of this debate, we avoided endorsing any single definition. Instead, we chose pairs of emotional states that were very similar along several dimensions (except for their affective valence).

For instance, we paired the mildly negative emotional state *restless* with the mildly positive emotional state *content*, rather than the more intensely positive state *euphoric*. We paired *desperate* with *hopeful*, because both imply a long duration, in contrast to the shorter-lived *frustrated*. Similarly, we paired *envious* with *sympathetic* because both are feelings about the fortunes of other persons. And we paired *bored* with *curious* because neither necessarily involves interpersonal situations.

Our 12 pairs of emotional states were *Guilty-Proud*, *Bored-Curious*, *Sad-Joyful*, *Shy-Confident*, *Restless-Content*, *Afraid-Bold*, *Depressed-Happy*, *Disgusted-Admiring*, *Envious-Sympathetic*, *Callous-Caring*, *Desperate-Hopeful*, and *Angry-Grateful*. With these 12 pairs, we tried to span the emotional domain. Some of the emotional states, like *sad* and *joyful*, are widely recognised as primary emotional states. Others, like *envious* and *sympathetic*, are recognised as emotional states, but they probably entail more complex cognitive components. Still others, like *shy* and *confident*, have trait-like connotations.

For each of the 24 emotional states, we wrote a story. To make the stories relevant to our undergraduate subjects, we enlisted several undergraduate students' help. The stories were about typical adolescent and college-aged activities: going on a date, graduating from high school, interviewing for a job, living in a dorm, taking a vacation, and so forth.

The critical feature of these stories was that each implied that the main character felt a particular emotion—and rather importantly, each implied this emotional state *without explicitly mentioning any emotions*. Instead, only actions, relationships, settings, and goals were described (until the final target sentence). By manipulating whether the story-final target sentences contained a matching versus mismatching emotion word, and by measuring subjects' reading time to these target sentences, we could investigate whether readers form rich, lifelike, situational models that capture fictional characters' emotional states.

Method

Materials—We wrote 24 experimental stories; each story implied a different emotional state. We paired each story with the story that implied its "perceived complement" emotional state (the emotional state that was similar along many dimensions but opposite in affective valence). For instance, the story that induced subjects to represent Tom in a state of *guilt* was paired with another story that induced subjects to represent Tom in a state of *pride*.

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

We wrote four target sentences for each pair of stories. Two of the four target sentences shared their sentence frame, for example, “It would be weeks before Tom’s *guilt* would subside” and “It would be weeks before Tom’s *pride* would subside”. The other two target sentences also shared their sentence frame, for example, “Hearing that made Tom very *guilty*”, and “Hearing that made Tom very *proud*”. These four conditions are illustrated in Table 1. (The full set of stories and target sentences are available on request from the author.)

In addition to the 24 experimental stories, there were 24 filler stones. The filler stories were written in the same style as the experimental stories, but they were not intended to induce readers to represent a particular emotional state. In other words, they were relatively 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 story preceded each experimental story.

We formed four material sets by varying: (1) whether the emotion word in the target sentence matched or mismatched the emotional state we supposed readers would represent in their situational models; and (2) which of the two target sentence frames was presented. These four material sets are illustrated in Table 1.

Each material set comprised 24 experimental stories. Half had target sentences with matching emotion words, and half had target sentences with mismatching emotion words. No story or target-sentence frame was repeated. The 24 experimental stories and 24 filler stories appeared in the same order in each material set.

Procedure—Subjects were tested individually in a session lasting 35–45 minutes. From a computer screen subjects read instructions, which told them that the experiment involved reading several short stories, and their task was to read each story at a natural reading rate. To encourage their comprehension, the subjects were required to write a suitable continuation for some of the stories. They did not know in advance which stories they would have to continue.

At the beginning of each story, the message *READY?* appeared in the centre of the screen. When subjects pressed a response key, the message *READY?* disappeared. Then each sentence of a story appeared in the centre of the screen. After reading each sentence, subjects pressed a response key, which caused that sentence to disappear and the next sentence to appear. After the last sentence of the story, either the words *Please Continue the Story* or the words *Short Wait* appeared. Whenever the words *Please Continue the Story*

appeared, the subjects were instructed to pick up a nearby pencil and write a suitable continuation on a nearby clipboard. They were given 20 seconds to write each continuation.

Subjects wrote continuations for 12 experimental stories and 12 filler stories. Of the 12 experimental stories for which the subjects wrote continuations, half had target sentences with matching emotion words, and half had target sentences with mismatching emotion words. Subjects practised reading a story and writing a continuation to it before proceeding with the actual experiment.

Subjects—Subjects in this and the other experiments reported here were University of Oregon undergraduates who participated to either fulfil a course requirement or earn $5.00. All were native American-English speakers, and no subject participated in more than one experiment. In each experiment, approximately half (50–55%) the subjects were female. A total of 84 subjects participated in Experiment 1.

Results

Do readers form rich, lifelike, situational models that capture fictional characters' emotional states? If so, then target sentences containing emotion words that mismatched those emotional states should have been read more slowly than target sentences containing emotion words that matched those emotional states.

Figure 1 shows the subjects' mean reading times for the target sentences that matched versus mismatched the characters' emotional states. As Figure 1 illustrates, target sentences were read considerably more slowly when they contained mismatching emotion words. This difference was highly reliable, both when subjects were considered random effects, $F(1,83) = 163.3$, $P < 0.0001$, and when target sentences were considered random effects, $F(1,23) = 133.2$, $P < 0.0001$. In fact, 83 of the 84 subjects showed the effect, as did 47 of the 48 target sentences.[1]

How much of this effect is caused only by initial surprise? Perhaps subjects' reading times slowed only the first few times that they encountered mismatching emotion words rather than each time they encountered them. To investigate this possibility, we computed a mean reading time for target sentences read during the first half of the experiment and another mean reading time for target sentences read during the second half of the experiment. These means are illustrated in Fig. 2. As Fig. 2 illustrates, reading time decreased from the first to the second half of the experiment; in other words, the subjects read the target sentences faster during the second half of the experiment. However, the difference between reading sentences with matching versus mismatching emotion words was equally strong in the two halves of the experiment (Fs < 1 for the interaction between first versus second half and matching versus mismatching emotion word). Thus, the effect was equally strong during the first versus second half of the experiment.

EXPERIMENT 2

We propose that readers' rich situational models capture fictional characters' emotional states. In our first experiment, we found evidence to support this proposal: Sentences were

read more slowly when the emotion words they contained were the perceived opposites of the emotional states that the stories implied.

However, how explicit are the situational models that readers form? Perhaps they are neither as lifelike nor as explicit as we propose. Perhaps readers represent events or outcomes only in terms of global aspects—for instance, whether the outcome is negative or positive.

Indeed, even after reading that an actress fell from a fourteenth-story window, readers might not represent the actress's death. Readers might only establish in their mental representations the notion that "something bad happened" (McKoon & Ratcliff, 1986). Perhaps subjects in Experiment 1 represented the events and outcomes of the stories they read only in terms of global aspects, such as whether those events or outcomes were negative or positive.

Consider the story about Tom and the 7–11 store. Although some actions of that story are positive (Tom had a friend, whom he visited at the 7–11), and some actions are neutral (Joe went to the storage room), the more salient and final actions are negative (Tom stole money; Joe was fired; Tom learned why Joe was fired). Perhaps, when reading this story, readers merely represent the notion "something bad happened". If so, then a sentence containing a positive emotion word (like *pride*) would be read more slowly than a sentence containing a negative emotion word (like *guilt*). This is the result we found. So, perhaps Experiment 1 demonstrates only that readers are sensitive to the negative versus positive tone of actions, relationships, settings, and goals, rather than demonstrating that readers form explicit situational models that capture specific emotional states.

We investigated this counter-explanation in Experiment 2. In Experiment 2, the mismatching emotion words were not the perceived opposites of the matching emotion

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[1]The only experimental story that did not demonstrate the predicted effect was the following story:

> Doug and Greg had been friends since childhood, and they shared many attitudes and beliefs. On Friday, Doug met Greg for lunch. Greg had recently joined a very prestigious brokerage company. It was Greg's first real job out of college. Immediately after Doug and Greg sat down at the table, Greg said, "Guess what? I found out our company is involved in illegal trading. So I resigned and then I turned them in." "But", Doug interjected, "it was such a high paying job". "Well", Greg responded, "it just wasn't right, and the truth is more important than one job".

This story was intended to induce the emotional state of *admiration*. When the two target sentences contained matching emotion words, they were:

(21) Just listening to Greg filled Doug with admiration.

and

(22) Doug could barely contain his admiration.

This story was paired with a story that implied the perceived opposite of *admiration*, which is *disgust*. When the two target sentences contained mismatching emotion words they were:

(23) Just listening to Greg filled Doug with disgust.

and

(24) Doug could barely contain his disgust.

Contrary to our predictions, and contrary to all our other experimental stories and target sentences, sentences (23) and (24) were not read reliably more slowly than sentences (21) and (22). Perhaps sentences (23) and (24) were not read more slowly because they do not mismatch another emotional state that Doug could have been feeling. Perhaps Doug was feeling *disgust*—not *disgust* toward Greg but *disgust* toward the company that was involved in illegal trading.

words. Rather, in Experiment 2, the matching and mismatching emotion words were the same affective valence—but the mismatching emotion words were unlikely. For instance, after reading that Tom heard that Joe had been fired, half the subjects in Experiment 2 read sentence (18), just as half did in Experiment 1.

(18) It would be weeks before Tom's guilt would subside.

This is an example of a target sentence that contains a matching emotion word. But the other half of the subjects in Experiment 2 read sentence (19):

(19) It would be weeks before Tom's shyness would subside.

This is an example of a target sentence with a mismatching emotion word. Notice, however, that both *guilt* (the matching emotion word) and *shyness* (the mismatching emotion word) have negative affective valence. If readers represent emotional states only in terms of their negative or positive valence, then sentences like (19) should not be read more slowly than sentences like (18). In contrast, if readers form rich, lifelike, situational models that capture specific information about characters' emotional states, then there should be a difference between subjects' reading times for sentences like (18) versus (19).

Methods

The materials for Experiment 2 included the 24 filler and 24 experimental stories that were included in Experiment 1. However, in Experiment 2, we re-paired the 24 experimental stories so that each was paired with a story that induced an emotional state of the same affective valence. For instance, the story that induced subjects to represent the main character experiencing *guilt* (a negative emotional state) was paired with the story that induced subjects to represent the main character experiencing *shyness* (also a negative emotional state). In the same way, the story that induced subjects to represent the main character experiencing *pride* (a positive state) was paired with the story that induced subjects to represent the main character experiencing *curiosity* (also a positive state). The 12 pairs of emotional states were *Bored-Angry, Guilty-Shy, Restless-Disgusted, Depressed-Afraid, Callous-Desperate, Sad-Envious, Proud-Curious, Joyful-Bold, Sympathetic-Happy, Caring-Content, Hopeful-Admiring, Grateful-Confident*. In other ways, Experiment 2 was identical to Experiment 1. A total of 72 subjects participated in Experiment 2.

Results

Do readers explicitly represent characters' emotional states? Or do readers only represent emotional states in terms of their affective valence (positive or negative)? If readers explicitly represent characters' emotional states, then target sentences containing emotion words that mismatched those emotional states should have been read more slowly than target sentences containing emotion words that matched those emotional states—even though the matching versus mismatching emotion words were the same affective valence. In contrast, if readers represent emotional states only in terms of their affective valence, then target sentences containing mismatching emotion words should not have been read more slowly than target sentences containing matching emotion words because the matching and mismatching emotion words shared their affective valence.

Figure 3 displays the subjects' mean reading times for the target sentences. As Fig. 3 illustrates, target sentences were read considerably more slowly when they contained mismatching emotion words. This difference was reliable, both when subjects were considered random effects, $F(1,71) = 60.0$, $P < 0.0001$, and when target sentences were considered random effects, $F(1,23) = 42.4$, $P < 0.0001$. In fact, 64 of the 72 subjects showed the effect, as did 43 of the 48 target sentences.

These data demonstrate that readers do not simply represent emotional states in terms of their affective valence. As in Experiment 1, the target sentences in Experiment 2 that mismatched the characters' emotional states were read more slowly. However, as Figs. 1 and 2 illustrate, the effect was reliably smaller in Experiment 2 than Experiment 1, both when subjects were considered random effects, $F(1,154) = 41.8$, $P < 0.0001$, and when target sentences were considered random effects, $F(1,46) = 27.02$, $P < 0.0001$. This result suggests that the mismatching emotion words in Experiment 2 did not conflict as sharply with the readers' mental representations as did the mismatching emotion words of Experiment 1 (when the mismatching emotion words were the perceived opposites of the matching emotion words). This is exactly the result we predict if readers represent emotional states in a very lifelike and explicit way: The more the emotion words conflict with the implied emotional state, the more slowly their target sentences should be read.

The results of a post-experiment questionnaire also support this prediction. We asked subjects if any of the stories they read "seemed unusual". In Experiment 1, 95% of the subjects responded that some of the stories seemed unusual. In contrast, in Experiment 2, only 76% of the subjects responded that any of the stories seemed unusual. We also asked subjects to identify (in any way they could) which stories seemed unusual. In Experiment 1, 96% of the stories that subjects remembered as being unusual were stories in which the target sentences contained mismatching emotion words. In contrast, in Experiment 2, only 80% of the stories that subjects remembered as being unusual were stories in which the target sentences contained mismatching emotion words. Thus, the more the emotion words conflicted with the implied emotional state, the more likely subjects were to identify the stories as unusual.[2]

EXPERIMENT 3

In our first two experiments, we found evidence to support the proposal that readers represent fictional characters' emotional states. In our first experiment, sentences were read more slowly when the emotion words they contained were the perceived opposites of the emotional states implied by the stories. In our second experiment, sentences containing mismatching emotion words were also read more slowly, even though the mismatched emotion words were the same affective valence of the emotional states implied by the stories.

We suggest that these reading time experiments demonstrate that readers form lifelike situational models of text: Sentences containing mismatching emotion words are read more slowly because they conflict with those situational models. But consider a counter-explanation: Perhaps readers only represent emotional states when they are forced to. For

instance, in our first two experiments, perhaps subjects only represented the emotional states when they were forced to, which might have been when they read the target sentences. Perhaps only after reading:

(20) It would be weeks before Tom's guilt would subside.

did subjects represent Tom in the emotional state of *guilt*. If so, then a sentence about *guilt* might have been read more rapidly than a sentence about *pride* not because it matched the subjects' already formed mental representations, but because at that point it was easier to construct a situational model of Tom in a state of *guilt* rather than a state of *pride*.

We tested this counter-explanation in Experiment 3. We employed a laboratory task that some cognitive psychologists argue reflects only what is currently activated in readers' mental representations; it does not reflect how easily a stimulus (such as a target sentence) can be established in that representation. The task is simply to pronounce a printed 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).

Pronouncing a printed word is such an easy and relatively automatic task that some researchers assume that subjects do not attempt to integrate the word into their mental representations; presumably, subjects simply pronounce the test word as fast as they can. If most of the test words are unrelated to the stories (and in our experiment, 87.5% were unrelated), subjects are discouraged from interpreting the test words *vis-à-vis* the ongoing story; they simply view the pronunciation task as an additional (and unrelated) task involved in completing the experiment.[3]

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[2]The results of our post-experiment questionnaire also demonstrated that our experimental stories were effective in implying the emotional states that we intended them to imply. For example, three subjects in Experiment 1, wrote that one of the "unusual" stories was about:

(25) Alice, *who was afraid* to go out at night in the city, but the story said she was bold.

(26) The girl *who was afraid* to leave her apartment but was described as bold when walking to her appointment.

(27) The girl *who was afraid* to leave her apartment, but she felt bold when she finally went out. Why was that?

When identifying another story that was "unusual", two subjects wrote:

(28) The woman *who was bored*, but [the story] said she was content after she clearly portrayed a discontent feeling.

(29) The person who was cooped up in her house and *was bored* and antsy, so why was she content?

Another subject wrote than an "unusual" story was about:

(30) The girl working in the nursing home. it said she felt joy *when she really was sad*.

These responses suggest that the stories implied the emotional states so successfully that subjects falsely remembered that emotion, although they did not. Other responses to the questionnaire suggested that the stories successfully implied an emotional state, by virtue of the actions, events, relationships, and other "facts". For example, two subjects wrote that an "unusual" story was:

(31) The one where the girl *seemed restless* from the story details, but then the story said she was content.

(32) In the one where the girl was sitting on her deck in the sun with herbal tea, the story said she felt restless when most people *would feel relaxed and content*.

[3]It is possible that subjects have already accessed the meanings of the test words and attempted to integrate those meanings into their developing representation of the story prior to their pronunciation of them. If so, test words that match the story would be pronounced more rapidly than those that do not. However, our motivation for conducting Experiment 3 was based on Keenan et at. 's (1990) assumption that the pronunciation task does not reflect this type of "context checking".

Therefore, subjects in Experiment 3 read the same stories as the subjects in the first two experiments read. As in the first two experiments, there was no explicit mention of emotion in the stories, for instance, one story began:

> Joe worked at the local 7–11, to get spending money while in school. One night, his best friend, Tom, came in to buy a soda. Joe needed to go back to the storage room for a second. While he was away, Tom noticed the cash register was open. From the open drawer Tom quickly took a ten dollar bill. Later that week, Tom learned that Joe had been fired from the 7–11 because his cash had been low one night.

However, unlike the stories in the first two experiments, each story in Experiment 3 was not followed by a target sentence that contained a matching or mismatching emotion word. Instead, at different points during both the experimental and filler stories, test words appeared on the screen, and the subjects' task was simply to pronounce each test word as rapidly as possible.

In the experimental stories, one of the test words was our target word, and it appeared immediately after subjects read the last line of the story (e.g. after they read *Later that week, Tom learned that Joe had been fired from the 7–11 because his cash had been low one night*). The target word either matched (e.g. *guilt*) or mismatched (e.g. *pride*) the emotional state implied by the story. By measuring how rapidly subjects pronounced the matching versus mismatching target words, we could measure whether readers had already formed their mental representations of the emotional states.

Method

Materials—The materials included the same 24 filler and 24 experimental stories as included in our first two experiments (with the exception of one experimental story that we altered for the reason described in Footnote 1). The 24 experimental stories were paired in the same way as they had been paired in Experiment 1. This meant that the experimental stories were paired with their perceived opposites; for instance, the experimental story that induced readers to represent the main character in the emotional state of *guilt* was paired with the experimental story that induced readers to represent the main character in the emotional state of *pride*.

During each experimental story, two test words were presented. One test word was a target word. For half the experimental stories, the target word matched the emotional state implied by the story (*guilt*); for the other half of the experimental stories, the target word mismatched the emotional state implied by the story—in particular, the mismatching emotion word was the perceived opposite of the emotional state (*pride*). The other test word in each experimental story was a filler word; it was unrelated to the story (e.g. *broccoli* in the story about Tom and the 7–11). Just like the experimental target words, the subjects' task was to rapidly pronounce the filler words.

We also included the same 24 filler stories that we had included in Experiments 1 and 2. During each filler story, one to three test words were presented for the subjects to rapidly pronounce. All the test words in the filler stories were unrelated to their respective stories. Therefore, there were 48 test words presented during the filler stories that were unrelated to

the stories and 24 test words presented during the experimental stories that were unrelated to the stories. In addition, half of the 24 emotion words presented during the experimental stories mismatched the emotional state implied by the story. Thus, of the 96 test words presented during the entire experiment, only 12 were related.

We formed two material sets by manipulating whether the experimental target word was the matching or mismatching emotion word. The 24 experimental stories and 24 filler stories appeared in the same order in both material sets.

Procedure—Subjects were tested in a session lasting 50 minutes. Each subject occupied a soundproofed room. The instructions, presented on the computer screen, told the subjects that they would see several short stories, and their primary task was to read and understand each story. To encourage their comprehension, subjects were also told to write continuations to some of the stories. As in our previous experiments, subjects did not know in advance which stories they would be required to continue.

The subjects were also told that in addition to reading each story, they would perform a secondary task. They were told that occasionally a word would appear on the screen, in capital letters, flanked by asterisks, for example: **GUILT**. When a word appeared like this, their task was to say the word aloud as fast as they could. Subjects practiced pronouncing several target words aloud (and triggering the voice-activated-relay).

Before each story began, the message *READY?* appeared in the centre of the screen. After subjects said “ready” aloud, it disappeared. Then a story appeared, one sentence at a time in the centre of the screen. Each sentence appeared for a period of time proportional to its length plus a constant. The constant was 1500msec, and the function multiplied the number of characters in the sentence by 33.3msec. When the target words appeared, they appeared 150msec after the offset of a sentence, and they remained on the screen until either the subject triggered the voice-activated-relay, or 1.5sec elapsed. The experimenter monitored whether the subject pronounced each target word correctly.

Subjects—A total of 48 subjects participated.

Results

Do readers represent characters’ emotional states as part of normal comprehension? Or do readers only represent emotional states when forced to, for instance, when they read a target sentence that contains an emotion word? If readers have already represented the characters’ emotional states, then they should have been slower to pronounce the target words when those target words mismatched the emotional states implied by the stories.

Although subjects rarely mispronounced the words (this occurred on less than 1% of the trials), on a few occasions they were unsuccessful in triggering the voice-activated-relay (less than 4%). These trials were replaced by the subjects’ mean pronunciation times for other target words in that condition.

Target words were pronounced more slowly when they mismatched (M = 876msec) the implied emotional states than when they matched them (M = 836msec). This difference was reliable when subjects were considered random effects, $F(1,47) = 11.74$, $P < 0.001$ (although not when target words were considered random effects, $P = 0.18$). These data suggest that readers might represent characters' emotional states as part of normal comprehension.

DISCUSSION

Our research was intended to answer the question: Do readers mentally represent fictional characters' emotional states? Our results suggest that readers do represent characters' emotional states. Furthermore, our results suggest that readers' representations of characters' emotional states are very explicit; readers do not simply represent that an outcome was positive or negative.

Our research adds to previous research that has investigated the contents of the representations that readers form during comprehension. In particular, previous research demonstrates that readers' rich, lifelike situational models capture spatial relations (Morrow, Bower, & Greenspan, 1989; Morrow, Greenspan, & Bower, 1987) and even temporal relations (Anderson, Garrod, & Sanford, 1983). Spatial and temporal relations are natural candidates for representation in readers' situational models because most readers understand —albeit naïvely—the laws of time and space. But the laws that govern emotional states are less well articulated than, for example, the law that time moves only forward or the law that two objects cannot simultaneously occupy the same space.

Nevertheless, our research suggests that readers represent fictional characters' emotional states, and they form these representations from only the juxtaposition of characters' actions, goals, and relationships. Recall that in our experimental stories there was never any explicit mention of any emotion. However, we certainly do not want to imply that our subjects' situational models of our experimental stories contained only representations of the fictional characters' emotional states. Our investigations tapped only that aspect of our subjects' mental representations, but we assume that our subjects also represented spatial, temporal, physical, and other relations. For instance (as we proposed before), in addition to their representation of Tom feeling guilt, subjects reading the story about Tom at the 7–11 store might also have represented a spatial layout of the store, a graphic image of Tom's physical attributes, and a mental time frame that organised the sequence of events.

After answering our primary question, our research raises further questions. For instance, how consciously are emotional states represented? We have suggested that sentences that contain matching emotion words are read faster than sentences that contain mismatching words because the matching words match the readers' representations. But how consciously aware are readers of these representations?

In our discussion so far, we have specifically avoided proposing that readers "infer" fictional characters' emotional states, because the connotation of drawing an inference often involves being consciously aware of that inference. We assume that emotional states (and other

implicit information) can be represented without conscious awareness and definitely without conscious prediction. Our experiments demonstrate only that emotional states are represented, or "activated", as phrased in some models of cognition. Whether subjects in our experiments consciously drew inferences is unclear.

How do readers understand fictional characters' emotional states? Miall (1989) proposes that readers understand characters' emotional states partly by considering what their own emotional reactions to the events, outcomes, or goals of a story might be. He writes that "affect enables a wider, self-referential resource of contextual information to be brought to bear on the story, it transfers feelings across domains, and it provides the main vehicle for anticipation". Miall's (1989) proposal suggests that readers who are good at adopting the characters' point of view should be most successful at capturing characters' emotional states in their mental representations. Although plausible, this suggestion demands empirical investigation.

Are readers' mental representations of emotional states dynamic? Freyd (1987) has demonstrated that mental representations of spatial and temporal relations are dynamic—even when the stimuli are static. For instance, after viewing a series of static photographs of a man jumping off a ledge, subjects often misremember the man's final location. Intriguingly, subjects misremember the man as being farther along the trajectory of his jump; it is as if their mental representations capture the momentum implied by the photographs. Subjects' representations are even affected by the perceived velocity of static stimuli (Freyd & Finke, 1985; Freyd & Johnson, 1987).

Readers' mental representations of characters' emotional states might also be dynamic. According to many emotions researchers, assessing an emotional state involves a complex sequence of appraisal (Frijda, 1987; Ortony et al., 1988; Roseman, 1984; Scherer, 1984; Smith & Ellsworth, 1985; Stein & Levine, 1987, 1990). The specific components of appraisal differ among theories, but they include appraising consequences for self and others, assessing goals, determining the interrelations among objects, events, and other persons evaluating certainty (or ambiguity), estimating controllability and intentionality, registering novelty, and other component processes.

Because the appraisal of emotion is most likely dynamic, readers' representations of emotional states are most likely also dynamic. Furthermore, readers' mental representations of characters' emotional states are most likely malleable. What if Tom returns the money, Tom's friend, Joe, regains his job, and Tom and Joe grow closer through the experience? Tom's state of guilt might change into a state of *relief*. We propose that readers' situational models will reflect these changes, but again, this proposal demands empirical investigation.

Finally, do readers represent emotional states automatically? Although some readers might be more versus less adept at capturing fictional characters' emotional states, capturing those emotional states must be a primary component of story comprehension. Emotion is a central component of day-to-day interaction and thought, and literature mirrors those day-to-day interactions and thoughts. Because emotion is a central part of life and a central part of the

literature that reflects it, we suggest that readers' tendency to represent fictional characters' emotional states occurs frequently and relatively automatically.

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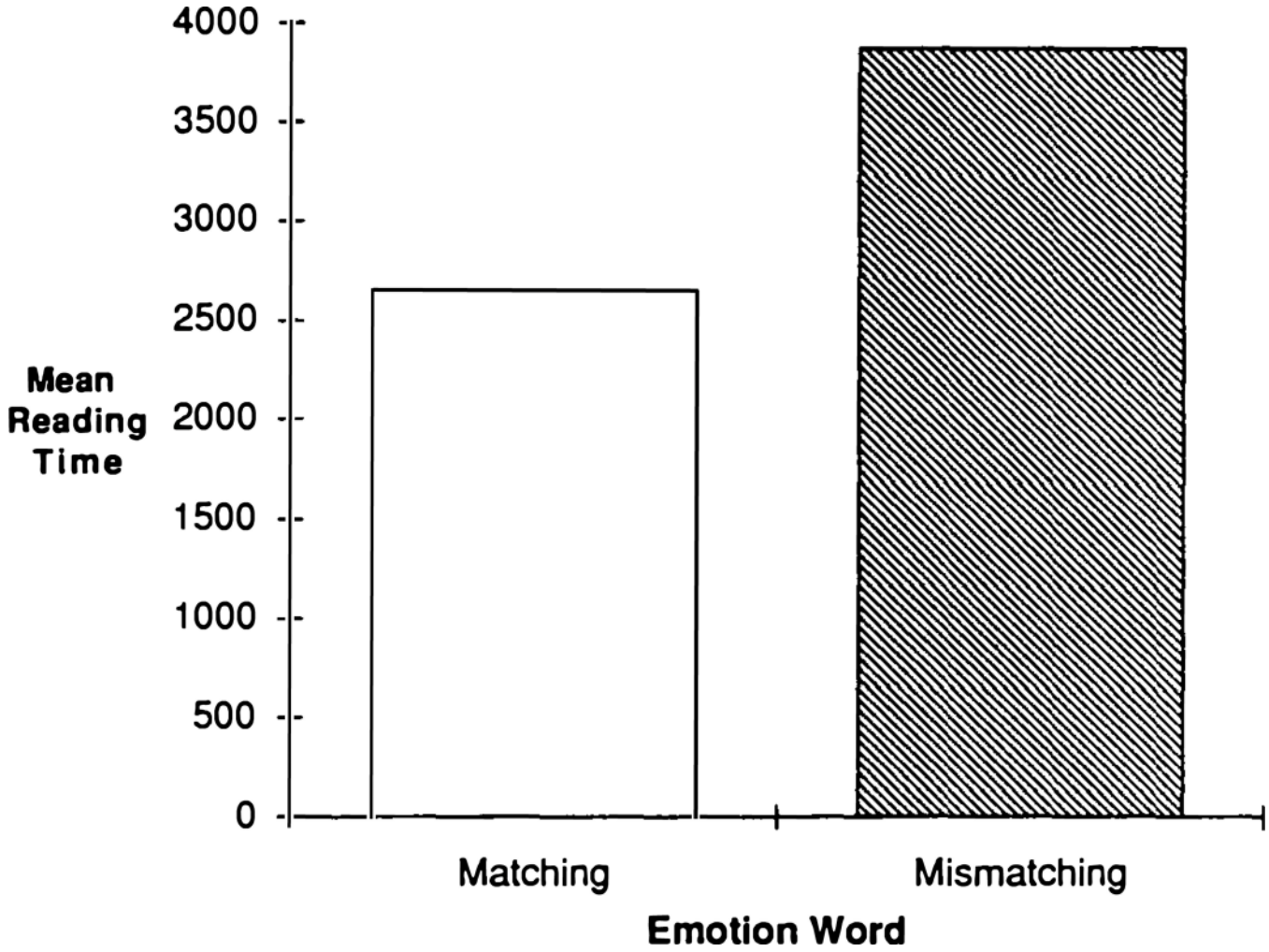

FIG. 1.
Subjects' mean reading times (in msec) in Experiment 1.

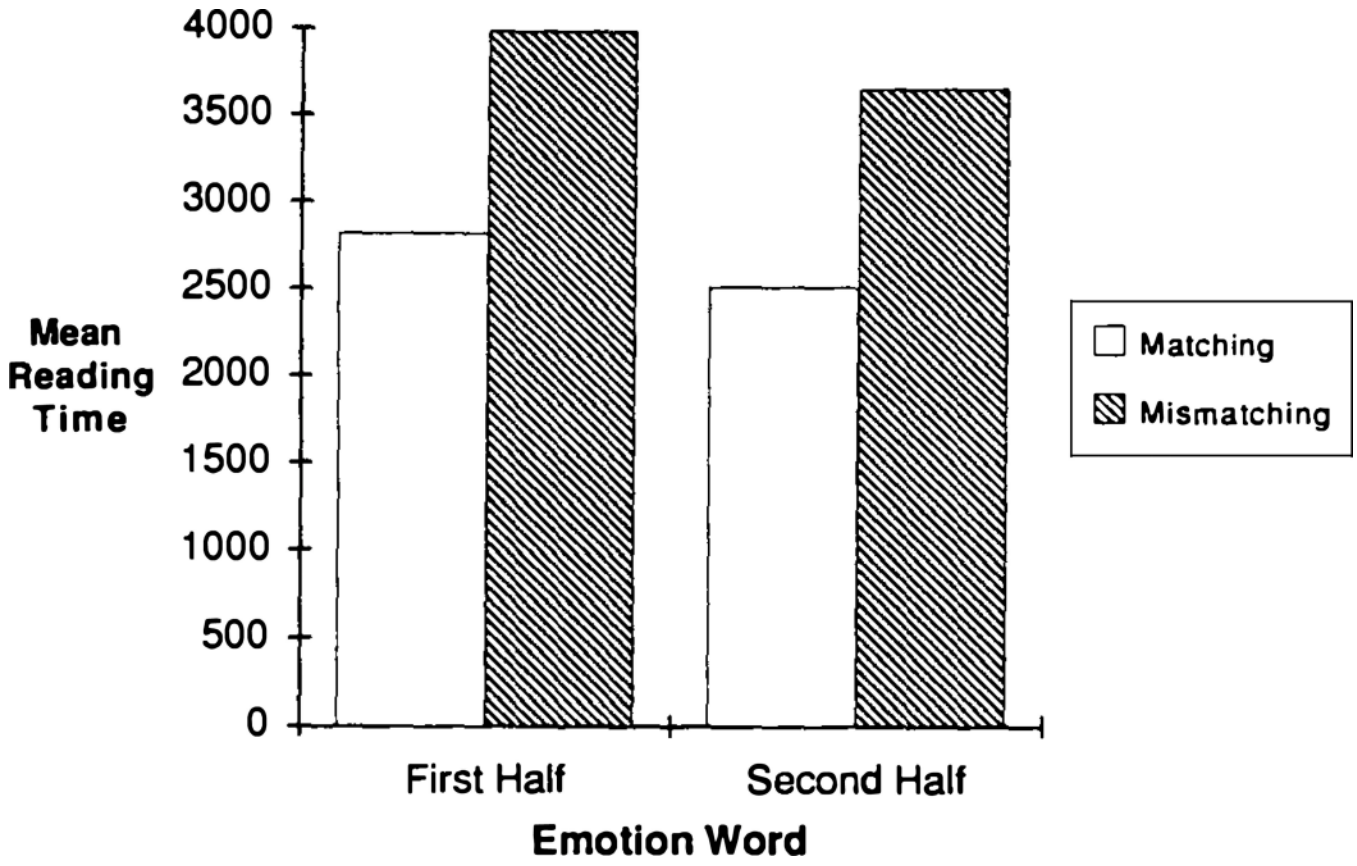

FIG. 2.
Subjects' mean reading times (in msec) in the first versus second half of Experiment l.

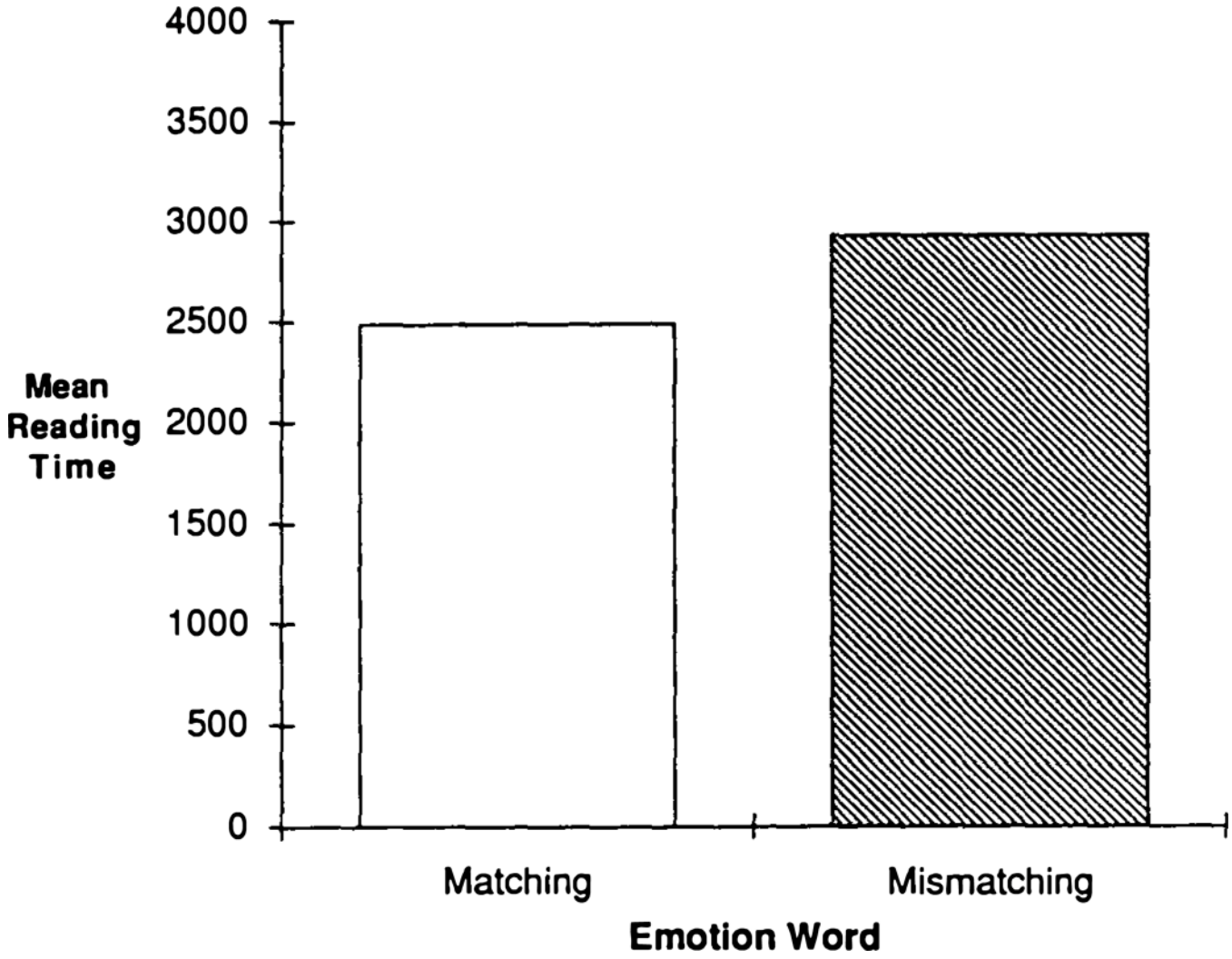

FIG. 3.
Subjects' mean reading times (in msec) in Experiment 2.

TABLE 1

Experiment 1: Example Stories and Target Sentences

Joe worked at the local 7–11, to get spending money while in school. One night, his best friend, Tom, came in to buy a soda. Joe needed to go back to the storage room for a second. While he was away, Tom noticed the cash register was open. From the open drawer Tom quickly took a ten dollar bill. Later that week, Tom learned that Joe had been fired from the 7–11 because his cash had been low one night.	
Target sentences	
Matching:	It would be weeks before Tom's guilt would subside.
Mismatching:	It would be weeks before Tom's pride would subside.
Matching:	Hearing that made Tom very guilty.
Mismatching:	Hearing that made Tom very proud.
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 very 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 Award.	
Target sentences	
Matching:	It would be weeks before Paul's pride would subside.
Mismatching:	It would be weeks before Paul's guilt would subside.
Matching:	Hearing that made Paul very proud.
Mismatching:	Hearing that made Paul very guilty.