



## Post-event processing and memory bias for performance feedback in social anxiety

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### ABSTRACT

Despite predictions following from cognitive theories of anxiety, evidence for memory biases in social anxiety has been mixed. This study extends previous research by using stimuli relevant to participants' concerns and allowing time for post-event processing. Participants high ( $n=42$ ) or low ( $n=39$ ) in social anxiety symptoms gave speeches and received standardized feedback on their and a confederate's performance. Participants then took recognition and recall tests for the feedback immediately after it was given and after a two-day delay. Results showed no recall biases. However, the hypothesized recognition biases were found: the high social anxiety group remembered the confederate's feedback more positively than their own, remembered their negative feedback as worse than the low group, and diminished positive feedback over time. Moreover, post-event processing mediated the relationship between social anxiety and memory for negative feedback. Results suggest that biased recognition of social feedback is linked to social anxiety.

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### 1. Introduction

Cognitive theories of social anxiety suggest that anxiety is maintained through information processing biases that lead affected individuals to view social situations through a negatively distorted lens (Clark & McManus, 2002). Biases in attention, interpretation, and memory have been proposed as possible mechanisms to explain why people with social anxiety tend to make negative evaluations of themselves in social situations, despite sometimes strong evidence to the contrary (Clark & Wells, 1995; Musa & Lépine, 2000). However, evidence for memory biases has been very inconsistent (see Coles & Heimberg, 2002). The current study investigates whether socially anxious individuals are characterized by a memory bias that may perpetuate their negative self-evaluations. Participants high and low in social anxiety were given false feedback about their and a confederate's speech performance, and memory for the feedback was tested both immediately and after a two-day delay. This design allowed for an investigation of the effects of post-event processing, a type of rumination characteristic of social anxiety, on memory for self- and other-relevant social feedback.

#### 1.1. Memory bias in social anxiety

According to Beck, Emery, and Greenberg (1985), pathological anxiety results from maladaptive cognitive schemas that, when activated, direct the intake, organization, and recall of information about a particular situation. People with anxiety disorders are thought to over-rely on schemas that preferentially process dangerous information. When a threat schema is activated, threat-relevant biases are theoretically supposed to pervade all stages of information processing (Musa & Lépine, 2000). Furthermore, in theory, these biases are interwoven such that preferential allocation of attention leads to deeper encoding of threat-relevant stimuli, which should then lead to heightened accessibility of threat memories (Heinrichs & Hofmann, 2001). However, evidence for a memory bias in social anxiety has been elusive, even though other information processing biases have been clearly linked to social worries (e.g., attention bias: Rinck & Becker, 2005; interpretation bias: Stopa & Clark, 2000).

Several studies have not found conclusive evidence of memory bias in social anxiety (see review by Coles & Heimberg, 2002). For instance, Rapee, McCallum, Melville, Ravenscroft, and Rodney (1994) found no evidence of memory bias for negative social stimuli across four studies, examining both recall and recognition, implicit and explicit memory, autobiographical memory, and recall of hypothetical performance scenarios. Further, Lundh and Öst (1997) did not find an explicit (cued recall) or implicit (word stem completion) memory bias in socially phobic participants, relative to non-anxious controls. In addition, Becker, Roth, Andrich, and

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Margraf (1999) did not find any disorder-relevant memory bias in participants with social phobia despite finding a strong explicit memory bias for panic-relevant words in participants with panic disorder using an identical paradigm. Moreover, Wenzel and Holt (2002) actually found a memory bias *against* threatening prose passages in participants with social phobia. These findings suggest that information processing theories of social anxiety may need to be revised regarding the role of memory biases.

Alternatively, methodological characteristics of these studies may partly explain the null findings. For example, the majority of prior studies have used stimuli comprised of generic, artificial cues, such as words on a computer screen that are not necessarily relevant to each participant's idiographic concerns (e.g., Becker et al., 1999; Lundh & Öst, 1997; though see Rapee et al., 1994, study 4, which assessed autobiographical memory). Low external validity of stimuli combined with heterogeneity of social concerns within samples may obscure memory biases. Indeed, studies that have used more externally valid stimuli (such as facial expressions) and more homogenous samples seem to be somewhat more likely to obtain results indicating a bias (e.g., Coles & Heimberg, 2005; Lundh & Öst, 1996). In addition, studies that have been successful at finding a memory bias in socially anxious individuals have often used actual or anticipated social exposures (e.g., Mansell & Clark, 1999; O'Banion & Arkowitz, 1977). The current study builds on these earlier findings by using externally valid stimuli with a real social stressor in a sample with a specific social anxiety focus (fear of public speaking).

### 1.2. Post-event processing

Biased processing *after* the social event may also play an important role in facilitating the selective recall of negative information about one's social performance, so that past studies of memory bias may have missed effects by measuring memory only immediately after stimuli were presented. Following real-life social encounters, people with severe social anxiety ruminate for hours or even days over their perceived social failures, a process known in the cognitive model of social phobia as post-event processing (Clark & Wells, 1995). Post-event processing is unproductive and theoretically maintains anxiety, possibly through the rehearsal and elaboration of negative social memories (Kocovski, Endler, Rector, & Flett, 2005; Rachman, Grüter-Andrew, & Shafran, 2000).

The effect that post-event processing has on biased memory in social anxiety has been investigated in three studies. Field and Morgan (2004) tested Clark and Wells' (1995) prediction that post-event processing involves the retrieval of prior instances of perceived social failure. When participants high and low in social anxiety were instructed to engage in post-event processing after recalling a social experience, those who were high in social anxiety generated more negative and shameful autobiographical memories than those who were low in social anxiety. Similarly, Mellings and Alden (2000) found that, one day after a social interaction, the extent of self-reported post-event processing predicted negative self-relevant recall, even though there was only a non-significant trend for group differences according to social anxiety classification (favoring more negative recall among the high social anxiety group). Consistent with earlier research (e.g., Hope, Heimberg, & Klein, 1990), Mellings and Alden also found that socially anxious participants had worse memory for neutral information the next day.

Edwards, Rapee, and Franklin (2003) further assessed the relationship between post-event processing and negative memory biases. They asked participants high and low in social anxiety to give an impromptu speech and then provided a mix of positive and negative feedback on their performance. Memory for the feedback was tested in both immediate and delayed free recall tasks.

Edwards et al. found that a measure of trait social anxiety was associated with negative rumination and that the high social anxiety group showed negatively biased recall at both time points (a trend at time 1 and a significant group difference at time 2). However, there was not a significant relationship between negative rumination and recall bias. Thus, using a real social exposure and allowing time for post-event processing led both Mellings and Alden (2000) and Edwards et al. (2003) to find evidence for a memory bias favoring the recall of negative self-relevant information in high socially anxious participants. However, Mellings and Alden found that post-event processing was correlated with negative recall, while Edwards et al. did not. Results across studies were thus somewhat mixed, but suggest that post-event processing, when examined under the right conditions, may be an important predictor of memory biases. The current study extends this research by using multiple memory tasks, externally valid stimuli, and a two-day delay (intermediate between the delay times used in previous studies) to further explore the link between post-event processing and biased memory in social anxiety. In addition, we examine memory for positive, negative, and neutral information, because a memory bias may be manifested in poor memory for positive information, as well as preferential recall of negative.

### 1.3. Memory for others' social feedback

We are also interested in how memory for information about the self compares to memory for information about other people, especially since this has not yet been examined in relation to post-event processing. Because one of the key features of social anxiety is a sense of inferiority, social comparison processes may be particularly relevant to understanding this type of anxiety (Antony, Rowa, Liss, Swallow, & Swinson, 2005). In fact, recent research has shown that socially phobic individuals make more upward social comparisons (in which the self is judged inferior to others) and experience more negative affect after making those comparisons, relative to control participants (Antony et al., 2005). Furthermore, socially phobic individuals have exhibited a negative bias when appraising their own social performance but a positive bias when judging the performances of others (Alden & Wallace, 1995). In the current study, memory bias is expected to be more negative for self-relevant information and more positive for other-relevant information, as socially anxious individuals negatively compare their performance feedback to that of others during post-event processing.

### 1.4. Overview of current research

In the current study, participants high or low in social anxiety completed a public speaking task and received standardized feedback on their performance, comprised of ratings for positive and negative performance indicators. They also watched a video of a confederate giving a similar speech and read the speech feedback supposedly given to the confederate. After reading the feedback, participants were given free recall and recognition tests and a quiz about neutral information that they had read during the speeches. Memory for feedback for themselves and for the confederate was examined both immediately after the feedback was given and again after a two-day delay. Examination of memory differences between the high and low social anxiety groups at the first visit was exploratory given the prior mixed findings and because participants would have not yet had the opportunity to ruminate on the feedback. However, we hypothesized that at the second visit, participants in the high social anxiety group would show a memory bias such that they would have better memory for negative feedback about themselves and positive feedback about the confederate (as evident by enhanced recall and a tendency to rec-

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