Interpretative Inferences When Reading About Emotional Events.

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\textsuperscript{3} The research reported here formed part of a PhD thesis submitted to the University of Cambridge.
ABSTRACT

In three experiments we investigated the extent to which individuals with high or low levels of anxiety about interviews made emotionally-congruent interpretative inferences while reading descriptions of a relevant ambiguously-threatenng event (being interviewed for a job). Evidence was found to support the hypothesis that groups varying in self-reported concern about the described event differed in the interpretations that they made while reading. Taken together, the results of the three experiments are consistent with the conclusion that non-anxious individuals infer positive outcomes to an ambiguous event, while highly anxious individuals do not. We suggest that these results have implications for cognitive processes that could maintain anxiety in real life.

Acknowledgments.

Thanks are due to Morton Ann Gernsbacher and Manuel Gutierrez Calvo for helpful comments on an earlier version of this manuscript.
A number of recent studies have shown that anxious subjects tend to interpret ambiguous words in a more negative way than do non-anxious control subjects. Using homophones that had both threatening and neutral meanings, Mathews, Richards & Eysenck (1989) found that, relative to control subjects, anxious patients were more likely to use spellings consistent with the threatening meaning, when required to write down a tape recorded word list. In a related study, Richards & French (1992) used homographs with threatening and non-threatening meanings (e.g. stroke) as primes for a lexical decision task in which the targets were semantically associated with one or the other meaning. After SOAs of 750 or 1250 milliseconds, but not 500 ms., mildly anxious subjects were faster to endorse word targets related to the threatening rather than the non-threatening meaning of the priming homograph, relative to non-anxious controls.

Eysenck, Mogg, May, Richards & Mathews (1991) had anxious patients and controls listen to sentences that could lead to negative or neutral interpretations, such as "The doctor examined little Emma's growth". Alternative versions of these sentences that had been changed so as to make them unambiguously threatening or emotionally neutral (e.g. by referring to cancer versus height) were then rated for similarity of meaning to the recalled originals. In two experiments, control subjects rated the more neutral versions as being more similar in meaning to the original version that they had heard previously. The anxious patients, however, endorsed either of the two versions as being equivalently similar in meaning to the original.

Using the same type of material, MacLeod & Cohen (1993) recorded reading times for threatening or neutral continuations of ambiguous sentences, to determine if the former results could be attributed to word interpretations made on-line (i.e. at the time of reading). Thus a sentence such as “They completed the service by filling in the hole” was continued with a disambiguating sentence, such as “The funeral (repairs) finished much sooner than expected”. Results suggested that the groups differed in their reading times for threat-consistent
continuations, with anxious subjects being faster than non-anxious controls, implying that they had already imposed a mood-congruent interpretation on the original sentence.

An alternative method of assessing on-line inferences is to use speeded decisions for probes matching a possible inference. Calvo, Eysenck & Estevez (1994) presented test anxious students with incomplete sentences that could imply either a negative or neutral outcome, and then required a lexical decision for probes matching one or other outcome. Anxious subjects were slower than controls to make lexical decisions for words matching a neutral rather than a threatening inference, and were also slower to reject a non-word that resembled a threatening probe word.

One possible implication of these results is that selection of the more threatening meaning of ambiguous events is a characteristic of individuals who are prone to anxiety. It has further been argued that this bias may be a factor in causing or maintaining their anxious mood (Mathews & MacLeod, 1994). Because many real-life events are inherently ambiguous and allow for both positive and negative interpretations, a consistent bias to make negative inferences under uncertainty would cause the world to be perceived as being relatively threatening. However, there is clearly a very large gap between the interpretation of ambiguous words, and inferences about complex events in real life.

The major purpose of the present experiments was to attempt to extend the previous results to encompass such complex events. Rather than using single sentences, we developed more realistic descriptions, intended to more closely simulate real life events, and sampled possible interpretative inferences made by readers at several points in each text. Furthermore, the texts were written in such a way that, despite easy comprehension of literal meaning, the emotional implications of the situation described remained ambiguous. Hence the experiments were designed to investigate the ongoing interpretation of described ambiguous events, rather than the meaning of individual ambiguous words. Each of the critical texts were descriptions of being interviewed for a job, and we selected subjects who
reported that they were typically very anxious, or fairly calm during interviews. Subjects were requested to imagine themselves in the situation as they read each description. At several points during the text, when the outcome of the events being described was uncertain, subjects performed speeded decisions for words matching predictive inferences that we had previously found to differentiate reports made by anxious and calm subjects.

In three experiments, we varied the nature of the speeded decision to probes, to explore whether differences depended on the extent to which this task required that readers refer back to the text, and whether they depended on specific inferences rather than on more general context priming effects. In a first experiment we maximized the probability that subjects would make inferences while reading, by using a task in which subjects had to determine whether the probe could legitimately complete the current sentence, thus forcing reference to the text when making the decision. In a second experiment we used the lexical decision task, that does not force reference to the text in order to respond. Finally, in a third experiment, we used the same task to test for general context priming effects under conditions that made inferences unlikely.

EXPERIMENT 1.

METHOD

Subjects

Subjects were community volunteers who had indicated on a survey form that they were either “very anxious” or “not at all anxious” about job interviews. They were then sent a 20-item set of statements found in earlier pilot work to distinguish between people high and low in anxiety about interviews (E.g. “When I have an interview, I get so nervous I forget facts I really know”). Each item was rated on a 5-point scale from "strongly agree" to "strongly disagree", with maximum anxiety corresponding to a score of 100. Volunteers with high or low anxiety scores were invited to participate in the experiment, and the same
questionnaire was readministered after the experimental session was over. Subjects scoring 75 or more on both administrations were allocated to the high anxious group (second mean 86.5, s.d. 7.3); and those scoring 45 or less both times to the low anxious group (second mean 40.3, s.d. 7.7). A total of 30 subjects were finally included, 15 in each group, matched for gender, age, and education, after exclusion of two subjects who did not follow task instructions correctly.

Materials and Apparatus

A total of eight descriptions were developed for presentation in the experiment. Six of the descriptions (ranging from between 623 and 659 words, and between 79 and 89 lines of text), were about different types of interviews for jobs (varying from an international bank to a supermarket), and the remaining two were shorter practice descriptions of social occasions. The descriptions were designed to be of neutral valence (except for the resolution of the ambiguity from the probe words), in that no emotional descriptors were included, and no information about the success or failure of the interview was given. However, the text was ambiguous at certain points, and probe words were presented at these points, producing either a threatening or non-threatening resolution of this ambiguity. For example, one critical sentence and following probe were:

(1) As you go into the interview you think that all your preparation will be forgotten.  
(2) forgotten.  [probe for threatening inference]

These critical sentences were developed in the following way (see Graesser et al, 1994). First, we questioned pilot subjects to obtain descriptive statements about interviews that differentiated anxious and non-anxious individuals. Statements which were endorsed by other subjects varying in anxiety were then re-written to form the ambiguous sentences that could be resolved by probe words in either a threatening or a non-threatening manner. Each of six interview descriptions included two sentences resolved by a probe word consistent with a threatening interpretation, two by a probe word consistent with a non-
threatening interpretation, and two by irrelevant filler probes that had no emotional content
and were not related to the outcome of the interview. There were thus a total of 36 critical
sentences, 12 of each type. Additionally, there were 36 similar sentences for which the probe
was not a grammatically possible ending, so that the number of correct “yes” and “no”
answers were equal. After such a non-grammatical probe was presented, a neutral
completion of the sentence was provided. For example:

(3) The interviewer asks you to elucidate on your point and you think this

means they are

(4) agreement    [to-be-rejected probe]

(5) listening. They then . . .    [continuation]

At the end of each description, three verification questions, unrelated to
the probe trials, were presented as a check on comprehension.

Descriptions were presented on an IBM computer, with the screen approximately 15
inches from the subject, controlled by Micro Experimental Laboratory software (Schneider,
1988). Each line of text, or probe word, was revealed by subjects pressing the space bar.
Responses were made by pressing keys labeled Y and N, that corresponded to the z and /
keys on a keyboard positioned in front of the subject. When an incorrect response was made
a computer-generated tone was produced to signal the error.

Procedure

Subjects were seated in front of the computer, with their index fingers on the space
bar, and asked to read the instructions on the screen. They were instructed that their main
task was to answer correctly the comprehension questions at the end of each description,
and that a secondary task was to indicate whether single probe words that appeared during
the text were ‘grammatically possible’ endings of the current sentence. Subjects were told to
respond to probes as quickly as possible without making errors, and that anticipating how each sentence might end would be helpful.

After the two practice descriptions had been completed, the six interview descriptions were presented in random order. The situation to be described was briefly introduced, and subjects were reminded to imagine they were actually in that situation. Each time subjects pressed the space bar a new line of text appeared. This continued until a probe trial occurred; consisting of a row of question marks displayed for 750 ms, warning subjects to place their fingers on the N and Y keys, followed by the presentation of a probe word until the subject responded. After a one-second pause the next line of text appeared. The type of probe trials varied unpredictably throughout each text, and were separated by varying numbers of lines, so that subjects could not anticipate when the next probe would appear.

When each description had been completed, the three comprehension questions were presented. After the final description had been read, subjects re-rated the 20-item interview anxiety questionnaire, were thanked and paid for their time.

RESULTS

Accuracy data.

An independent t-test of accuracy scores for the 18 comprehension questions showed that there was no significant difference in mean number correct between the anxious and non-anxious groups [15.67 (s.d. 1.79) vs. 15.13 (s.d. 2.06), \( t = 0.75, \) d.f. = 28, n.s.]. This confirmed that groups did not differ in their understanding of the non-ambiguous aspects of the text.

Mean percentage errors for probe word decisions in all subjects was 7%. Accuracy data was analyzed using a mixed model ANOVA, with one between-subjects factor (anxious vs. non-anxious) and a repeated within-subject factor of probe type (consistent with
a threatening vs. non-threatening interpretation). The irrelevant probes were excluded from this and all subsequent ANOVAs, as they were not matched to the critical probe sets, and no specific predictions were made concerning them. There were no significant effects of group, F(1,28)= 0, Mse= 1.03, or type of probe, F(1,28)= 2.34, Mse= 0.84. There was a non-significant interaction between the two factors, F(1,28)= 3.37, Mse= 0.84, p= 0.08, with a trend for anxious subjects to incorrectly reject more threatening probes, and non-anxious subjects to incorrectly reject more non-threatening probes.

Latency data.

Only latencies for grammatically possible (to-be-endorsed) probes were analyzed, as our hypotheses did not concern rejection times for non-grammatical probes. ANOVAs were performed on the median latencies for correct threatening and non-threatening responses of each subject (see note 1). The group reaction times are shown in Table 1. ANOVAs were as above, with group as the between-subjects factor and probe type as the within-subject factor. There was no effect of group, F(1,28) = 0.52, Mse= 339,538, but there was a significant main effect due to probe type, F(1,28)= 18.31, Mse= 25,299, p<0.001: mean latencies to endorse to threatening probes were longer than for non-threatening probes. This was qualified by a significant interaction between group and probe type, F(1,28)= 5.38, Mse= 25,299, p< 0.05.

Simple main effects for probe type showed no difference for anxious subjects, F(1,14) = 0.2, but the equivalent effect for non-anxious subjects was significant, F(1,14)= 21.78, p< 0.001. As can be seen from Table 1, non-anxious subjects responded faster to probes consistent with non-threatening meanings than to those consistent with threatening meanings.

[insert Table 1 about here]
The main finding of Experiment 1 was that the groups performed similarly with the threatening probes, but the non-anxious subjects were speeded more when verifying probes consistent with non-threatening inferences. There were no group differences in comprehension for other (non-emotional) parts of the texts. This suggests that the non-anxious group were more likely to make non-threatening (positively valenced) interpretative inferences while reading than were the anxious subjects. The verification task was chosen, however, to force reference to the text at the time of the speeded decision, and it is by no means certain that group differences would remain if the task could easily be performed without reference to the text. Since subjects in Experiment 1 were encouraged, both by direct instructions, and indirectly by the nature of the task, to anticipate how the described events would turn out, they may have adopted a strategy of drawing inferences that they would not otherwise have made. The second experiment was very similar to the first, with the difference that no encouragement was given to anticipate outcomes, and a standard lexical decision task replaced the previous verification task. An additional purpose of Experiment 2 was to investigate whether the hypothesized inferential differences varied continuously according to anxiety level, or whether either the very high or low anxious groups differed from the general population. For this reason, a group with intermediate (average) levels of anxiety was included in Experiment 2.

EXPERIMENT 2

METHOD

Subjects

Twenty four new subjects, recruited as before, were allocated to the high and non-anxious groups. An additional 12 subjects were recruited with scores of between 50 and 70, to form an intermediate group (mean 57, s.d. 5.3). Two subjects from the anxious group and
two from the intermediate group were replaced because they did not follow instructions correctly.

**Materials and Apparatus**

The descriptions used in Experiment 1 were presented as before, but with the modifications described below. Subjects responded to probes and comprehension questions by pressing the arrow keys, and pressed both keys together to move on a line, thus ensuring that subjects fingers were appropriately positioned at all times. The warning signal was also changed to indicate the direction of ‘Yes’ and ‘No’ responses (<---N  Y--->), to encourage subjects to respond as quickly as possible without having to look down at the keys.

The to-be-endorsed probes from Experiment 1 were retained unaltered, although "Yes" responses in Experiment 2 depended on their status as words, rather than on whether or not they were grammatically possible completions. Also, subjects had to respond within a time window of two seconds to avoid a error signal. The to-be-rejected incorrect completions from Experiment 1 were replaced by non-words. These were developed from possible completion words by altering the order and/or identity of one or more letters to produce pronounceable non-word letter strings. An example of a to-be-rejected probe is illustrated below.

(6) The interviewer asks you to elucidate on your point and you think this means they are

(7) ageering [non-word probe]

(8) listening. They then. . . [continuation]

As before, there were 36 to-be-endorsed probes (words) and 36 to-be-rejected probes (non-words), distributed across the six critical texts. Within each text there were thus 12 probes (6 words and 6 non-words): four related to a threatening inference, four related to a non-threatening inference, and four concerned neutral inferences that were irrelevant to the outcome of the interview.
The instruction to anticipate how the text might continue was eliminated, to remove any external demand on subjects to make predictive inferences. Also, the number of comprehension questions asked after each description was increased to six, to further emphasize that this was the primary experimental task; although in fact these responses were not recorded.

**Procedure**

Subjects read their instructions on the screen, which emphasized that the main task was to answer correctly the comprehension questions at the end of each description, and that the secondary task was to indicate, as quickly as possible, whether probes that appeared during the text were English words or not. The only other difference from the previous instructions was that subjects were told that they had to respond within two seconds to avoid an error signal.

Probe trials themselves were the same as before except that the warning signal presented for 750 ms reminded subjects of the responses required (←←N  Y→→), and that the trial was terminated if subjects did not respond within two seconds of the probe appearing; responses produced after this time were not logged. Finally, when all descriptions and comprehension questions had been completed, but before debriefing, subjects were briefly questioned about whether they had tried to predict how the sentences might end, and completed the interview anxiety questionnaire.

**RESULTS**

The only results of relevance to the current hypotheses were lexical decision responses to words that were consistent with either a threatening or a non-threatening inference. Across all word probes, the mean error rate was 4%, and the only significant effect on ANOVA was for probe type, $F(1,33)= 10.43$, $M_{se} = 0.58$, $p< 0.01$, with more errors made to probes that matched threatening inferences (6% vs. 2%).
Analyses of latencies were performed on the medians of correct responses for each subject and probe type as before (see Table 2). There was no main effect of group, $F(2,33) = 1.05$, $M_{se} = 55113$, n.s., but responses to probes consistent with threatening inferences were slower than to non-threatening probes, $F(1,33) = 23.75$, $M_{se} = 5650$, $p<0.001$. However, this was again qualified by a significant interaction between group and probe type, $F(2,33) = 3.40$, $M_{se} = 5650$, $p<0.05$. Analysis of simple main effects showed the probe type difference for the anxious group to be non-significant, $F(1,11) = 0.47$, whereas there was a significant effect of probe type for the other two groups: intermediate, $F(1,11) = 10.33$, $p<0.01$; and non-anxious, $F(1,11) = 26.54$, $p<0.001$. Both the non-anxious and intermediate groups responded faster to probes matching non-threatening inferences (see Table 2).

The apparent similarity between the non-anxious and intermediate groups, and their difference from the anxious group, was examined by comparing the latter group with each of the other two. A comparison of the intermediate with the non-anxious group revealed no differences, group x probe type $F(1,22) = 0.11$. Comparison of the anxious group with the intermediate group revealed a significant interaction; group x probe type, $F(1,22) = 4.32$, $p<0.05$. Finally, the equivalent comparison was made between anxious and non-anxious groups, as a direct test of the prediction that these groups would differ. The predicted interaction was significant; group x probe type, $F(1,22) = 5.77$, $p<0.05$.

In sum, the anxious and non-anxious group demonstrated the same pattern of results as those found in the first experiment. The anxious group responded at similar speeds to the threatening and non-threatening probes, whereas the non-anxious (and intermediate) groups were faster to respond to non-threatening probes.
DISCUSSION

The main finding of Experiment 2 was to confirm and extend that of Experiment 1: non-anxious and the intermediate subjects were faster to identify probes that were consistent with positive rather than threatening inferences, whereas the anxious group were not. Thus, despite eliminating explicit demand in the instructions or inherent in the task to anticipate event outcomes, subject differences based on division by anxiety level still influenced response to probes that were consistent with positive interpretations. Because the pattern of results for non-anxious and intermediate were similar, but different from those of the anxious subjects, it seems that it is the latter group that is distinctive from the rest of the population. On post-experimental questioning, only one subject in each group reported that they had attempted to predict how the descriptions might continue, suggesting that these findings were unlikely to be entirely dependent on voluntary strategies.

It could be argued, however, that the probe word sets were differentially primed by some general aspect of the descriptions, rather than by specific inferences or interpretations. Most of the probe words were emotionally valenced, and even those that were not would presumably have emotional connotations within the context of reading about interviews. Thus, the results may be attributable to general emotional effects of the probe words within that overall context, rather than to interpretations made after reading the immediately preceding text.

To investigate this possibility, we carried out a third experiment, using similar materials, and the same lexical decision task. However, probe words and non-words were relocated in the text, so that despite being grammatically possible continuations, they were unlikely to match any differential inferences or interpretations made at that specific point in the description.
EXPERIMENT 3

METHOD

Subjects

Twelve anxious and 12 non-anxious subjects were recruited as before. Two anxious and two non-anxious subjects were replaced because they did not follow instructions properly.

Materials and apparatus

The apparatus and descriptions used in Experiment 3 were very similar to those in previous experiments, but word probes were placed such that while they were grammatical continuations of a sentence, they were unlikely to match any inference made at that time. An example is shown below.

(9) Then the discussion moves on to why you are interested in this

(10) ordeal.  [re-located probe].

Synonyms or synonymous phrases were inserted where the probes had been positioned previously, to keep the general sense of the descriptions the same. Non-words were also replaced in a different context, but the previous neutral continuation was retained, so that the meaning of the text remained very similar to that used in Experiment 2. Six comprehension questions were presented after each text.

Procedure

The procedure and instructions were the same as in Experiment 2.

RESULTS

Errors on probe word decisions across all subjects averaged 4%, and there were no differences in accuracy involving group or probe type in Experiment 3. There were also no group differences in comprehension accuracy.

A mixed model two-by-two ANOVA was performed on the medians of correct decision latencies for words, with group as the between-subjects factor and probe type as the
within-subject factor. There was no difference due to group, $F(1,22) = 0.15, M_{se} = 56675, n.s.$, but there was a significant main effect of probe type, $F(1,22) = 29.69, M_{se} = 8513, p < 0.001$; mean latencies for "threatening" probes were longer than for "non-threatening" probes. Most importantly, the interaction between group and probe type did not approach significance, $F(1,22) = 1.34, M_{se} = 8513, n.s.$ Thus, under conditions making inferences unlikely, anxious and non-anxious groups responded to the different sets of probe words in a similar way.

[insert Table 3 about here]

GENERAL DISCUSSION

In the first two experiments reported here there was evidence that anxious and non-anxious subjects differed in speed of their reactions to probes matching possible interpretative inferences about emotional events. Non-anxious subjects were faster to identify words that matched a non-threatening (or positive) interpretation of events that they had just read about, than they were to identify equivalent words matching a threatening interpretation. Anxious subjects, in contrast, were not significantly faster to identify positive versus threatening probes in either experiment. The results of the third experiment suggest that these subject differences were absent or less marked when the same probe words were re-located so as to make differential interpretations less likely. Thus it may be that all subjects, with the exception of those who are highly anxious about the topic described, are more likely to make positive than negative inferences. Alternatively, since all subjects were faster to respond to positive probes in the third experiment, it could be argued that the results are best described as showing that anxious subjects are (relatively) more likely to make threatening inferences than were other subjects.
There remain a number of alternative explanations for this pattern of results, including differential semantic priming effects from immediately preceding words, or individual differences in the frequency with which emotional words were used by the subject groups. Whatever the explanation, at the very least the present results indicate important individual difference influences on speeded word decisions of the type commonly used to index on-line inferences while reading text. That is, when reading about personally important topics, readers’ speed of responding to probes may be differentially influenced by individual differences such as emotionality. These effects are unlikely to be apparent in most text comprehension experiments, that typically involve non-emotional passages and probe words, and are unrelated to the personal concerns of readers.

In any event, we do not think that simple semantic priming or word valence differences alone are likely to account for the present results. In several earlier experiments there have been consistent failures to demonstrate any differences in lexical decision speeds for single emotional words across groups varying in anxiety, even when primed (e.g. MacLeod & Mathews, 1993; Mathews & Milroy, 1993; Calvo et al, 1994). The absence of group differences in Experiment 3 is thus entirely consistent with previous research. Consequently, we believe that the group differences in Experiments 2 and 3 are better understood as being due to differential interpretations or inferences about the immediately preceding text. The most obvious explanation would seem to be that non-anxious readers were more likely to anticipate positive (versus negative) continuations of the critical ambiguous sentences, or that anxious readers were less likely.

If so, our results could have implications for general theories of text comprehension. The minimalist hypothesis (McKoon & Ratcliff, 1995) suggests that inferences are not normally made when reading unless they are very easily available, or are necessary to provide local coherence. It may be that for the non-anxious subjects, inferences about positive outcomes to interviews were indeed ‘easily available’, whereas for highly anxious
subjects they were not. While this certainly seems possible, it highlights the problem that ease of availability is not easy to define, and could vary for different material across individuals. Thus, when reading about personally involving and emotional events, inferences may be made more frequently than when reading uninteresting and uninvolving text (see, for example, Gernsbacher, Goldsmith & Robertson, 1992). It would seem very unlikely that we would enjoy reading short stories, romantic novels, or murder mysteries, unless we were to identify with the central characters, and react emotionally to what happens, or might be going to happen, as we read. As argued by Graesser et al (1994), whether inferences are made or not may depend on the goals of the reader, and emotional identification may be an important influence on those goals.

We would not want to claim that the differences we observed arise from automatic on-line inferences. In the first experiment subjects could only perform the probe task by making backward reference to the text, in order to check grammaticality. Additionally, subjects were specifically encouraged to anticipate how the text would develop. Any anticipatory interpretations that were made, therefore, might well have been a response to the instructions or to the task demands. These demands were much less apparent in the second experiment, and the probe task could easily be performed with no reference whatsoever to the text. It still remains possible, of course, for subjects to make such backward checks, although they were not told to try to anticipate events as they read. Perhaps therefore, subjects made inferences or other related interpretations that they would not have made under other circumstances.

It was not our purpose, however, to demonstrate the automaticity of inferencing in any strong sense. Rather, we wished to come as close as possible, within the present experimental paradigm, to simulate the processes that might occur when anxiety prone versus non-anxious individuals encounter ambiguously threatening events such as interviews. We would suggest that interpretative inferences similar to those proposed to
have occurred here might be made by people in real-life social situations involving ambiguity, even without deliberate intent. However, it also seems likely that these emotional inferences would occur only in an appropriate context and a corresponding mental set, so that they cannot be described as automatic, even if they are not entirely voluntary either.

As indicated in the introduction, differential interpretations of ambiguous words or sentences containing such words have been found previously across groups high and low in anxiety (Eysenck et al., 1991; MacLeod & Cohen, 1993; Calvo et al, 1994). Our purpose in carrying out the present experiments was to investigate if these previous findings of an interpretative bias could be confirmed when the material did not depend on ambiguous words, but rather involved complex situations of inherent ambiguity, which did not have to be resolved for literal comprehension of the text. Specifically, we wanted to test if threatening inferences were made while anxious subjects read quite complex and personally involving descriptions of realistic emotional events.

The present findings do not support the hypothesis as stated above, since both groups responded similarly to probe words consistent with a threatening interpretation of the current text. Instead, the differences observed concerned the non-threatening probes, implying that non-anxious subjects were biased towards more positive interpretations. Comparison with previous results, however, reveals that the present findings are in fact quite consistent with others. The differences reported by Eysenck et al. (1991), for example, were due to the non-anxious subjects endorsing positively-valenced more than negatively-valenced disambiguations, while anxious patients endorsed both equally. Similarly, Calvo et al. (1994) reported differences between groups of high versus low test-anxious students in latencies for probes that disconfirmed a threatening continuation, rather than any differences for those that confirmed such a threatening inference. Consequently, both these and the present study are consistent in suggesting that non-anxious subjects are more likely to
access positive interpretations of ambiguous information than are anxious subjects. Although we have no evidence showing that such differential access is causally related to emotion (in either direction), it seems at least plausible to us that interpretations and mood are reciprocally related. We suggest (as have many others) that emotionality or current mood can prime valenced interpretations of events, and that such interpretations can then augment congruent mood states. In this way, a “positive interpretative bias” is likely to serve a protective function, and assist in maintaining a positive and confident mood state. If so, then the lack of this protective bias in some subjects might be sufficient to make them more vulnerable to anxious mood.

In our introduction to these experiments we reviewed a series of earlier studies that used widely varying methods, but which have suggested that the interpretation of ambiguously threatening words is biased by anxiety. The present results concern the effects of reading descriptions of complex events in which the ambiguity is inherent in the situation itself, rather than depending on specific word meanings. Under these circumstances, we propose that most people are biased in favor of positive interpretations, while anxious subjects are not. Many situations in real-life share this inherent ambiguity. The complexity of social encounters, for example, leads us to draw inferences about the intentions, thoughts and feelings of others. A mild joke at our expense, a failure to respond fully to our greeting, or a temporary disagreement with a friend; can all be interpreted in a benign way, or as a serious threat to our self-esteem. The thoughts typically reported by socially anxious people (such as “They must think I’m stupid”) can thus be seen as the outcome of failure in the positive inferential bias that protects the less anxious majority. Unlike the transient effects of reading texts, however, such real-life inferences could play a role in perpetuating the severe and persistent distress that is associated with social anxiety.
REFERENCES


NOTES

1. All analyses reported were conducted with probe words treated as a fixed rather than as a random effect. Subjects were treated as a random effect because our primary interest here was to generalise across samples drawn from populations of subjects who are or are not anxious about interviews. In contrast, we do not regard the probe words as a random sample from a larger population to which we want to generalise, because we attempted to incorporate all of the words that we had found to match possible differentiating emotional inferences about interviews, within the present experiments. Furthermore, we did not expect all subjects within a particular group to respond equivalently to all probe words of a specific type, since emotional inferences likely depend on individual concerns about interviews that vary across subjects, even from within the same anxiety group. Thus our prediction was that the median latencies for the whole set of probes of a particular type would vary systematically across subjects drawn from the different anxiety populations, not that any individual words drawn from a particular lexical population would necessarily show similar differences.
### TABLE 1
**Experiment 1: Sentence completion latencies**

<table>
<thead>
<tr>
<th>Inference Valence</th>
<th>Threat</th>
<th>(s.d.)</th>
<th>Non-threat</th>
<th>(s.d.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious</td>
<td>1350</td>
<td>(502)</td>
<td>1269</td>
<td>(500)</td>
</tr>
<tr>
<td>Non-anxious</td>
<td>1336</td>
<td>(386)</td>
<td>1065</td>
<td>(279)</td>
</tr>
</tbody>
</table>

### TABLE 2
**Experiment 2: Lexical decision latencies**

<table>
<thead>
<tr>
<th>Inference Valence</th>
<th>Threat</th>
<th>(s.d.)</th>
<th>Non-threat</th>
<th>(s.d.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious</td>
<td>892</td>
<td>(174)</td>
<td>871</td>
<td>(237)</td>
</tr>
<tr>
<td>Intermediate</td>
<td>859</td>
<td>(144)</td>
<td>740</td>
<td>(163)</td>
</tr>
<tr>
<td>Non-anxious</td>
<td>853</td>
<td>(176)</td>
<td>733</td>
<td>(133)</td>
</tr>
</tbody>
</table>

### TABLE 3
**Experiment 3: Lexical decision latencies**

<table>
<thead>
<tr>
<th>Inference Valence</th>
<th>Threat</th>
<th>(s.d.)</th>
<th>Non-threat</th>
<th>(s.d.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious</td>
<td>958</td>
<td>(166)</td>
<td>844</td>
<td>(164)</td>
</tr>
<tr>
<td>Non-anxious</td>
<td>963</td>
<td>(201)</td>
<td>786</td>
<td>(188)</td>
</tr>
</tbody>
</table>
Sample Description: Interview for a job in banking

You are about to leave your house to go to the interview. As you step outside, you decide it looks like it will rain, so you dart back inside and get your umbrella?

As you travel into town, you notice there is a lot of traffic. You glance down at your watch to see the time. It is half past eleven so, you have plenty of time to get there. The interview is not until one. You start to think about it. You know that in the interview situations you come across as confident?

On your journey you see a woman dragging her children along the street, with what seems like hundreds of bags of shopping weighing her down. You think that she must be wishing she was at home. Then you get in a traffic jam which you know may make you late?

frustrated. Finally you arrive at the hotel where they are conducting the interviews. It is quite a large hotel which seems very grand. You notice a family of tourists, who are presumably returning from their lunch. You walk up to the hotel receptionists to find directions to the relevant rooms. They are on the sixth floor so you take the lift?

You arrive at the waiting room which has dark leather sofas. A few other interviewees are there and glance up at you. You sit down and pick up a magazine, which is on the coffee table. You flick through it for a moment and then replace it. Everyone is sitting there in silent?

anticipation. The interviews are running late and you have some time to sit and think. You think about how you will deal with the interview. You want to make a good impression which is quite unlikely?

The person before you walks out of the interview room. You realise it is your turn to be interviewed. You get up and go in thinking about what you have prepared to say. You wonder whether when you are in the interview, all your preparation will be forgotten?

As you enter the room, the three interviewers are deep in conversation and do not look up. After a couple of moments they ask you to sit down in a chair which is opposite them. They offer you some coffee and the interview begins. You feel the interview is very stress?

formal. They begin by asking about your relevant experience. They are all looking at you as you speak. Then the main interviewer asks a complicated question. You formulate an answer and as you try and reply you realise it is quite good?

They are all in a line opposite you, almost oblivious to each other. You notice that throughout the interview one of the interviewers remains silent. You think about their postures and how they are conducting themselves and you think about yourself and how they will be perceiving you. You know that having appropriate body language is impossibly?
desirable. They then move onto questions about what you feel you could offer them. You refer back to jobs you have had in the past and the ways in which the skills which you have developed may help them. The interviewer asks you to elucidate on your point and you think this means they are listening. They then ask you what your good and bad points are. You reply as positively as you can. Then you are asked whether you have any questions. You ask them more about the team of people you would, if successful, be working with. The interview is then over and you leave the interview room. When you leave you realise that during the interview you felt relaxing?

hungry.

Comprehension questions
Were you offered refreshments during the interview?
Did all the interviewers take an equal role?
Did you read a book in the waiting room?