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The representation of characters' emotional responses: Do readers infer specific emotions?

Pascal Gygax, Jane Oakhill, and Alan Garnham

University of Sussex, Brighton, UK

This paper argues that emotional inferences about characters in a text are not as specific as previously assumed (DeVega, Diaz, & Leon, 1997; DeVega, Leon, & Diaz 1996; Gernsbacher, Goldsmith, & Robertson, 1992; Gernsbacher, Hollada, & Robertson, 1998; Gernsbacher & Robertson, 1992). The emotional information inferred by readers does not differentiate between emotions that are similar, though not identical. In both Experiments 1 and 2, participants read the stories used by Gernsbacher et al. (1992). Results from Experiment 1 (off-line) show that participants judged several emotions consistent with the same story. In Experiment 2 (on-line), participants took longer to read target sentences containing emotions mismatching the stories, but there was no difference between target sentences containing different matching emotions as determined by Experiment 1. Results from Experiments 1 and 2 suggest that the emotional information readers infer from the stories is too broad to determine a specific emotion. The results are consistent with the idea that a general emotional response is evoked, which is compatible with one or more specific emotions.

Inference generation is an aspect of reading comprehension that has received considerable attention. Theories of text comprehension have attempted to understand which inferences are made and under what conditions they are made (e.g., Graesser, Singer, & Tabasso, 1994; McKoon & Ratcliff, 1992). This paper focuses on one class of inferences: Emotional inferences. Recently, a number of studies have explored whether readers infer characters' emotions while reading (DeVega et al., 1996; Gernsbacher et al., 1992; Gernsbacher et al., 1998; Gernsbacher & Robertson, 1992). The importance of emotion in literary text was emphasised by Miall (1989), who saw emotions as playing a primary role in directing the reading of literary narratives. Miall (1989) suggests three main principles that underlie the importance of emotion in the comprehension process. First, affect (emotion) is self-referential, which means that readers can

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access information about themselves and apply it to the understanding of the text. Second, affect enables cross-domain categorisation of text elements. Text elements (e.g., sentences) that are initially assessed in one way in terms of their importance for the meaning of the text (e.g., specifying the story's setting) can be reassessed or recategorised in the light of new information (e.g., also important for the characters' relationships). According to Miall (1989), the affective valence of text elements is important for this reevaluation. Third, affect allows the reader to anticipate what text characters will do, which means that readers can pre-structure their understanding of the text early in the comprehension process.

Gernsbacher et al. (1992) investigated the ability of readers to represent the situation described in a text, and especially their ability to represent the emotional state of the characters. Of particular interest is the fact that readers might be able to infer emotions that are not explicitly mentioned in the text. In their three experiments, they used two different paradigms: The first two experiments used self-paced reading and the third experiment used a naming task. In self-paced reading, it is expected that readers will take longer to read a sentence that contains incongruent information, for example, emotional information that mismatches the implied emotion of one of the characters. In the naming task, it is expected that people take longer to pronounce a single word (i.e., name an emotion) that is incongruent with the emotion(s) attributed to the story character.

In their study, Gernsbacher et al. (1992) compared different emotion terms. They first matched pairs of emotions that share intensity, duration, and relevance to self (Frijda, 1986) but that have opposite affective valence (e.g., Guilty-Proud, Bored-Curious, Sad-Joyful, Shy-Confident). In their first experiment, they compared reading time of sentences containing different target Matching/Mismatching words. Each term was tested once as a matching emotion and once as a mismatching emotion. An example of the passages related to a pair of emotion words is given in Table 1.

Gernsbacher et al. (1992) found that sentences were read significantly faster when they contained matching emotion terms than when they contained mismatching emotion terms. A possible explanation they advanced for such a result was that the readers were surprised to see mismatching emotions and they took longer to read the sentences containing this incongruent information. Gernsbacher et al. (1992) hypothesised that any pure surprise effect would disappear as the experiment progressed. They, therefore, compared the results for passages presented in the first and second halves of the experiment. If there had been a surprise effect, then the mismatching emotions would take longer to process in the first half of the experiment. In the second half, the participants would get used to these mismatching emotions and thus the surprise effect would be diminished. There was a small difference between the two parts of the experiment, but there was a strong matching/mismatching effect in both parts. However, although the surprise hypothesis was dismissed, it is not clear how such

TABLE 1
Example stories and target sentences from Gernsbacher et al. (1992)

Story
John, who always made good grades, had just transferred to a new school. He wished he had a hobby to occupy his time, or something to keep him busy in the afternoons until he made more friends. After all, his new school was simply not very much of a challenge. And today was no different. As he walked home, he thought about another afternoon, just sitting around watching stupid reruns on TV.

Target sentences
Matching condition
It didn't take an expert to see the boredom written all over his face.
Mismatching condition
It didn't take an expert to see the curiosity written all over his face.

Story
Russ had just graduated with a degree in archaeology. As a graduation gift, his uncle sent him on an expedition to the Yucatan. While there, he went into the jungle to examine the ancient Mayan pyramids. In one pyramid, he noticed a rock that looked strangely like a handle. It was protruding from a smooth wall. He walked toward the rock to get a closer look.

Target sentences
Matching condition
It didn't take an expert to see the curiosity written all over his face.
Mismatching condition
It didn't take an expert to see the boredom written all over his face

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surprise could have arisen, unless an emotional inference had been made. In effect, what Gernsbacher et al. have shown is that the surprise of seeing the mismatching emotions is not overcome simply by getting used to the idea that mismatching emotions occur in the experiment.

In their second experiment, Gernsbacher et al. (1992) investigated whether emotional inferences are mainly valence driven (i.e., driven by whether they are positive or negative). They compared the reading times of sentences containing matching and mismatching emotion words that had the same valence (e.g., Bored-Angry, Guilty-Shy, Restless-Disgusted). The difference between the matching and the mismatching conditions was smaller in this experiment than in the first, but it was still significant.

In their final experiment, Gernsbacher et al. (1992) investigated whether readers infer emotions only when forced to do so by the task, that is, when presented with a target sentence that describes a character's emotional response, which they have to check for consistency with the story so far. To do so, they used a naming task. Instead of presenting a target sentence explicitly stating what the protagonist felt, they presented the participants with single target words (emotion names) that they had to read aloud. Naming times for these target words should be faster if they are consistent with an inferred emotion, but should not force an inference in the way that integrating a sentence into a text

representation would. The results were less clear than for the first two experiments. The difference between matching and mismatching emotion words was significant when participants were considered as a random effect, but not when words were considered as a random effect. Methodologically, one might argue that the first two experiments were forcing an inference that might not otherwise have been made. However, it has also been suggested that naming may not be a good measure of inference processing (see Balota & Lorch, 1986; Lucas, Tanenhaus, & Carlson, 1990; Whitney, Ritchie, & Crane, 1992). It has been argued that naming only accesses surface levels of representation (Whitney et al. 1992) by mere grapheme to phoneme lexical routes. Hence, naming is believed to be ineffective for accessing deeper levels of representation such as a semantic level (Balota & Lorch, 1986). Others have raised the point that naming might be so easy that any differences across conditions would be difficult to detect (Lucas et al., 1990). Recent evidence (Calvo & Castillo, 1996; Estevez & Calvo, 2000) indicates that naming is especially insensitive to inference generation when the interval between the end of the experimental text and the presentation of the target word is shorter than 550 ms. In Gernsbacher et al.'s (1992) third experiment, the target words appeared 150 ms after the offset of the experimental text, which could account for their nonsignificant results.

From these experiments, Gernsbacher et al. (1992) suggested that readers infer emotions while reading, though they were not able to come to a definite conclusion about when the inferences were made. They ruled out a surprise effect and ruled out the possibility of merely inferring emotional valence. As a result of their valence manipulation, they showed that the emotional information inferred by readers is not so broad as to include emotions that merely share valence with the target emotion (e.g., Bored-Angry, Guilty-Shy, Restless-Disgusted). However, their results do not address the issue of emotions that share more than valence. They have not shown that readers discriminate between negative emotions that are closer than, for example, ''guilty'' and ''shy''. Even though Gernsbacher et al. (1992) provide a valuable account of the kind of emotional inference processes that might occur while reading, it is not clear from their results exactly what emotional information is inferred on-line. Gernsbacher et al. (1992) assume that readers infer specific emotions, such as ''guilt'' or ''boredom''. This specificity had been assumed by other researchers (e.g., DeVega et al., 1996; Gernsbacher et al., 1998) who also tested pairs of matching/mismatching emotions to support their hypothesis. In the present paper we address the assumption of specificity of emotional inferences by questioning whether the emotional information inferred by readers from the stories is as specific as Gernsbacher et al. (1992) assumed it to be.

This issue inevitably relates to the debate about how emotions are defined. Some theorists (e.g., Johnson-Laird & Oatley, 1992) suggest that there are a limited number of basic emotions, from which all other emotions are derived. Most researchers who postulate basic emotions include anger, happiness,

sadness, and fear among them (for an account, see Ortony & Turner, 1990), and relate their ideas to the work of Ekman (e.g., 1984) who suggested a link between basic emotions and universally recognisable facial expressions. The notion of a basic set of core emotions has been controversial, and has led some researchers, such as Ortony and Turner (1990), to advocate a componential theory of emotion based on the principle that a set of subcomponents, such as valence and intensity, combine to form a specific emotion. These sub-components are rooted in different cognitive mechanisms, such as appraisal, that eventually lead to emotional responses (Smith & Lazarus, 1993). Such mechanisms themselves depend on components such as environmental cir-cumstances, one's relation to these circumstances, and personal goals and beliefs (Smith & Lazarus, 1993). The definition of emotion will not be considered in depth in this paper, although the relation between the results of the experiments and componential theories will be briefly addressed in the General discussion.

The hypothesis of Experiment 1 was that, in an off-line task, people find a variety of different emotions consistent with each of the stories used by Gernsbacher et al. (1992). If this hypothesis is supported, it would suggest that readers infer some general information shared by all the emotions generated for each story, rather than a specific emotion, although the results of Gernsbacher et al. (1992) suggest limits on how general this information is likely to be. Experiment 2 tested the same assumption by using a self-paced reading para-digm, to provide an on-line measure of inference processes. Experiment 1 was divided into two parts: generation of emotions related to the stories (Experiment 1a), and rating of emotions related to the stories (Experiment 1b).

EXPERIMENT 1A

Method

Participants.   A total of 11 students from the University of Sussex participated in Experiment 1a (inference generation). They were paid £4 for a session that lasted for about 30 minutes.

Materials.   Twenty-five stories from Gernsbacher et al. (1992) were used.[1] Table 1 shows two examples. Each story was written so as to suggest an emotional reaction in the main character. The stories, which were originally written for readers of American English, were modified where necessary for British English readers. Each story was paired with an opposite (perceived opposite) emotion story. Although one of the stories involving the emotion ''admiration'' demonstrated mixed results in Gernsbacher et al. (1992) (hence,

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[1] We would like to thank Morton Ann Gernsbacher for making these stories available.

Gernsbacher et al., 1992, created an extra story), it was included in the present study to see if the same problems arose even when a different task was used.

Procedure.   Participants were presented with 25 stories, each on a separate sheet of paper. The order of the presentation of the stories was random and different for each person. The participants were asked to read each story carefully and to carry out a sentence completion task following it. The sentence completion task was for each story:

[Main character] felt . . .

The participants were asked to give a minimum of one answer and a maximum of ten answers. They were not asked specifically to write emotional terms. The instructions specified that they could complete the sentence with one word or several words.

Results

The number of distinct responses generated for each story ranged from 16 to 42 with an average of 26 items. Table 2 shows examples of stories representative of the whole set with all the answers given.

As shown in Table 2, the answers sometimes comprised a phrase rather than a single word. The number of agreed answers (at least two participants generating the same answer) for each story varied from 4 to 14. The responses generated for a particular story were clearly different emotions, and usually not synonymous (e.g., the following emotions were generated for one story: shy, annoyed, nervous, lonely, sad, insecure, unconfident, worried). However, the emotions that participants produced for a single story were much closer than the pairs of same valence emotions compared by Gernsbacher et al. (e.g. envious-sad, grateful-confident). Thus, although Gernsbacher et al.'s study demonstrated that readers infer something more than the valence of the story character's emotional response (as they differentiate between same-valence emotions, such as sympathetic and happy), the results of our production study suggest that readers evoke a number of different, but mutually compatible, emotions in response to a story, and do not infer one specific emotion as Gernsbacher et al. concluded. In our second study, we explored whether the variety of emotion terms produced by participants in Experiment 1a would be rated as likely to be felt by the main story character. In this way, we can see whether participants prefer one, or a small number of, particular terms as representing the emotional state of the main story character, rather than focusing on one particular emotion. Although participants in Experiment 1a produced a range of emotion terms for each story, they may have more specific preferences when required to evaluate, rather than produce, terms.

TABLE 2
Examples of stories with the responses generated in Experiment 1a and 1b

Story

Andrea was awakened by a ray of sunshine coming in through her window. She rose and looked out to find a beautiful day. Because last week had been so productive, she knew that there was nothing urgent that needed to be done today. She made herself a cup of herbal tea, and went out onto her back porch to simply soak in the sun. Andrea felt . . .:

Items generated (Experiment 1a) along with the rating of eight items (Experiment 1b)
Content (6.3), relaxed (6.3), happy (5.8), calm (6.3), lucky to be able to take the day off (6.2), good (6.0), unstressed (6.2), self-satisfied (6.0), on top of things, warm, serene, really content, excited, radiant, fresh, lazy, optimistic, healthy, laid back, unpressured, in control, sleepy, alive, care-free, deserving.

Story

Russ had just graduated with a degree of archaeology. As a graduation gift, his uncle sent him on an expedition to the Yucatan. While there, he went into the jungle to examine the ancient Mayan pyramids. In one pyramid, he noticed a rock that looked strangely like a handle. It was protruding from a smooth wall. He walked toward the rock to get a closer look.

Items generated (Experiment 1a) along with the rating of eight items (Experiment 1b)
Curious (6.84), excited (6.36), nervous (4.52), scared (4.10), intrigued (6.89), anxious (4.15), interested (6.57), amazed (4.52), privileged, like it was fate, inquisitive, fascinated, hopeful, it was too strange to be true.

Story

Eric really wanted to go to the End of Term Party, but he didn't have a date. He was thinking of asking Shelly, a girl in his history class. Chances are she'd actually consider going with him, but he hadn't been able to ask her. He'd talked to her once when she asked him if she could borrow a pencil. He'd been wanting to say something else to her ever since, but he had little practice talking to girls— or anyone else.

Items generated (Experiment 1a) along with the rating of eight items (Experiment 1b)
Shy (6.26), annoyed (3.89), nervous (6.10), lonely (4.63), sad (4.05), insecure (5.89), unconfident (6.36), worried (5.26), frustrated, cross, uncomfortable, butterflies, hopeless, fed up, scared, silly, insignificant, embarrassed, desperate, timid, anxious, angry, inadequate.

Story

Ken was talking to his counsellor at the Office of Academic Advising. She was reviewing with him the fact that he was on scholastic probation, and how he had to get higher than a 2.2 to stay in University. Ken wished his grades were higher. But he just found out that he was going to fail four of his courses, and it was too late in the quarter to do anything about it. He just couldn't pull his grades up no matter what he did. Perhaps a college degree was no longer in his reach.

Items generated (Experiment 1a) along with the rating of eight items (Experiment 1b)
Despair (5.73), angry (4.73), useless (5.57), miserable (5.57), upset (5.78), sad (5.68), fed up (5.89), disappointed, hopeless, frustrated, stupid, worthless, despondent, pessimistic, resigned, bad, concerned, devastated, dismayed, embarrassed.

Note: The numbers in parentheses represent the mean rating (7 point scale) of the likelihood that the main character would feel the emotion. The first item of each list is Gernsbacher et al.'s (1992) original item.

EXPERIMENT 1B

The purpose of this experiment was to see if people would judge several emotions as likely to be felt by the main character in each of Gernsbacher et al.'s (1992) stories. Again, such a result would imply that people do not infer a specific emotion, but a general feeling attached to the story and its main character.

Method

Participants.   A total of 19 students from the University of Sussex participated in Experiment 1b (inference rating). They were paid £4 for a session that lasted for about 30 minutes. None of the participants from Experiment 1a took part in this study.

Materials.   Responses produced in Experiment 1a were used in this experiment. Eight of the answers produced in Experiment 1a for each story were tested. The following procedure was intended to select the words that were most closely associated to the stories for our participant group.

1. The emotional word from Gernsbacher et al. (1992) was selected.
2. The words that were mentioned most often were chosen. If several words were mentioned equally often for a particular story, the words mentioned most frequently across Experiment 1a as a whole were chosen. If there were still more than enough words, then the words generated first by participants in Experiment 1a were chosen.
3. If the number of words mentioned more than once was lower than eight, then the words mentioned only once in that story but mentioned most frequently over the whole set of stories were chosen. If the number was still lower than eight then the words mentioned first in that particular story were chosen.

Procedure.   The participants were presented with the same 25 stories used in Experiment 1a. They were instructed to read each story carefully and to complete a rating task. In the rating task, participants had to rate the likelihood of the main character feeling several emotional responses on a 7-point scale (1 = ''not very likely'' to 7 = ''very likely''). The emotional responses that the participants had to rate were the eight words chosen using the procedure explained above and three words from the story with the perceived opposite emotion (as defined by Gernsbacher et al.). The three words from the perceived opposite emotion story comprised the emotion word from Gernsbacher et al. (1992) and two further words generated in Experiment 1a. These three words were added to prevent participants from deciding that all the emotions matched the stories and rating them all highly without reading the experimental materials

properly. The order of the presentation of the stories and of the words were randomised independently for each participant. The instructions specified that several responses could be given the same rating, to prevent people from engaging in a comparative strategy.

Results and Discussion

In Experiment 1b, people had to rate a number of emotions according to the likelihood that the main character would feel them. The aim of the experiment was to see if people would give similarly high ratings to several clearly different emotions, implying that they had not inferred one specific emotion, but some more general emotional information attached to the story and its characters.

A one-way ANOVA was performed on each story to see if there was any difference between the ratings of the different emotional terms tested. On average, participants rated five emotions per story to be as likely to occur as the emotion words tested by Gernsbacher et al. (1992). For each story, at least three words showed no significant difference ($p > .05$) from the word tested by Gernsbacher et al. (1992) and in seven stories all eight words or phrases were rated as highly as Gernsbacher's target word (e.g., content, relaxed, happy, calm, lucky to be able to take the day off, good, unstressed, self-satisfied, on top of things; more examples are shown in Table 2).

As predicted, people rated highly a wide range of emotional terms related to the same story. The readers seem to infer a general feeling, which is compatible with several emotional terms. However, nothing can be said from Experiment 1 about what happens during reading, as people had as much time as they wanted to generate the answers. Also, it may be the case that the participants read the words and rated them by comparing them to other words in the list, and not with reference to the story. For these reasons we conducted an on-line study in which each story concluded with a single statement about how the main character felt, and measured the time it took participants to read statements that were emotionally congruent or incongruent to the story.

EXPERIMENT 2

The purpose of this experiment was to extend the findings of Experiment 1 by using a self-paced reading paradigm. Such a paradigm was also used by Gernsbacher et al. (1992), who assumed that it provided a measure of on-line inference processes. In order to discriminate between different levels of specificity, four types of emotion terms were included in this present experiment. The initial emotion (Matching) used by Gernsbacher et al. (1992) was compared to a synonym (Matching Synonym) and to a similar emotion (Matching Similar). This latter condition is of particular interest, as it differs from the initial emotion along several dimensions (e.g., Depressed-Useless), but is still congruent with the story. We did not include the more distal, but same valence, emotions used

by Gernsbacher et al. (1992). In our study, the Matching Similar emotion shared valence and several other components with the original Matching emotion, but was not a synonym of that emotion. In addition to these three Matching emotions, an incongruent emotion (Mismatching) was included for each story. If people infer specific emotions while reading, then their reading times for sentences containing Matching emotions should be faster than those for sentences containing either Matching Synonym or Matching Similar emotions. Moreover, reading times of sentences containing Matching Synonym emotions should be the closest to reading times of sentences containing Matching emotions. If readers do not infer specific emotions, but only a more general impression of how the protagonist is feeling, then there should not be any differences among the reading times for sentences containing Matching, Matching Synonym, and Matching Similar emotions. For both hypotheses, reading times for sentences containing Mismatching emotions are expected to be longer than for sentences containing Matching emotional information.

Method

Participants.   A total of 24 students from the University of Sussex participated in this experiment. They were paid £4 for a session that lasted for about 30 minutes. None of the participants from Experiment 1 took part in this study.

Materials.   The stories were the same as in Experiment 1. The story that showed mixed results in Gernsbacher et al. (1992) also demonstrated mixed results in Experiment 1b (i.e., mismatching emotions were rated as high as some of the matching emotions) and, thus, was excluded from the present experiment.

In addition to the 24 experimental stories, 24 filler stories (taken from Gernsbacher et al., 1992) were used. The 24 filler stories were written in the same general style as the experimental stories, but were not intended to imply any particular emotional response.

Each experimental story appeared in four conditions, defined by the target emotional words (an example is given in Table 3):

1. Matching: Gernsbacher's initial target word matching the story.
2. Matching synonym: The closest synonym that was generated in Experiment 1. This synonym was agreed by four judges, who were asked to chose the closest synonym to Gernsbacher et al's (1992) initial matching emotion among the emotions rated as highly consistent with the story in Experiment 1b.
3. Matching similar: An emotional term differing in several dimensions but still rated (in Experiment 1b) as very likely to occur (e.g., ''lonely''

TABLE 3
Example of a story used in Experiment 2 with the emotion words in the four conditions
and the four target carrier sentences

Story

''How many things like this can happen in one day?'' Don asked himself. First, he was beaten out of
a new job by a younger man. If that wasn't enough, on the way home, he wrecked his car. Then,
when he got home, he found out his wife wanted a divorce. All he could do was sit in his living room
and stare into space.

Conditions

Matching:	depressed
Matching synonym:	miserable
Matching similar:	useless
Mismatching:	happy

Target carrier sentences

1. It was a moment when [character] felt really [emotion]
2. [character] could not believe how [emotion] s/he felt
3. There could be no doubt that [character] felt[emotion]
4. It was not surprising that [character] felt[emotion]

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instead of ''bored''). This emotional term had always the same valence as
the Matching emotion.
4. Mismatching: Gernsbacher's perceived opposite emotion, mismatching
the story (and opposite in valence).

As there were four conditions per story, four different lists of stories were
constructed, and six participants were assigned to each list. Each list had six
stories in each of the four conditions, and each story occurred the same number
of times, across the experiment, in each of the four conditions. The filler stories
were the same in each list. The order of presentation of the filler and experi-
mental stories was random and different for each of the four lists.

Apparatus.   The stories were presented on a PC fitted with an Advantech
PCLabCard, using a version of the TSCOP program (Norris, 1984). Responses
were collected using response buttons attached to the PCLabCard, which permits
millisecond accuracy.

Procedure.   The participants were instructed to read each story at a normal
reading speed, as though they were reading a magazine. To make sure that
participants read the stories carefully, some stories ($N = 16$) were followed by a
question related to the text. Participants had to answer the question by pressing a
button labelled either ''yes'' or ''no''. Each story was presented in four parts (of
one or more sentences), with the last part being the target sentence. Participants
were instructed to press the ''yes'' button when they finished reading each part.

Reading times for the target sentences were recorded. Different carrier sentences were created for the target words to avoid participants becoming too accustomed to a particular sentence structure at the end of each story. These carriers are shown in Table 3. All the target sentences were approximately the same length. In each list, each of the different target carrier sentences was randomly selected for six stories.

Before the main part of the experiment, the participants read two practice stories, both of which were followed by questions, to familiarise them with the procedure and with the kinds of passages that they would be reading.

Results and Discussion

The aim of this experiment was to see if readers infer specific emotions or more general emotional information. If the latter, there should be no difference in reading time between target sentences containing matching but different emotion terms. If people infer specific emotions, reading times for the matching emotion condition should be faster than the matching synonym condition, which in turn should be faster than the matching similar condition. On either hypothesis, it was expected that sentences with mismatching emotional information would take longer to read than sentences with matching information.

Table 4 shows the mean reading times for the target sentences in the four conditions. A one-way ANOVA showed the expected difference between the four conditions, which was significant in both the by-subject analysis: $F_1(3, 69) = 34.01$; $p < .001$, and the by-items analysis: $F_2(3, 69) = 15.6$; $p < .001$.

When the Mismatching condition was excluded, the analysis showed no significant differences between the Matching, Matching Synonym and Matching Similar conditions in either the by-subjects analysis: $F_1(2, 46) = 3.01$; $p > .05$, or in the by-items analysis: $F_2(2, 46) = 1.35$; $p > .05$. The Mismatching condition was significantly different from the Matching condition: $F_1(1, 23) = 48.27$; $p < .001$ and $F_2(1, 23) = 26.89$; $p < .001$, from the Matching Synonym condition: $F_1(1, 23) = 33.94$; $p < .001$ and $F_2(1, 23) = 16.78$; $p < .001$ and from the Matching Similar condition $F_1(1, 23) = 48.36$; $p < .001$ and $F_2(1, 23) = 17.46$; $p < .001$.

TABLE 4
Reading times (ms) in Experiment 2

Condition	Mean (ms)	Standard deviation
Matching	1767	453
Matching synonym	1941	555
Matching Similar	1849	456
Mismatching	2703	838

It might be thought that the slightly (though not significantly) faster responses in the Matching condition (see Table 4) provide some evidence that Gernsbacher et al's (1992) emotions were being inferred first or most strongly. The other matching emotions might be inferred less strongly or by a chain of association (e.g., because depression might result from a feeling of uselessness). For this argument to be plausible, readers should respond faster to the Matching Synonym condition, which is closer to the Matching condition, than to the Matching Similar condition. However, they did not.

These results, therefore, support our hypothesis that readers infer general emotional information, which is compatible with a number of different emotions, rather than one specific emotion. Although no difference between the Matching condition and the Synonym condition would be expected, an account based on the idea of specific emotional inferences cannot explain the non-significant difference between emotions that are similar, though not identical (i.e. those in the Matching condition and the Similar condition). The general emotional information inferred is not only shared by close synonyms but also by other emotions that share similar properties (not merely valence).

GENERAL DISCUSSION

The two experiments reported in this paper investigated the assumption that people do not attribute specific emotions, such as ''guilt'' or ''boredom'', to characters in a text, but only more general information that is shared by several specific emotions. The process of inferring specific emotions might be too complex and too effortful for the readers to engage in while reading, or it might lead to an unjustifiably specific emotion attribution. Hence, the two experiments investigated differences, or lack of differences, between several emotions that the same story character might feel, both off-line (Experiment 1) and on-line (Experiment 2). The hypothesis was that there would not be any differences between different, but similar, emotions that were congruent with the stories.

Experiments 1 and 2 both supported this hypothesis. In Experiment 1a, participants generated a large number of possible emotions appropriate to the characters in the stories. In Experiment 1b, participants rated several emotions as being as consistent with the stories as the emotions initially assigned by Gernsbacher et al. (1992) (i.e., the main character was very likely to feel any of these emotions). In Experiment 2, which used an on-line measurement, there was no significant difference in reading times between the three matching conditions (Matching, Matching Synonym, and Matching Similar). Emotions that were very close to the original Gernsbacher et al. emotion (Matching Synonym) and, perhaps more surprisingly, emotions that were only broadly similar (Matching Similar) behaved in the same way as the originally selected emotion. There was, however, a significant difference between the mismatching condition and the three matching conditions. In view of these results, it is

possible to say that the emotional information inferred by readers from the stories is more general than a specific emotion. Gernsbacher et al. (1992) provided evidence that the emotional information inferred while reading is not as broad as to confuse emotions merely sharing valence, and the present results show that the emotional information inferred while reading is not as specific as to differentiate between similar emotions. Exactly what information is inferred remains to be investigated.

If one believes that emotions are constructed from a large set of subcomponents (Ortony & Turner, 1990), such as valence or intensity, it is possible that while reading, readers do not infer all the subcomponents necessary to define specific emotions. Inferring or processing all the subcomponents needed to determine the specific emotion that a character felt might be cognitively too taxing, or not justified by the limited information provided in a short text. Hence, the inferred subcomponents might be the most salient or the most clearly implied ones under these constraints.

Although our discussion has focused on specificity versus nonspecificity, this distinction should be seen as a continuum rather than a dichotomy. Indeed, in the experiments reported, readers appear to have inferred at least several of the subcomponents characteristic of a specific group of emotions. For example, for the story in Table 3, ''depressed'', ''miserable'', and ''useless'' belong to a related group, defined by similar appraisal, valence, and intensity subcomponents. The emotional information is, therefore, not so vague as to embrace emotions from broader groups (e.g., it is not merely valence driven). In that sense, our results are not necessarily incompatible with those of Gernsbacher et al. (1992), although they are incompatible with the interpretation of those results as showing that the emotions inferred while reading are specific. The experiments presented in this paper show that the emotional information inferred is not sufficient enough to pinpoint a specific emotion. That is, the subcomponents needed to differentiate ''depressed'' from ''useless'', for example, were not included in the emotional information inferred from the story. Instead of considering the specificity of emotion as such, the argument should be focused on the level of specificity of emotion inferences. Therefore, the conclusion of the experiments reported in this paper should be that the level of specificity of emotion inferences while reading is not as high as previously assumed.

The possibility of inferring specific emotions while reading remains open. Future research could be directed to determining which conditions are necessary for the readers to infer specific emotions. Specifically, whether aspects of more complex texts allow the reader to infer more specific emotions, or in terms of a componential theory, to extract more subcomponents. If readers are capable of inferring specific emotions under certain circumstances, it would support the idea that people can build a complex model of the situation, depending on the particular characteristics of the text. Also, as Gernsbacher et al. (1992) pointed

out, people might have inferred emotional information because they needed to integrate information in target sentences into their representation of the story. Experiments using tasks, such as naming, taking the methodological points discussed earlier into consideration, or lexical decision tasks, may shed further light on when emotional inferences are made.

In conclusion, these experiments demonstrate that readers do infer some emotional information while reading, but that it is not always sufficient to enable them to pinpoint a specific emotion. So emotion inferences are not as specific as it has been assumed in previous research (DeVega et al., 1997, 1996; Gernsbacher et al., 1992; Gernsbacher et al., 1998; Gernsbacher & Robertson, 1992).

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