The Effect of Practice on Recall of Emotional Information in Individuals With Generalized Social Phobia

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Understanding memory processes in social anxiety is important because these individuals often report negative memories of anxiety-provoking situations and because of the recent emphasis on learning and memory in models of anxiety. The authors examined the effect of learning on memory for negative social, positive social, and nonsocial information using the retrieval-induced forgetting paradigm in individuals with generalized social phobia (GSPs) and in nonanxious controls (NACs). Words were presented in 1 of 3 practice conditions: practiced words from a practiced category, unpracticed words from a practiced category, and unpracticed words from an unpracticed category. GSPs and NACs showed the same patterns of memory for practice categories for positive social and nonsocial words. However, for negative social words, GSPs benefited less from practice and were hurt less from the effect of practicing competing negative social information than were NACs. This pattern of processing may hamper GSPs' learning of, and habituation to, negative social information.

Psychopathologists have postulated that preferential processing of threat-relevant information may play a role in the maintenance and possibly the etiology of emotional disorders (e.g., Williams, Watts, MacLeod, & Mathews, 1988, 1997). Consequently, researchers examined whether individuals with different anxiety disorders are characterized by attention, interpretation, or memory, biases for threat-relevant information. For example, individuals with social phobia have been shown to have an attentional bias for socially threatening information (e.g., Amir et al., 1996; Hope, Rapee, Heimberg, & Dombeck, 1990). Socially anxious individuals also interpret ambiguous information as threatening (e.g., Amir, Foa, & Coles, 1998b; Stopa & Clark, 1993). Preferential memory for threat-relevant information, however, has received mixed support (e.g., Amir, Foa, & Coles, 2000; Claeyss, 1989; Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994).

Other investigators examined specific mechanisms that may be involved in the maintenance of social anxiety. For example, various researchers (e.g., Amir, Foa, & Coles, 1998b; Mogg, Mathews, & Weinman, 1987) suggested that anxiety may involve inhibitory abnormalities during the automatic (i.e., early, parallel, and capacity-free) and strategic (i.e., late, sequential, and limited-capacity) stages of processing of threat-relevant information. More specifically, Amir et al. (1998b) showed that individuals with generalized social anxiety may show enhanced automatic activation of threat-relevant information that is later inhibited during the strategic stage of information processing. This strategic inhibition may cause difficulties in learning and remembering information about negative social interactions in socially anxious individuals.

Understanding the role of learning and memory in social anxiety is important for at least three reasons. First, learning principles figure prominently in recent animal models of fear acquisition, suggesting the involvement of multiple stages and multiple brain pathways (e.g., Armony & LeDoux, 1997; Damasio, 1994). This research has direct implications for the study of learning and memory in anxiety, because the model delineated by LeDoux (1996, p. 164) emphasizes the role of learning in the acquisition of fear. Second, studies of memory bias in anxiety have produced inconsistent results. Although some have suggested that inconsistent results are an artifact of assessing different types of memory processes in various studies (e.g., implicit vs. explicit memory; Amir, McNally, Riemann, & Clements, 1996; Schacter, 1987), this explanation itself has received mixed support. Third, clients with social anxiety and other anxiety disorders often report that they are plagued by memories of anxiety-provoking situations. For example, anecdotal clinical observations suggest that individuals with generalized social phobia (GSP) often report intrusive memories of negative social interactions, individuals with posttraumatic stress disorder often report intrusive memories of their traumatic experience, and individuals with panic disorder often report intrusive memories of their first, or worst, panic attack. These clinical reports of intrusive memories of anxiety-provoking situations may
suggest preferential learning and memory of negative events, which may play a fundamental role in the pathogenesis of these disorders. Indeed, in individuals with GSP, exaggerated ruminations and rehearsal of negative social interactions may lead to more practice of this information compared with positive or neutral information. This relative increased practice of negative information may interfere with remembering positive or neutral information (Anderson, Bjork, & Bjork, 1994). For example, if an individual with social fears were repeatedly to recall an incident in which a member of the audience yawned during a speech, this practice may interfere with remembering the faces of people who were listening intently.

This explanation regarding the role of practice on memory is consistent with current models of long-term recall (e.g., Anderson et al., 1994). Anderson and Spellman (1995) used the retrieval-induced forgetting paradigm to examine long-term memory. They presented individuals with category-plus-exemplar pairs (e.g., fruit—orange). They then asked the participants to practice remembering half of the items from half of the categories. Later, a final cued-recall test examined the effect of retrieval practice on memory. In other words, these researchers were able to examine the effect of practice of certain exemplars (e.g., orange) of a category (e.g., fruit) on the recall of other nonpracticed exemplars (e.g., apple) from that same category (Anderson & Spellman, 1995). More specifically, the experiment involved three phases. In the first phase, individuals studied several category-plus-exemplar pairs (e.g., fruit—orange, fruit—apple, furniture—table). In the second phase, they practiced remembering half of the items from half of the categories (e.g., fruit or orange). In the third phase, participants performed a cued-recall test and were asked to write down all studied exemplars of the category cue. The impact of the retrieval practice (e.g., fruit or orange) on the recall of the remaining unpracticed exemplars (e.g., apple) was the focus. If practiced items (e.g., orange) inhibit recall of unpracticed items (e.g., apple), then the recall of unpracticed items from practiced categories should be worse than performance on unpracticed items (e.g., table) from baseline categories (e.g., furniture) in which no items were practiced.

Anderson et al. (1994) found that for practiced categories practiced items were recalled better than unpracticed items. More importantly, the recall of the latter was inferior to the recall of items from unpracticed categories, thus implying active inhibition of the unpracticed items. Many studies examined impairments in memory from practice of semantically related material (e.g., Blaxton & Neely, 1983; Brown, 1968; Karchmer & Winograd, 1971) and illuminated various characteristics of the retrieval-induced forgetting effect. For example, actively generating items enhances the retrieval-induced forgetting effect (Blaxton & Neely, 1983), impairment from this effect can last beyond short-term memory and endure over time (e.g., 20 min; Anderson et al., 1994), and inhibitory processes, rather than changes in associative weights and activations, are involved in producing the effect (Anderson & Spellman, 1995).

In the current study, we used a modified version of the retrieval-induced forgetting paradigm to examine the effect of practice of negative social, positive social, and nonsocial information on the subsequent recall of this information as well as unpracticed but related information in individuals with GSP. We hypothesized that because these individuals show enhanced inhibition of negative social information (e.g., Amir et al., 1998a), they would benefit less from practicing negative social information compared with controls. As a result of this reduced learning, individuals with GSP would show less inhibition of the unpracticed negative social exemplars. This bias would be specific, pertaining to negative social material, and not general, pertaining to positive social and nonsocial material.

Method

Participants

This experiment included two samples: individuals with GSP (GSPs) and nonanxious controls (NACs). The GSP group comprised 25 individuals (20% female) who were recruited from consecutive treatment referrals. These individuals met Diagnostic and Statistical Manual of Mental Disorders (fourth edition; DSM-IV; American Psychiatric Association, 1994) criteria for social phobia using the Structured Clinical Interview for DSM-IV—Patient Edition (SCID-P; Spitzer, Williams, Gibbon, & First, 1994). SCID interviews were conducted by trained doctorate-level psychologists experienced in the differential diagnosis of social anxiety and trained to reliability standards. Socially anxious individuals reported difficulties in multiple social domains; thus, they meet criteria for GSP according to the SCID interview. GSPs participated in the current study before entering a clinical trial comparing cognitive–behavioral therapy and medication, thus at the time of the current study subjects were not receiving any type of treatment.

The NAC group comprised 25 community volunteers (44% female) who had never met DSM-IV criteria for any Axis I disorder. All controls reported English as their first language, normal or corrected-to-normal vision, and no known memory impairments.

Participants completed the State–Trait Anxiety Inventory (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), the Beck Depression Inventory (Beck & Steer, 1987), and the Anxiety Sensitivity Index (Reiss, Peterson, Gursky, & McNally, 1986). These data are presented in Table 1.

As expected, GSPs were more depressed, more generally anxious, and more sensitive to anxiety than the NACs. Groups did not differ in years of education; however, the GSP group was older on average and was composed of a larger percentage of men than the NAC group.

Materials

We used eight categories and 96 words in this experiment. These words are presented in Table 2. The nonsocial categories and exemplars were based on those used by Anderson et al. (1994) and included four categories, each composed of 12
words for a total of 48 words. We constructed the social categories for the current study using words within each category that would be representative of a superordinate category. To identify these words, we conducted a pilot study using a separate group of GSPs (n = 5). These individuals were presented with social categories and asked to list the first 6 positive and first 6 negative words that came to mind. For each word, participants were also asked to rate its emotionally on a scale ranging from -3 (very disturbing emotional meaning for you) to +3 (very pleasant emotional meaning for you). On the basis of this pilot work, we chose four social categories (12 words each, 6 negative and 6 positive) that gave preference to exemplars that were listed most frequently and belonged to only one category. Finally, we attempted to match all word types on word length and frequency (Francis & Kucera, 1982). Words ranged in length from 4 to 14 letters; the mean numbers of letters by word type were as follows: negative social = 7.6, positive social = 7.9, and nonsocial = 6.2. Mean word frequencies by word type were as follows: negative social = 31.7, positive social = 7.9, and nonsocial = 20.6.

Procedure

Words were presented in black lowercase letters (3–5 mm in height) against a white background on a Macintosh computer. Participants were seated approximately 30 cm from the screen. The procedure involved three phases: a study phase, a retrieval practice phase, and a final test phase.

In the study phase, participants studied category-plus-exemplar pairs (e.g., party-happy); all participants practiced the same pairs from the same categories. After the study phase, participants engaged in directed “retrieval practice” on half of the items from half of the studied categories. Participants practiced retrieving exemplars by completing category-plus-exemplar stems (e.g., Party-Ha__) followed by feedback (e.g., party-happy) and then a final category-plus-exemplar stem (e.g., party-ha__) practice. They were asked to read the category out loud and then say what they thought the second word was. The participants were instructed to read the word out loud when the feedback was given if they were not sure of the word during practice. Participants then performed a filler task consisting of listing all the states and all the state capitals they could remember (20 min). They were then administered a free-recall test in which they were given category cues (e.g., party, fruits) and asked to recall all exemplars for that category.

Results

For each participant we calculated percent correct recall by word type and practice condition. These data were submitted to a 2 (group: GSP, NAC) X 3 (practice condition: practiced category–practiced word, practiced category–unpracticed word, unpracticed category–unpracticed word) X 3 (word type: negative social, positive social, nonsocial) analysis of variance (ANOVA). Significant interactions were followed up with simple main effects analyses and paired comparisons using the protected significant difference method (Kepple & Zedeck, 1989, p. 117) to protect for familywise Type 1 error.

The overall analysis revealed significant main effects of word type, F(2, 96) = 86.61, p < .001, and practice condition, F(2, 96) = 114.44, p < .001, which were modified by a trend toward a Group X Practice Condition interaction, F(2, 96) = 2.62, p = .07, and a Group X Practice Condition X Word Type interaction, F(4, 192) = 3.55, p < .01. To explore the three-way interaction of Group X Practice Condition X Word Type further, we conducted separate 2 (group) X 3 (practice condition) mixed ANOVAs for each word type.

Negative Social Words

For negative social words there was a main effect of practice condition, F(2, 96) = 32.99, p < .001, that was modified by a Group X Practice Condition interaction, F(2, 96) = 5.74, p < .01. Mean percentages of negative social words recalled by group, word type, and practice condition are presented in Figure 1. Simple main effects of practice condition revealed that NACs recalled significantly more negative social words from the practiced category–practiced words condition, t(48) = 2.22, p < .04, than did GSPs. The opposite pattern was found for the practiced category–unpracticed words condition; GSPs recalled more negative social words than NACs, t(48) = 2.40, p < .03.

Simple main effects of group revealed that GSPs responded differently to the various practice conditions, F(2, 48) = 5.60, p < .01. Paired comparisons revealed that GSPs recalled more negative social words from the practiced category–practiced word condition than from the unpracticed category–unpracticed word condition, t(24) = 2.53, p < .02, and from the practiced category–unpracticed word condition, t(24) = 2.87, p < .01. GSPs did not differ in their recall of negative social words from the unpracticed category–unpracticed and practiced category–unpracticed conditions, t(24) = .29, ns.
Parallel analyses for NACs revealed that they also responded differently to the various practice conditions, $F(2, 48) = 34.71$, $p < .001$. NACs recalled more negative social words from the practiced category–practiced condition than from the unpracticed category–unpracticed condition, $t(24) = 4.53$, $p < .001$, and from the practiced category–unpracticed word condition, $t(24) = 8.12$, $p < .001$. NACs also recalled more negative social words from the unpracticed category–unpracticed condition than from the practiced category–unpracticed condition, $t(24) = 3.74$, $p < .001$.

Positive Social Words
For positive social words there was a main effect of practice condition, $F(2, 96) = 39.03$, $p < .001$. None of the other main effects or interactions were significant for positive social words. Mean percentages of positive social words recalled by group, word type, and practice condition are presented in Figure 2.

Follow-up paired comparisons revealed that all individuals recalled significantly more positive social words from the practiced category–practiced condition than from the unpracticed category–unpracticed condition, $t(49) = 5.67$, $p < .001$, or the practiced category–unpracticed condition, $t(49) = 7.65$, $p < .001$. Individuals also recalled significantly more words from the unpracticed category–unpracticed condition than from the practiced category–unpracticed condition, $t(49) = 3.29$, $p < .01$.

Nonsocial Words
For nonsocial words there was a main effect of practice condition, $F(2, 96) = 97.78$, $p < .001$. None of the other main effects or interactions were significant for nonsocial words. Mean percentages of nonsocial words recalled by group, word type, and practice condition are presented in Figure 3.

Follow-up paired comparisons revealed that all individuals recalled more nonsocial words from the practiced category–practiced condition than from the unpracticed category–unpracticed word category, $t(49) = 10.62$, $p < .001$, and the practiced category–unpracticed condition, $t(49) = 11.73$, $p < .001$. Individuals also recalled more nonsocial words from the unpracticed category–unpracticed condition than from the practiced category–unpracticed condition, $t(1, 49) = 3.38$, $p < .001$. Therefore, the patterns of results for the nonsocial words and positive words were identical.

Controlling for Effects of Age and Gender
Although groups differed on recall of negative social words, as was noted in the Participants section, the GSP group was significantly older and composed of a larger percentage of men than the NAC group. To examine the effect of these variables on the obtained results, we conducted analyses of covariance controlling for age and gender. These analyses revealed an identical pattern of results; groups differences remained significant when these variables were parialed out.

Discussion
We found a standard retrieval-induced forgetting effect for all individuals and all word types except for GSPs when recalling negative words. These results suggest that GSPs do not benefit from practicing recall of negative social words as much as NACs. Further, GSPs' memory for negative social words was more resistant to the effect of practicing competing negative social information than NACs' memory. These findings suggest that in GSPs' memory for negative social words is more stable and less influ-
enced by practice than in NACs. For positive and nonsocial words, however, no such group differences emerged.

What are the implications of our results for experimental psychopathology research and treatment interventions? First, the current results for nonsocial words replicate previous research (Anderson & Spellman, 1995) showing additional evidence for the utility of the retrieval practice paradigm. As noted earlier, this paradigm is potentially very informative for psychopathologists in light of the emphasis on the role of learning of threat-related information in various models of psychopathology (e.g., Davey, 1992) as well as neuroscience (e.g., LeDoux, 1996).

If generalized social phobics do not learn threat-related information as well as normals, what may account for the exaggerated salience of these memories of negative social interactions (e.g., coming to mind)? One possible explanation is that this pattern of information processing may hamper the full recall of negative events. As a result, partial recollections of the event are represented in memory. For example, if a generally socially anxious
person were to give a talk and see an audience member yawn, the practice of this negative interaction may leave him or her with an incomplete memory of the event.

Thus, one implication of lack of complete memory is that these individuals are left with partial representations of negative social events. These partial representations then need to be interpreted later, and because of their interpretation bias in favor of threat, generally socially anxious individuals will likely produce more negative than neutral or positive recollections. In addition, generalized social phobias may complains about memories of negative social interactions always coming to mind, even in light of their relatively decreased learning of threat-related information, because of an increase in the distress associated with these memories. This elevated distress may lead to increased salience of the memories even when they are not as fully formed as the nontarget memories.

Another finding of this study was the lack of inhibition of negative social material when alternative negative social material is practiced. This lack of inhibition may also have negative consequences. Returning to the prior example, being confronted with multiple sources of feedback, a degree of inhibition of one, in the favor of the other, may be adaptive. If generally socially anxious individuals do not inhibit additional sources of threat, they are left with multiple and possibly incomplete representations of negative information that need to be processed. As a result, they will again have to use interpretive processes to disambiguate this information later, leading to additional negative recollection.

Our results for negative social words demonstrate the potential role of learning and memory abnormalities in individuals characterized by diffuse social anxiety (i.e., GSP). Consistent with our previous work (Amir et al., 1998b), we found that GSPs may strategically inhibit threatening information. GSPs' better memory for unpracticed words from practiced categories may be driven by their vigilance for threatening stimuli. This is consistent with the literature showing that GSPs initially allocate preferential attention to socially threatening information (e.g., Asmundson & Stein, 1994; Hope et al., 1990). Further, GSPs' poorer memory for negative social words that were practiced is consistent with models that propose strategic avoidance of threatening information (e.g., Mogg, Bradley, Bono, & Painter, 1997; Mogg et al., 1987).

Our results also have tentative treatment implications. For example, it may be useful to help GSPs encode information in their environment more accurately. This suggestion is consistent with research showing that decreases in internal focus of attention (and presumably increases in attention on external input) are related to decreases in speech anxiety among patients with public speaking fears (Woody, Chambless, & Glass, 1997).

Our study has limitations. First, the structured rehearsal of word pairs used in this study may differ from the mental reviewing of real-life negative social events. For example, although the systematic presentation of words allows for experimental control, it is unlikely to produce levels of negative affect experienced in social situations. A second limitation of this study was the difficulty in matching social and nonsocial words. Although we attempted to construct cohesive categories of social words through piloting, the words in the social categories were less cohesive with respect to their superordinate categories than were the nonsocial words. This increased cohesiveness of nonsocial words may have enhanced their memorability. However, the finding that group differences emerged only for negative social words and not positive social words argues against a simple explanation based on cohesiveness of categories. Finally, although we have proposed possible interpretations of the current findings, possible alternative explanations exist. For example, we interpreted our results as suggesting that GSPs show less inhibition of negative social words when related words are practiced. However, an equally plausible interpretation is that NACs show more inhibition of negative words.

In summary, results of this study suggest that practicing negative social information has less influence on the memories of GSPs than NACs. We propose that this pattern of processing may hamper GSPs' learning of and habituation to negative social information, playing a role in the maintenance of their anxiety. This conceptualization of anxiety is consistent with models of emotional disorders that posit a lack of emotional processing as the cause of pathological anxiety (Foa & Kozak, 1986; Rachman, 1980). Memory biases that may be partly responsible for the development and maintenance of anxiety disorders are likely to involve multiple processes. Future studies should address the specificity of these biases by examining other anxious populations (e.g., including individuals with specific or nongeneralized social phobia) and including threatening stimuli of a nonsocial nature.

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