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AN INVESTIGATION OF FALSE MEMORIES IN ANXIOUS AND FEARFUL INDIVIDUALS

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Abstract. The present study applied the Deese-Roediger-McDermott false memory paradigm to examine whether anxious and fearful individuals exhibit higher recall and recognition rates of never presented threat words than nonanxious individuals. In Study 1, 39 spider fearful individuals, 28 blood fearful individuals, and 41 nonfearful individuals learned four word lists associated with unpresented target words: "spider", "blood", "river", and "music". Regardless of whether participants completed only a recognition task or a recall task and then a recognition task, there were no differences as a function of group in the degree to which they falsely remembered unpresented target threat words. In Study 2, 48 socially anxious and 51 nonanxious individuals learned four lists associated with social/evaluative threat unpresented target words and four lists associated with neutral unpresented target words. Similar to the findings from Study 1, groups did not differ in the degree to which they falsely remembered target words. These findings add to an increasingly large literature suggesting that anxious individuals are not characterized by a memory bias toward threat.

Keywords: False memory, memory bias, fear, social anxiety, threat.

Introduction

It is well established that anxious and fearful individuals are characterized by attentional biases toward threat, such that they detect threat-relevant information in their environment more quickly than they detect neutral information and more quickly than do nonanxious individuals (see Williams, Watts, MacLeod, & Mathews, 1997, for a comprehensive discussion). Although it is logical to predict that an attentional bias would facilitate anxious individuals in encoding

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and retrieving threat-relevant information in a biased manner, results from studies examining memory for threat-relevant stimuli associated with anxiety have yielded equivocal results (cf. Coles & Heimberg, 2002). In general, evidence suggests that individuals with panic disorder and individuals with posttraumatic stress disorder (PTSD) demonstrate enhanced explicit memory for threat-relevant information (e.g. McNally, Foa, & Donnell, 1989; Paunovic, Lundh, & Ost, 2002). In contrast, explicit memory biases toward threat generally have not been demonstrated in individuals with generalized anxiety disorder and individuals with social phobia (e.g. Mogg, Mathews, & Weinman, 1987; Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994). The literature on explicit memory biases toward threat in individuals with specific phobias is mixed, such that some studies find evidence for a memory bias toward threat (e.g. Rusted & Dighton, 1991), some studies find evidence for a memory bias against threat (e.g. Watts & Dalgleish, 1991), and some studies find no evidence for a bias in either direction (e.g. Thorpe & Salkovskis, 2000).

Several explanations have been posited to account for this perplexing pattern of results. For example, some researchers have argued that single threat-relevant words are not sufficient to activate fear structures that would in turn bias the manner in which individuals elaborately process information (e.g. Wenzel & Holt, 2002). Others have indicated that the main function of anxiety is to prepare individuals to detect threat as quickly as possible, which might facilitate implicit memory biases for threat-relevant material, but not necessarily explicit memory biases toward threat-relevant material (cf. Williams, Watts, MacLeod, & Mathews, 1988). Indeed, in their comprehensive review of studies investigating memory biases in anxious individuals, Coles and Heimberg (2002) concluded that there are much higher rates of memory biases toward threat in implicit memory studies than in explicit memory studies. A third explanation for the lack of compelling findings for explicit memory biases toward threat in anxiety is that most methodological approaches that have been adopted to date are subject to a number of confounds, such as demand characteristics and an inability to isolate the particular memory process (e.g. encoding, retrieval) that might be biased by fearfulness. Thus, it is possible that memory biases toward threat would be observed only when using more sophisticated memory tasks in which the purpose of the study is not as transparent as in tasks used to date. We argue that researchers investigating cognitive processes in anxiety disorders should adopt established methodologies from the cognitive psychology literature that have been demonstrated to advance our understanding of specific memory processes.

One such methodology that has received a great deal of recent attention in the cognitive psychology literature is the false memory paradigm, first described by Deese (1959), and later resurrected by Roediger and McDermott (1995). In Roediger and McDermott's study, participants were presented with 15-item lists of single words associated with unpresented target words. Rather than the number of words associated with each list that participants recalled, the variable of interest was the rate at which participants recalled and recognized target words that were never presented. Roediger and McDermott reported that unpresented target words were recalled 55% of the time and were recognized between 65% and 79% of the time depending on whether or not participants had first completed a free recall task. In fact, unpresented target words were recalled at a higher rate than words included in serial positions 4–11 of the word lists. Thus, results from this study provided evidence for the existence of false memories, or memories of material that was never presented.

The false memory paradigm is well suited to examine memory biases associated with anxiety and fear. It is possible that anxious individuals accurately recall threat-relevant material that is

actually present in their environment because they closely monitor it and direct a substantial amount of cognitive resources toward it (cf. Wessel & Merckelbach, 1997, 1998). However, because anxious individuals often catastrophize the implications of and exaggerate the distress associated with encounters with threat (Marks & Hemsley, 1999), it also is likely that they would be prone to recalling some aspects of threat that were *never present*. Straightforward list-learning procedures to study explicit memory would not capture the latter type of memory bias because the primary dependent measure would be number of previously presented words recalled, which is limited to the stimuli to which participants had been exposed.

Although the Deese-Roediger-McDermott (DRM) false memory paradigm has been subject to much scrutiny in the cognitive psychology literature (e.g. Blair, Lenton, & Hastie, 2002; Roediger, Watson, McDermott, & Gallo, 2001), surprisingly few studies have examined rates of false memories as a function of clinically relevant individual differences. In a well-designed exception, Zoellner, Foa, Brigidi and Przeworski (2000) administered a nearly identical protocol to that described in Roediger and McDermott's (1995) Experiment 2 to women with PTSD, traumatized women without PTSD, and nontraumatized control women. Participants were presented with a series of 24 15-item word lists, all of which were associations to an unpresented target word. After the presentation of some lists, participants completed an immediate recall task, whereas after the presentation of other lists, they completed arithmetic problems. Following the presentation all lists, participants completed a recognition task in which they indicated whether or not the word had been presented earlier in the experiment. Results provided partial evidence for Zoellner et al.'s (2000) hypothesis that individuals with PTSD would falsely recall and recognize unpresented target words at a greater rate than individuals in the other two groups. Moreover, PTSD symptom severity correlated positively with the rate of false recall.

Although the Zoellner et al. (2000) study represents an important advance in the literature, there were several limitations that temper conclusions that can be drawn about the degree to which false memories are characteristic of anxious individuals. First, many of their between-group comparisons reached significance at only a trend level, suggesting that additional research must be conducted to replicate and extend the effects that they reported. Second, all of the stimuli included in their experimental design were neutral in valence, making it unclear whether a bias would emerge for the false recall and recognition of threat-relevant stimuli. Thus, results from Zoellner et al.'s study have implications for the manner in which individuals with PTSD process information in general, but they do not shed light on the more interesting issue of the manner in which anxious individuals process threat-relevant material in comparison to the manner in which they process neutral information.

The present study was designed to examine rates of false recall and recognition in anxious and fearful individuals and nonanxious and nonfearful individuals. Similar to Roediger and McDermott (1995) and Zoellner et al. (2000), participants were presented with lists of single words that were associated with unpresented target words. Also similar to these studies, participants either completed a free recall task followed by a recognition task or completed a distracter task followed by a recognition task. Unlike these studies, two types of word lists were presented to participants: those associated with neutral unpresented target words, and those associated with treat-relevant unpresented target words. It was predicted that anxious and fearful participants would demonstrate higher rates of false memories for *unpresented* threat-relevant target words than nonanxious and nonfearful participants. However, consistent with the lack of compelling results found in the literature on explicit memory biases toward

single threat-relevant stimuli, it was expected that anxious and fearful participants would not recall more *presented* threat-relevant words than nonanxious and nonfearful participants.

Study 1

Method

Participants

Three samples were used in the present study: 39 individuals with self-reported spider fears, 28 individuals with self-reported blood fears, and 41 individuals with neither self-reported spider nor self-reported blood fears. They were recruited from undergraduate psychology classes and received course or extra credit for their participation. Participants had a mean age of 20.1 years, and 92% were Caucasian. These demographic variables did not differ among groups. However, groups differed significantly on gender, $x^2(2) = 14.94$; $p = .001$. Approximately 92% of the spider fearful, 61% of the blood fearful, and 54% of the nonfearful individuals were female.

Participants were identified and recruited through an elaborate screening process. In group testing sessions, students ($n = 2{,}659$) completed the *Spider Phobia Questionnaire-Avoidance Scale* (SPQ-AV; Watts & Sharrock, 1984) and the *Fear Questionnaire-Blood/Injury Scale* (FQ-B/I; Marks & Mathews, 1979). Individuals scoring one standard deviation above the mean on the SPQ-AV and below the mean on the FQ-B/I (SPQ-AV $\geqslant 6$; FQ-B/I $\leqslant 8$) were identified for the spider fearful group, and individuals scoring one standard deviation above the mean on the FQ-B/I and below the mean on the SPQ-AV (SPQ-AV $\leqslant 3$; FQ-B/I $\geqslant 16$) were identified for the blood fearful group. Individuals scoring one standard deviation above the mean on both inventories were excluded from the study in order to separate samples of relatively pure spider fearful individuals and relatively pure blood fearful individuals. Individuals scoring one standard deviation below the mean on both the SPQ-AV and FQ-B/I (SPQ-AV $\leqslant 1$; FQ-B/I $\leqslant 1$) were identified for the nonfearful group. One hundred ninety-nine individuals (7.5% of the total sample; mean SPQ-AV = 7.4; mean FQ-B/I = 3.9) met the criteria to be contacted for participation in the spider fearful group, 207 individuals (7.8% of the total sample; mean SPQ-AV = 2.1; mean FQ-B/I = 21.3) met the criteria for the blood fearful group, and 112 individuals (4.2% of the total sample; mean SPQ-AV = 0.64; mean FQ-B/I = 0.24) met the criteria to be contacted for participation in the nonfearful group.

Eligible participants were contacted by telephone to inquire about their interest in participating in the study. Reasons for eligible research participants declining participation included having already completed their course requirement, scheduling difficulties, having dropped the introductory psychology class, disinterest, and failing to report for an experimental session. At the time of the experimental session, all participants again completed the SPQ-AV and the FQ-B/I to assess the degree to which scores on the fear scales regressed to the mean. Data from fearful individuals were excluded from analyses if their score on the scale associated with their primary domain of fear dropped below the mean obtained on the screening sample or if their score on the scale associated with the other domain of fear increased to that which was one standard deviation above the mean obtained on the screening sample. Data from nonfearful individuals were excluded from analyses if their scores on either fear scale rose above the mean obtained on the screening sample. In all, data from 21 spider fearful individuals, 22 blood/injury fearful individuals, and 3 nonfearful individuals were excluded

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from analyses for these reasons. There were no differences in demographic characteristics between individuals whose data were included in analyses and individuals whose data were excluded from analyses.

Stimuli

Stimuli consisted of four lists, each composed of 15 words that were associated with an unpresented target word.[1] Two of these lists contained associations to neutral target words, "music" and "river" (Roediger & McDermott, 1995). The remaining lists contained associations to the target word "spider" and the target word "blood". Words associated with the neutral targets were borrowed from those published in Roediger and McDermott's (1995) appendix. Stimuli associated with the target word blood were taken from word association norms reported in Palermo and Jenkins (1965). Because associations to the target word spider were not published, they were identified though the same procedure described by Palermo and Jenkins (1965), such that undergraduate students ($n = 15$) listed the 10 associations that entered into their mind when cued with that word. The 15 most frequently listed associations were selected as stimuli for the experiment. Analyses on normative characteristics associated with the stimuli indicated that there were no differences among any of the word lists or target words in length or frequency in the English language. Four different orders of list presentation were created using a Latin Square counterbalancing scheme, and participants were randomly assigned to one of the four list orders.

Procedure

Participants were tested in small group sessions of one to six people. They were presented with word lists one at a time by means of a prerecorded cassette tape. Consistent with Roediger and McDermott's (1995) procedure in Experiment 2, words were presented by a recorded male voice at a rate of one word every 1.5 seconds. After each list presentation, participants were given two minutes to perform either an immediate free recall test or a word search distracter task in which they were asked to locate as many words, different than those used in the experiment, amongst an array of letters. Thus, administration of the immediate free recall task or the distracter task was a between-subjects variable (cf. Roediger & McDermott, 1995).

After all the lists were presented, participants completed a recognition test that included the unpresented targets, stimuli presented in the first, second, eighth, fourteenth, and fifteenth serial positions of each list, and 16 words from 4 of Roediger and McDermott's (1995) lists that were not presented in this study. Items from unpresented lists included targets and words from the first, eighth, and fifteenth serial positions. Participants determined whether items on the recognition test had been presented on the cassette (marked "old") or not presented (marked "new"). Participants also assigned remember-know judgments to items marked "old". According to Roediger and McDermott (1995), a "remember" judgment is defined as "one in which the subject can mentally relive the experience", and a "know" judgment is defined as an instance in which "subjects are confident that the item occurred on the list but are unable

[1] Stimuli are available from the first author upon request.

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Table 1. Study 1: Scores on self-report inventories

	Spider fearful participants ($n = 37$)	Blood fearful participants ($n = 28$)	Nonfearful participants ($n = 41$)
SPQ-Vigilance	3.97 (2.92)[b]	1.22 (1.22)[a]	0.93 (1.25)[a]
SPQ-Avoidance	5.95 (1.40)[c]	2.76 (0.52)[b]	2.05 (0.84)[a]
SPQ-Preoccupation	2.32 (2.33)[b]	0.37 (0.63)[a]	0.34 (0.57)[a]
FQ-B/I	3.52 (2.82)[b]	18.68 (7.12)[c]	1.20 (1.93)[a]
MBPI	10.63 (14.91)[a]	37.14 (31.04)[b]	3.06 (4.43)[a]
STAI-T	38.09 (9.91)[b]	35.41 (10.29)[b]	28.07 (6.71)[a]
GDS	2.14 (2.15)[b]	2.15 (2.43)[b]	0.85 (1.37)[a]

Note: SPQ = Spider Phobia Questionnaire; FQ-B/I = Fear Questionnaire, Blood/Injury Scale MBPI = Multidimensional Blood/Injury Phobia Inventory; GDS = Geriatric Depression Scale. Means with different superscripts are significantly different at $p < .05$. Values in parentheses are standard deviations.

to re-experience (i.e. remember) its occurrence" (p. 807).[2] Participants in the recall plus recognition condition were instructed to make judgments based only upon their memory of the presentation of the words, not on their memory of writing the word during the recall test. At the end of the experiment, participants completed the following self-report inventories: *Spider Phobia Questionnaire* (SPQ; Watts & Sharrock, 1984), *Fear Questionnaire* (FQ; Marks & Mathews, 1979), *Multidimensional Blood/Injury Phobia Inventory* (MBPI; Wenzel & Holt, 2003a), *State-Trait Anxiety Inventory-Trait Version* (STAI-T; Spielberger, Gorsuch, & Lushene, 1970), and *Geriatric Depression Scale* (Sheikh & Yesavage, 1986; see Ferraro & Chelminski, 1996, for a discussion about application of this scale to a college student sample).

Results

Self-report inventories

Table 1 displays scores on self-report inventories as a function of group. As expected, groups scored significantly different on the *vigilance*, $F(2, 104) = 25.85$; $p < .001$, the *avoidance*, $F(2, 104) = 154.54$; $p < .001$, and the *preoccupation*, $F(2, 104) = 21.62$; $p < .001$, scales of the SPQ. Follow-up Tukey tests revealed that spider fearful participants scored higher than participants in the other two groups on these scales ($ps < .001$). Although blood fearful participants scored similarly as nonfearful participants on the vigilance and preoccupation scales, they scored higher than nonfearful participants on the avoidance scale ($p = .02$). Also as expected, groups differed significantly on the two measures of self-reported blood fearfulness, including the FQ-B/I, $F(2, 104) = 161.90$; $p < .001$, and the MBPI, $F(2, 104) = 29.53$; $p < .001$. Follow-up Tukey tests indicated that blood fearful participants scored significantly higher on both of these measures than participants in the other two groups ($ps < .001$). Although spider fearful participants scored similarly as nonfearful participants on the MBPI,

[2] No significant results involving the group variable emerged when "remember" and "know" judgments were analysed separately. Thus, these ratings will not be considered further.

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they scored significantly higher than nonfearful participants on the FQ-B/I ($p = .039$). Finally, groups differed significantly on the STAI-T, $F(2, 104) = 13.33$; $p < .001$, and on the GDS, $F(2, 104) = 5.35$; $p < .001$, such that both groups of fearful participants scored higher than nonfearful participants on these measures ($ps < .05$).

Total number of words remembered

To assess memory performance for participants in the *recall* condition, a 3 (group: spider fearful, blood fearful, nonfearful) X 4 (stimuli: spider, blood, river, music) mixed ANOVA was conducted. There was a main effect for stimuli, $F(3, 138) = 6.29$; $p < .001$, such that participants generally recalled more blood words than words associated with the other three targets. However, no main effect for group or group by stimulus interaction emerged in this analysis.

In addition, *recognition* performance as a function of group and condition was assessed using a 3 (group: spider fearful, blood fearful, nonfearful) X 2 (condition: recall plus recognition, recognition only) X 4 (stimuli: spider, blood, river, music) mixed ANOVA. Again, there was a main effect for stimuli, $F(3, 300) = 19.18$; $p < .001$, in this case that participants correctly recognized fewer music words than words associated with the other three targets (see Stadler, Roediger, & McDermott, 1999, for similar results). In addition, there was an expected main effect for condition, $F(1, 100) = 7.51$; $p = .009$, such that participants who had the benefit of previously recalling stimuli from the word lists correctly recognized more words than participants who completed a previous distracter task. However, again, there were no significant effects involving the group variable, suggesting that fearful participants did not exhibit a memory bias for enhanced or diminished recall of single threat-relevant words.

False memories

Table 2 presents the mean number of false memories made by each group as a function of each stimulus type and condition. A series of four chi square analyses were conducted to compare the percentage of participants in each group who incorrectly *recalled* the unpresented target words. There were no differences among groups in the percentage of individuals who incorrectly recalled the target words spider, blood, and river. In contrast, a higher percentage of blood fearful participants than spider fearful and nonfearful participants incorrectly recalled the target music, $x^2(2) = 9.36$; $p = .009$. In addition, a series of chi square analyses were conducted to compare the percentage of participants in each group who incorrectly *recognized* the never presented target words. These analyses were conducted separately for participants who completed the recall task prior to completing the recognition task and for participants who completed the distracter task prior to completing the recognition task. For participants who had completed the previous recall task, groups did not differ in the extent to which they incorrectly recognized the target words spider, blood, and music. However, there was a significant difference among groups in the extent to which they incorrectly recognized the target word river, such that a smaller percentage of spider fearful individuals than individuals in the other two groups committed this error, $x^2(2) = 6.06$; $p = .048$. For participants who had completed the previous distracter task, there were no significant differences in the extent to which they incorrectly recognized the unpresented target word.

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Table 2. Study 1: Percentage of false memories

	Spider fearful participants	Blood fearful participants	Nonfearful participants
Percentage recalling target			
Spider	35.29	46.15	42.11
Blood	23.53	23.08	36.84
River	35.29	30.77	38.89
Music	11.76	46.15	5.26
Percentage recognizing target	Participants who first completed recall task		
Spider	52.94	53.85	63.16
Blood	70.59	53.85	63.16
River	62.50	84.62	94.74
Music	52.94	76.92	78.95
Percentage recognizing target	Participants who first completed distracter task		
Spider	80.95	86.67	63.64
Blood	80.95	73.33	81.82
River	90.48	86.67	72.73
Music	95.24	80.00	86.36

Note: Number of participants who first recalled stimuli prior to recognition were as follows: spider fearful participants, $n = 17$; blood fearful participants, $n = 13$; nonfearful participants, $n = 19$. Number of participants who completed the distracter task prior to recognition were as follows: spider fearful participants, $n = 21$; blood fearful participants, $n = 15$; nonfearful participants, $n = 22$. Values in parentheses are standard deviations.

Discussion

As predicted, fearful participants did not recall more threat-relevant words than nonfearful participants, but contrary to expectation, they also did not incorrectly remember unpresented threat-relevant target words at a greater rate than nonfearful participants. Although group differences in the rate of false memory retrieval occurred on two occasions, they emerged for stimuli that were neutral rather than those that were threat-relevant. It is possible that the presentation of threat-relevant words distracted fearful participants from fully directing their cognitive resources to the task at hand, resulting in higher rates of false memories in some instances. However, it is acknowledged that this explanation is purely speculative and that it does not explain why fearful participants failed to demonstrate higher rates of threat-relevant false memories. Moreover, there is conflicting evidence regarding whether individuals with specific fears and phobias are indeed characterized by attentional difficulties in the context of experiments presenting threat-relevant information (see Watts, McKenna, Sharrock, & Trezise, 1986 and Wenzel & Holt, 1999 for conflicting results). In all, results from this study provided no evidence that fearful participants were characterized by a memory bias toward threat.

Before concluding that the DRM false memory paradigm has little utility in identifying individual differences in the rate of false memories, it is important to consider the impact of several methodological variables that could have accounted for this pattern of null results. First, data from a substantial percentage of fearful participants were excluded from analyses because they did not continue to score in a manner suggesting that they were characterized

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by relatively pure spider or blood fears at the time of the experimental session. This suggests that that the SPQ-AV and the FQ-B/I are not particularly useful in identifying participants who report stable levels of specific fearfulness. Moreover, because so many data sets were excluded from analyses due to regression to the mean on these inventories, sample sizes in each cell were quite small (range = 13–22). Thus, the degree to which the individuals included in the final analysis are representative of the original sample of fearful individuals is questionable.

Second, even if participants whose data were included in analyses are regarded as having stable levels of specific fears, it is possible that specific fears are not a distressing enough type of sub-syndromal pathology to exhibit cognitive biases toward threat. McNally, Hornig, Hoffman and Han (1999) indicated that individuals who score high on self-report inventories of anxiety show few of the cognitive biases toward threat that are typically observed in individuals who report clinically significant levels of anxiety. In fact, they speculated that the ability to overcome these cognitive biases might be the specific factor that protects these individuals from developing psychopathology. Thus, it is possible that the pattern of results was obtained in the present study because participants were not experiencing enough distress to exhibit the cognitive interference that is associated with anxiety disorders.

Third, Mansell and Clark (1999) purported that anxious undergraduate participants exhibit memory biases only when they are confronted with actual threat, rather than threat as represented by single words or pictures. In their study, socially anxious undergraduates recalled fewer positive public self-referent words than nonanxious undergraduates, but only when they anticipated giving a speech. Their study raises the possibility that a trait disposition to anxiety and fearfulness is associated with cognitive biases toward threat only when these individuals experience state anxiety in the context of an actual encounter with relevant threat.

In order to address these concerns, a second study to examine false memories in another anxious sample was designed. Instead of using samples of individuals with specific fears, we recruited individuals who scored high and low on two measures of social anxiety to serve as participants. Previous work in this area has confirmed that using two self-report inventories to identify anxious samples results in individuals with more substantial levels of distress and whose anxiety is reported at a high level on later occasions (e.g. Brendle & Wenzel, in press; Wenzel, Haugen, & Schmutzer, 2003). Moreover, previous studies using samples of socially anxious individuals have been successful in detecting cognitive biases toward threat (e.g. Brendle & Wenzel, in press), whereas many previous studies using samples of individuals with specific fears or phobias fail to detect these biases (e.g. Thorpe & Salkovskis, 2000; Wenzel & Holt, 1999). In addition, participants were tested in small groups and informed that they would have to make a small presentation to introduce themselves after the completion of the cognitive tasks. Although participants did not ultimately follow through with giving the presentation, it was expected that this design choice would activate state anxiety and relevant fear structures that might facilitate a memory bias toward threat. Finally, participants were presented with four word lists associated with neutral targets and four word lists associated with social or evaluative threat targets. By assessing memory performance across a wider range of stimuli, it was hoped that more stable estimates of false memory retrieval could be calculated.

Study 2

Method

Participants

Participants were 48 socially anxious individuals and 51 nonanxious individuals who received course or extra credit for completing the study. Participants had a mean age of 20.0 years ($SD = 2.1$), 65% were female, and 97% were Caucasian. Demographic variables did not differ between groups.[3] None of these individuals had participated in Experiment 1. The following is a description of the process by which participants were identified for the study.

In group testing sessions, students ($n = 1781$) completed the *Fear of Negative Evaluation Scale* (FNE; Watson & Friend, 1969) and the *Social Avoidance and Distress Scale* (SAD; Watson & Friend, 1969). Individuals scoring one standard deviation above the mean on both measures (FNE $\geqslant$ 21; SAD $\geqslant$ 13) were identified for inclusion in the socially anxious group, and individuals scoring one standard deviation below the mean on both measures were identified for inclusion in the nonanxious group (FNE $\leqslant$ 4; SAD = 0).[4] One hundred and sixty-three individuals (9.2% of the total sample; mean FNE = 25.8; mean SAD = 18.2) met criteria to be contacted for participation in the socially anxious group, and 87 individuals (4.9% of the total sample; mean FNE = 1.93; SAD = 0 or 1) met criteria to be contacted for participation in the nonanxious group.

Eligible participants were contacted by telephone and invited to participate in the study. At the time of the experimental session, all participants again completed the FNE and the SAD to assess the degree to which scores on the fear and anxiety scales regressed toward the mean. Data from anxious individuals were excluded from analyses if their scores on either inventory dropped below the mean obtained on the original screening sample, and data from nonanxious individuals were excluded from analyses if their scores on either inventory rose above the mean obtained on the screening sample. In all, data from six socially anxious individuals and one nonanxious individual were excluded from analyses for these reasons. There were no differences in demographic characteristics between individuals whose data were included in analyses and individuals whose data were excluded from analyses.

Stimuli

Stimuli consisted of eight lists, each composed of 15 words that were associated with an unpresented target word. Four of these lists contained associations to neutral target words, including "music", "river", "fruit", and "window" (Roediger & McDermott, 1995). The remaining four lists contained associations to social/evaluative threat target words, including "party", "interview", "date", and "speech". Word lists associated with the neutral targets were borrowed from those published in Roediger and McDermott's (1995) appendix. Word lists associated with threat targets were developed by instructing undergraduate students ($n = 15$),

[3] Demographic and questionnaire data for 11 participants are missing.

[4] When the pool of eligible nonanxious individuals was exhausted, individuals who scored less than 4 on the FNE but who scored 1 on the SAD was invited to participate in their study. However, their data were only included in analyses if their scores on these inventories at the time of the experimental session did not regress to the mean, as defined by the criteria described in the text.

different than those who participated in this study, to generate the first 10 associations when presented with the target words (cf. Palermo & Jenkins, 1965). The 15 most frequently listed associations to each target were selected as stimuli for the experiment. There were no differences between the social threat and neutral words in length or frequency in the English language. Four different orders of list presentation were created using a Latin Square counterbalancing scheme, and participants were randomly assigned to one of the four list orders.

Procedure

Participants were tested in small group sessions of approximately two to six people. Prior to beginning the session, participants were told that they would be asked to stand up and present a 2-minute introduction of their name and interests after completing the task. Although participants were not asked to follow through with this request, it was included in the experimental design in order to create a state of mild anxious apprehension. Following these instructions, participants completed the *State-Trait Anxiety Inventory-State Version* (STAI-S; Spielberger et al., 1970) to assess their current anxiety level. Similar to Study 1's procedure, words were presented by a recorded male voice at a rate of one word every 1.5 seconds. After each list presentation, participants were given 2 minutes to perform either an immediate free recall test or a word search distracter task. Again, completion of the immediate recall task versus the distracter task was a between-subjects variable.

After all the lists were presented, participants completed a recognition test that included the unpresented target words, stimuli presented in the first, second, eighth, fourteenth, and fifteenth serial positions of each list, and 48 words from the same serial positions in 8 of Roediger and McDermott's (1995) lists that were not presented in this study. They determined whether items on the recognition test had been presented on the cassette (marked "old") or not presented (marked "new"), and for items marked "old," they assigned remember-know judgments.[5] Participants in the recall plus recognition condition were instructed to make judgments based only upon their memory of the presentation of the words, not on their memory of writing the word during the recall test. At the end of the experiment, participants completed the following self-report inventories: FNE, SAD, STAI-T, the *Beck Depression Inventory* (Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961), and the *Shipley Institute of Living Scale-Vocabulary Test* (SILS; Shipley, 1946).

Results

Self-report inventories

Table 3 displays scores on self-report inventories as a function of group. As expected, socially anxious participants scored higher than nonanxious participants on the two measures of social anxiety, the FNE, $t(86) = 35.76$; $p < .001$, and SAD, $t(86) = 19.17$; $p < .001$. Socially anxious participants also scored higher than nonanxious participants on the STAI-S,

[5] No significant results involving the group variable emerged when "remember" and "know" judgments were analysed separately. Thus, these ratings will not be considered further.

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Table 3. Study 2: Scores on self-report inventories

	Socially anxious participants ($n = 48$)	Nonanxious participants ($n = 51$)
FNE*	25.27 (3.45)	2.16 (2.55)
SAD*	17.66 (5.65)	0.82 (1.44)
STAI-S*	43.93 (12.10)	27.80 (6.93)
STAI-T*	49.16 (11.55)	27.22 (4.40)
BDI*	13.50 (10.37)	2.16 (3.33)
SILS	29.28 (4.07)	28.20 (3.26)

Note: FNE = Fear of Negative Evaluation Scale; SAD = Social Avoidance and Distress Scale; STAI-S = State Trait Anxiety Inventory-State Version; STAI-T = State Trait Anxiety Inventory-Trait Version; BDI = Beck Depression Inventory; SILS = Shipley Institute of Living Scale. *Differences between groups were significant at $p < .001$.

$t(86) = 7.68$; $p < .001$, STAI-T, $t(85) = 11.66$; $p < .001$, and the BDI, $t(86) = 6.91$; $p < .001$. In contrast, there was no between groups difference on the SILS, suggesting that any significant between-groups differences in memory performance cannot be attributed to differences in verbal ability.

Total number of words remembered

To assess memory performance for participants in the *recall* condition, a 2 (group: socially anxious, nonanxious) X 2 (stimuli: threat, neutral) mixed ANOVA was conducted. There was a main effect for stimuli, $F(1, 42) = 8.41$; $p = .006$, such that participants generally recalled more threat-relevant words than neutral words. However, there was no main effect for group or group by stimulus interaction for this analysis.

In addition, *recognition* performance as a function of group and condition was assessed using a 2 (group: socially anxious, nonanxious) X 2 (condition: recall plus recognition, recognition only) X 2 (stimuli: threat, neutral) mixed ANOVA. Again, there was a main effect for stimuli, $F(1, 95) = 37.85$; $p < .001$, such that all participants correctly recognized more threat-relevant words than neutral words. In addition, there was a stimuli by condition interaction, $F(1, 95) = 5.71$; $p = .019$, such that participants in the recall plus recognition condition recognized more neutral words, but not more threat-relevant words, than participants in the recognition only condition. However, there were no significant effects involving the group variable in this analysis, suggesting that socially anxious participants did not exhibit a memory bias for the enhanced or diminished recall of single threat-relevant words.

False memories

Table 4 presents the mean number of false memories made by each group as a function of each stimulus type and condition. A 2 (group: socially anxious, nonanxious) X 2 (stimuli: threat, neutral) mixed ANOVA for the number of targets falsely *recalled* indicated a marginally significant main effect for stimuli, $F(1, 42) = 4.06$; $p = .05$, such that participants falsely

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Table 4. Study 2: Mean number of false memories

	Socially anxious participants	Nonanxious participants
Mean # targets recalled		
Social threat targets	1.05 (1.28)	0.96 (0.88)
Neutral targets	1.19 (0.98)	1.61 (1.08)
Mean # targets recognized	Participants who first completed recall task	
Social threat words	3.00 (1.00)	2.61 (1.27)
Neutral words	2.95 (1.12)	3.39 (2.71)
Mean # targets recognized	Participants who first completed distracter task	
Social threat words	3.44 (0.80)	3.46 (0.79)
Neutral words	3.37 (0.88)	3.46 (0.96)

Note: Mean number of targets recalled and recognized could range form 0–4. Number of participants who first recalled stimuli prior to recognition was as follows: socially anxious participants, $n = 21$; nonanxious participants, $n = 23$. Number of participants who completed the distracter task prior to recognition were as follows: socially anxious participants, $n = 27$; nonanxious participants, $n = 28$. Values in parentheses are standard deviations.

recalled more neutral target words than threat-relevant targets words. However, there was no main effect for group or group by stimuli interaction. In addition, a 2 (group: socially anxious, nonanxious) X 2 (condition: recall plus recognition, recognition only) X 2 (stimuli: threat, neutral) repeated measures ANOVA for the total number of targets falsely *recognized* yielded a main effect for condition, $F(1, 95) = 4.57$; $p = .035$. Specifically, individuals in the recognition only condition falsely recognized more target words than individuals in the recall plus recognition condition, suggesting that prior recall increased the accuracy of recognition. Again, there were no significant main effects or interactions involving the group variable.

Per the analytic strategy described in Roediger and McDermott (1995), data from participants in the recall plus recognition condition were analysed to determine whether they recalled target words at a higher rate than words falling in the middle of the serial position curve, or those that were presented in positions 4–11 in the lists. The 2 (group: socially anxious, nonanxious) X 2 (stimuli: threat, neutral) X 2 (type: targets, words in positions 4 to 11) ANOVA yielded a group by type interaction, $F(1, 42) = 4.62$; $p = .037$. Follow-up analyses indicated that socially anxious individuals recalled fewer targets and more words in serial positions 4–11 than nonanxious individuals, which provides some evidence that socially anxious participants performed more accurately than nonanxious participants.

General discussion

The present study found no evidence to confirm the hypothesis that anxious and fearful individuals are more likely than nonanxious individuals to retrieve false memories of threat-relevant single words. This finding emerged across two different samples of anxious and fearful individuals and despite the fact that the false memory methodology was implemented in an identical manner as that described by Roediger and McDermott (1995). Instead, spider fearful and blood fearful participants occasionally made errors on neutral stimuli, such that a higher

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percentage of these individuals remembered neutral never-presented target words as compared to nonfearful individuals. It is possible that the presentation of threat-relevant words distracted fearful participants from fully engaging in the memory task, resulting in higher rates of false memories of unpresented neutral target words. However, it is unclear why performance would not have differed between groups in the rates of false recall and recognition of threat-relevant target words.

In addition, one analysis suggested that socially anxious individuals demonstrated more accurate memory than nonanxious individuals, as they recalled fewer unpresented targets and more actually presented words in serial positions 4–11 of the lists as compared to nonanxious individuals. This finding does not provide evidence that sheds light on whether socially anxious individuals are characterized by a content-specific memory bias. On the other hand, it conceptually replicates Wenzel and Holt (2003b), which indicated that socially anxious individuals performed more accurately on two relatively easy memory tasks (e.g. paired associates, priming) than nonanxious individuals when they were in a state of anxious activation. Because socially anxious individuals in Study 2 expected to make a brief presentation following the memory experiment, it is likely that they were experiencing high levels of anxious activation, an assumption that can be supported by their high levels of state anxiety reported on the STAI-S. According to Humphreys and Revelle (1984), arousal facilitates performance on easy tasks, such as straightforward recall and recognition tasks, but disrupts performance on difficult tasks. Moreover, individuals high in achievement motivation perform better on cognitive tasks than individuals low in achievement motivation because they put more effort into their performance. It is possible that socially anxious individuals directed more effort into performing well than nonanxious individuals because of the evaluative nature of the experimental session, which in combination with having higher levels of arousal, could account for their more accurate performance relative to nonanxious individuals.

An alternative explanation relates to literature suggesting that anxious activation inhibits memory for peripheral details (see Christianson, 1992; Wessel & Merckelbach, 1997, 1998). According to the attention narrowing hypothesis, individuals who experience a state of physiological arousal direct their attentional resources toward threat-relevant information at the expense of threat-irrelevant information. Such narrowing facilitates the encoding of threat-relevant information to a greater degree than threat-irrelevant information, which in turn increases the likelihood that threat-relevant information would be retrieved accurately. It is possible that the state of anxious activation facilitated attentional narrowing in socially anxious individuals in the present study, such that they monitored the social threat stimuli that were and were not presented more closely than nonanxious individuals. It will be important for future researchers to test this hypothesis directly by manipulating the degree to which socially anxious individuals encode threat-relevant and neutral stimuli in states of anxious activation and rest.

Nevertheless, the fact remains that the main hypothesis of the study – that anxious and fearful individuals would demonstrate a memory bias toward threat by remembering more threat-relevant never-presented target words than nonanxious individuals – was not confirmed. It will be important for researchers in this area to determine precisely *why* memory biases toward threat are not observed in anxious individuals given that they allocate substantial cognitive resources toward processing threat-relevant information. Mogg et al. (1987) proposed the vigilance-avoidance hypothesis to account for the pattern of results observed in the memory bias literature, such that anxious individuals quickly detect threat in their environment but then

subsequently avoid elaborate processing of it. Although this theory is attractive, it suggests that anxious and fearful individuals in the present study should have recalled fewer threat-relevant unpresented target words, which clearly did not happen. In their seminal review on memory biases in anxiety disorders, Coles and Heimberg (2002) concluded that memory biases toward threat are much more evident in some types of anxiety pathology, such as panic disorder, than in other types of anxiety pathology, such as social phobia. Thus, it will be important to examine rates of threat-relevant false memories in samples of anxious patients who have been shown in the literature to demonstrate the most robust memory biases before drawing definitive conclusions. Finally, it is possible that memory *deficits* are more prominent in anxious individuals than memory *biases*. As described previously, Zoellner et al. (2000) found that women with PTSD exhibited higher rates of false recall and recognition than traumatized women without PTSD on a false memory task involving stimuli of neutral content. Bremner, Shobe and Kihlstrom (2000) reported nearly identical results in samples of abused women with PTSD, abused women without PTSD, and men and women without abuse or PTSD. These findings suggest that the scope of content-independent memory deficits must be identified in individuals who suffer from other anxiety disorders.

Furthermore, research examining the false memory phenomenon in the cognitive psychology literature has expanded tremendously since the publication of Roediger and McDermott's (1995) article. Many of these studies have identified methodological variables that affect the ability to achieve the false memory effect, several of which may have a bearing in the interpretation of results from the present study. Many of the characteristics of our procedure optimized the probability of obtaining a false memory effect, including auditory presentation of stimuli (e.g. Smith & Hunt, 1998), inclusion of lists relating to target words that produce a moderately high level of false recall and recognition (e.g. Stadler et al., 1999), and inclusion of a high number of associates to each target (e.g. Robinson & Roediger, 1997). On the other hand, Pesta, Murphy and Sanders (2001) indicated that rates of false recognition for emotional target words are lower than rates of false recognition for non-emotional target words. One explanation for this finding is that emotional words are especially distinctive, and that participants believe that they subjectively would have known if a highly charged emotional word had been included on the study list. It is possible that this factor counteracted the tendency for anxious and fearful individuals to process threat-relevant information in a biased manner. Moreover, McDermott and Watson (2001) reported that the propensity to falsely recall target words is greatest at presentation rates of one word per second and then declines as presentation rate increases. Consistent with Roediger and McDermott (1995), we presented stimuli at a rate of one word per 1.5 seconds, a procedural decision that could have diminished our ability to create an environment in which false memories were most likely to emerge.

In addition, results from several studies suggest that source monitoring is an important act that affects the rate at which individuals falsely recall and recognize stimuli. Source monitoring is defined as the process of trying to decide which memory (or memories) or beliefs are real and which are simply imagined (cf. Johnson, Hashtroudi, & Lindsay, 1993). Hicks and Marsh (2001) presented the counterintuitive result that individuals falsely recognized never presented target words if they had engaged in a source identification task rather than if they had simply been spoken by a male experimenter. To our knowledge, no studies examining the effects of source monitoring upon the recognition of threat-relevant material in anxious and fearful individuals has been conducted. However, the findings reported by Hicks and Marsh raise the possibility that manipulating the manner in which stimuli are presented and instructing

participants to choose the presentation modality may be an alternative way to elicit memory biases in anxious and fearful individuals.

In all, results from this study provided no evidence that anxious and fearful individuals are characterized by the tendency to falsely recall or recognize threat-relevant stimuli. These findings add to an increasingly large literature suggesting that several types of anxiety, including social anxiety and specific fears, are not associated with memory biases toward threat. This pattern of results is contrary to cognitive theories of anxiety, which clearly suggest that biased threat-related memories are an important component of the cognitive sequalae of anxiety disorders (e.g. Clark & Wells, 1995; Rapee & Heimberg, 1997). We encourage cognitive psychopathologists to identify the reasons why memory biases toward threat are not observed in many anxious individuals despite the fact that they allocate cognitive resources toward processing these stimuli in a preferential manner.

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References

BECK, A., WARD, C., MENDELSOHN, M., MOCK, J., & ERBAUGH, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561–571.

BLAIR, I. V., LENTON, A. P., & HASTIE, R. (2002). The reliability of the DRM paradigm as a measure of individual differences in false memories. *Psychonomic Bulletin and Review*, *9*, 590–596.

BREMNER, J. D., SHOBE, K. K., & KIHLSTROM, J. F. (2000). False memories in women with self-reported childhood sexual abuse: An empirical study. *Psychological Science*, *11*, 333–337.

BRENDLE, J. R., & WENZEL, A. (in press). Differentiating between memory and interpretation biases in socially anxious and nonanxious individuals. *Behaviour Research and Therapy*.

CHRISTIANSON, S. A. (1992). Emotional stress and eyewitness memory: A critical review. *Psychological Bulletin*, *112*, 284–309.

CLARK, D. M., & WELLS, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment and treatment*. New York: Guilford.

COLES, M. E., & HEIMBERG, R. G. (2002). Memory biases in the anxiety disorders: Current status. *Clinical Psychology Review*, *22*, 587–627.

DEESE, J. (1959). On the prediction of the occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology*, *58*, 17–22.

FERRARO, F. R., & CHELMINSKI, I. (1996). Preliminary normative data on the Geriatric Depression Scale-Short Form (GDS-SF) in a young adult sample. *Journal of Clinical Psychology*, *52*, 443–447.

JOHNSON, M. K., HASHTROUDI, S., & LINDSAY, D. S. (1993). Source monitoring. *Psychological Bulletin*, *114*, 3–28.

HICKS, J. L., & MARSH, R. L. (2001). False recognition occurs more frequently during source identification than during old-new recognition. *Journal of Experimental Psychology: Learning. Memory, and Cognition*, *27*, 175–183.

HUMPHREYS, M. S., & REVELLE, W. (1984). Personality, motivation, and performance: A theory of the relationship between individual differences and information processing. *Psychological Review*, *91*, 153–184.

MANSELL, W., & CLARK, D. M. (1999). How do I appear to others? Social anxiety and processing of the observable self. *Behaviour Research and Therapy*, *37*, 419–434.

MARKS, I. M., & MATHEWS, A. (1979). Brief standard self-rating for phobic patients. *Behaviour Research and Therapy*, *17*, 263–267.

MARKS, M., & HEMSLEY, D. (1999). Retrospective versus prospective self-rating of anxiety symptoms and cognitions. *Journal of Anxiety Disorders*, *13*, 463–472.

MCDERMOTT, K. B., & WATSON, J. M. (2001). The rise and fall of false recall: The impact of presentation duration. *Journal of Memory and Language*, *45*, 160–176.

MCNALLY, R. J., FOA, E. B., & DONNELL, C. D. (1989). Memory bias for anxiety information in patients with panic disorder. *Cognition and Emotion*, *3*, 27–44.

MCNALLY, R. J., HORNIG, C. D., HOFFMAN, E. C., & HAN, E. M. (1999). Anxiety sensitivity and cognitive biases for threat. *Behavior Therapy*, *30*, 51–61.

MOGG, K., MATHEWS, A., & WEINMAN, J. (1987). Memory bias in clinical anxiety. *Journal of Abnormal Psychology*, *96*, 94–98.

PALERMO, D. S., & JENKINS, J. J. (1965). Changes in word associations of fourth- and fifth-grade children from 1916 to 1961. *Journal of Verbal Learning and Verbal Behavior*, *4*, 180–187.

PAUNOVIC, N., LUNDH, L. G., & OST, L. G. (2002). Attentional and memory bias for emotional information in crime victims with posttraumatic stress disorder (PTSD). *Journal of Anxiety Disorders*, *16*, 675–692.

PESTA, B. J., MURPHY, M. D., & SANDERS, R. E. (2001). Are emotionally charged lures immune to false memory? *Journal of Experimental Psychology: Learning, Memory and Cognition*, *27*, 328–338.

RAPEE, R. M., & HEIMBERG, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*, 741–756.

RAPEE, R., MCCALLUM, S. L., MELVILLE, L. F., RAVENSCROFT, H., & RODNEY, J. M. (1994). Memory bias in social phobia. *Behaviour Research and Therapy*, *29*, 317–323.

ROBINSON, K. J., & ROEDIGER, H. L. III (1997). Associative processes of false recall and false recognition. *Psychological Science*, *8*, 231–237.

ROEDIGER, H. L., & MCDERMOTT, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*, 803–814.

ROEDIGER, H. L., WATSON, J., MCDERMOTT, K. B., & GALLO, D. (2001). Factors that determine false recall: A multiple regression analysis. *Psychonomic Bulletin and Review*, *3*, 385–407.

RUSTED, J., & DIGHTON, K. (1991). Selective processing of threat-material by spider phobics in a prose recall task. *Cognition and Emotion*, *5*, 123–132.

SHEIKH, J. I., & YESAVAGE, J. A. (1986). Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontologist*, *5*, 165–172.

SHIPLEY, W. C. (1946). *Shipley Institute of Living Scale: Manual of directions and scoring key*. Hartford: Institute of Living.

SMITH, R. E., & HUNT, R. R. (1998). Presentation modality affects false memory. *Psychonomic Bulletin and Review*, *5*, 710–715.

SPIELBERGER, C. D., GORSUCH, R. L., & LUSHENE, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

STADLER, M. A., ROEDIGER, H. L., & MCDERMOTT, K. B. (1999). Norms for word lists that create false memories. *Memory and Cognition*, *27*, 494–500.

THORPE, S. J., & SALKOVSKIS, P. M. (2000). Recall and recognition memory for spider information. *Journal of Anxiety Disorders*, *14*, 359–375.

WATSON, D., & FRIEND, R. (1969). Measurement of social evaluative anxiety. *Journal of Consulting and Clinical Psychology*, *33*, 448–457.

WATTS, F. N., & DALGLEISH, T. (1991). Memory for phobia-related words in spider phobics. *Cognition and Emotion*, *5*, 313–329.

WATTS, F. N., MCKENNA, F. P., SHARROCK, R., & TREZISE, L. (1986). Color naming of phobia-related words. *British Journal of Psychology*, *77*, 97–108.

WATTS, F. N., & SHARROCK, R. (1984). Questionnaire dimensions of spider phobia. *Behaviour Research and Therapy*, *22*, 575–580.

WENZEL, A., HAUGEN, E. N., & SCHMUTZER, P. A. (2003). Recall of schematic and non-schematic material related to threat in socially anxious and nonanxious individuals. *Behavioural and Cognitive Psychotherapy*, *31*, 387–401.

WENZEL, A., & HOLT, C. S. (1999). Dot probe performance in two specific phobias. *British Journal of Clinical Psychology*, *38*, 407–410.

WENZEL, A., & HOLT, C. S. (2002). Memory bias against threat in social phobia. *British Journal of Clinical Psychology*, *41*, 73–79.

WENZEL, A., & HOLT, C. S. (2003a). Validation of the Multidimensional Blood/Injury Phobia Inventory: Evidence for a unitary construct. *Journal of Psychopathology and Behavioral Assessment*, *25*, 203–211.

WENZEL, A., & HOLT, C. S. (2003b). Social-evaluative threat and cognitive performance in socially anxious and nonanxious individuals. *Personality and Individual Differences*, *34*, 283–294.

WESSEL, I., & MERCKELBACH, H. (1997). The impact of anxiety on memory for details in social phobics. *Applied Cognitive Psychology*, *11*, 223–231.

WESSEL, I., & MERCKELBACH, H. (1998). Memory for threat-relevant and threat-irrelevant cues in spider phobics. *Cognition and Emotion*, *12*, 93–104.

WILLIAMS, J. M. G., WATTS, F. N., MACLEOD, C., & MATHEWS, A. (1988). *Cognitive psychology and emotional disorder*. New York: John Wiley and Sons.

WILLIAMS, J. M. G., WATTS, F. N., MACLEOD, C., & MATHEWS, A. (1997). *Cognitive psychology and emotional disorders* (2nd ed.) New York: John Wiley and Sons.

ZOELLNER, L. A., FOA, E. B., BRIGIDI, B. D., & PRZEWORSKI, A. (2000). Are trauma memories susceptible for "false memories"? *Journal of Abnormal Psychology*, *109*, 517–524.