

**Do positive memories change over time? An examination of memory and social anxiety.**

by

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B.A., The University of British Columbia, 2013

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Arts

in

The Faculty of Graduate and Postdoctoral Studies

(Psychology)

The University of British Columbia

(Vancouver)

August 2015

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## **Abstract**

Cognitive theorists suggest that individuals with social anxiety disorder (SAD) display negative memory biases when recalling social events. However, evidence for memory bias has proved elusive. This study builds on recent work on post-event processing of negative events and extends this research to investigate whether positive memories change over time. Undergraduate participants engaged in an unexpected speech task with free choice of topic. After rating their own performance, participants were randomly assigned to receive either positive or neutral feedback. Following a distractor task, participants reported their memory of the feedback they received and completed brief measures of mood and affect. One week later, participants rated their memory of the session one feedback, indicated the amount of post-event processing they engaged in during the week, and completed symptom measures. Results indicated a significant interaction between social anxiety and condition predicting change in memory valence. This relationship was not mediated by post-event processing. This study provides evidence for biased memory of social performance feedback among socially anxious individuals.

## Preface

This thesis was based on work conducted in Professor Lynn Alden's laboratory at the UBC Department of Psychology. I was responsible for the study design, preparation, performance, and data analysis.

Preliminary results were presented as a poster. Glazier, B. L., & Alden, L. E. (2015, June). *Do Positive Memories Change Over Time?* Poster presented at the 76th Annual Convention of the Canadian Psychological Association, Ottawa, ON.

A version of the results were presented as part of a symposium. Alden, L., & Glazier, B. L. (2015, August). *Social Anxiety and Erosion of Status*. In I. M. Aderka (Chair), *Status and Power in Social Anxiety*. Symposium conducted at the 45<sup>th</sup> Annual EABCT Congress, Jerusalem.

The study was approved by the UBC Behavioural Research Ethics board under the project title "Self and Social Perception" (H14-00404).

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## **Acknowledgements**

I owe thanks to my supervisor, Dr. Lynn Alden, for her constant support and guidance throughout this project. I also thank my committee members, Drs. Colleen Brenner and Peter Graf, for their recommendations. The study would not have been possible without the help of dedicated research assistants: Crystal, Paula, Rachel, Kim, Stefanie. The thesis is partly funded by Social Science and Humanities Research Council and I thank them for their support. I would also like to thank Klint for his assistance and my cohort for their continual encouragement.



## **Introduction**

Social anxiety disorder (SAD) is characterized by excessive fear and anxiety about social situations in which one may be observed or scrutinized by others (American Psychiatric Association, 2013). SAD is a common disorder with an estimated lifetime prevalence of 13% (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012) and can cause significant life impairment. Although SAD has been the subject of considerable theory and research, there are still aspects of predominant theories that remain unsettled. Cognitive theorists hypothesize that socially anxious individuals should demonstrate a memory bias that favors negative information. However, current research is inconsistent. The present study examines whether *post-event processing* (PEP; i.e., thinking about a social event after it has occurred) can modify one's judgement of the event. This study builds on recent work suggesting that PEP modifies memories of negative social events, and extends this work by examining changes in memory for positive events. In this introduction, I describe cognitive models of social anxiety and then discuss extant work on memory bias in SAD. This will be followed by discussions of PEP and positive affect in SAD.

## **Cognitive Theories**

Cognitive models of social anxiety have focused on the role of self-related processes (Clark & Wells, 1995; Rapee & Heimberg, 1997). Clark and Wells (1995) proposed that socially anxious individuals develop negative assumptions about themselves and their social world due to a combination of previous experiences and innate predispositions. These beliefs lead them to predict that they will behave in an unacceptable way and that their behaviour will lead to negative social consequences. When these individuals enter a social situation, they shift their attention inward to focus on their own anxiety-related sensations. They assume that others are

also able to perceive their anxiety symptoms and will evaluate them poorly. This process further heightens their anxiety and leads to negative biases in their perceptions of their social performance. In addition, because their attention is focused inward, they neglect external cues from others that could disconfirm their negative thoughts.

The Clark-Wells' model also incorporates behavioral processes. Socially anxious individuals are hypothesized to adopt safety behaviours that are intended to reduce the likelihood of negative evaluation. However, these behaviours can prevent anxious individuals from learning that their feared outcomes would not occur. Self-focused attention and safety behaviours can also increase the likelihood of negative outcomes, thereby confirming the anxious individual's fears. Finally, Clark and Wells (1995) theorize that socially anxious individuals engage in post-event processing (PEP) of social events. Following a social event, they repeatedly review the event, focusing on their anxious feelings and negative self-perceptions. PEP is hypothesized to increase the salience of this negative information and further distort their interpretation of the event resulting in an increasingly negative view of their performance, which is then reconsolidated in memory.

In a similar model, Rapee and Heimberg (1997) proposed that socially anxious individuals assume that other people are inherently critical and likely to evaluate them negatively. Faced with a social situation, they form an image of how they believe others perceive them that is based on their internal anxiety sensations and memories of past failures. Although external cues such as audience feedback may be incorporated into this image, these cues tend to be distorted. They compare the imagined performance to the standard that they believe others will use to judge them. A perceived discrepancy between the image and presumed standards of others increases their anxiety symptoms, and contributes to a worsening perception of their

performance in a downward spiral. Rapee and Heimberg (1997) also note the importance of *subtle avoidance behaviours*, which are used by socially anxious individuals in an attempt to offset negative evaluation, but which interfere with effective social performance and increase the likelihood of a negative outcome.

## **Empirical Findings**

Many components of these cognitive models have received empirical support. Socially anxious individuals display selective attention to threat-related information (Becker, Rinck, Margraf, & Roth, 2001; Clark & McManus, 2002; Hirsch & Clark, 2004; Hope, Rapee, Heimberg, & Dombeck, 1990) and report greater self-focused attention and self-consciousness than nonanxious controls (Hope, Gansler, & Heimberg, 1989; Woody, 1996). They tend to take an observer perspective in their memories, rather than recalling the event through their own eyes (D'Argembeau, Van der Linden, D'Acremont, & Mayers, 2006; Wells & Papageorgiou, 1998). There is also evidence to support the tenet that socially anxious individuals engage in biased judgements. They tend to discount their social behavior, i.e., rate themselves more poorly than others rate them (Alden & Wallace, 1995; Perini, Abbott, & Rapee, 2006; Rapee & Lim, 1992; Stopa & Clark, 2000). They believe that others hold them to a high social standard (Moscovitch & Hofmann, 2007) and tend to overestimate the negative evaluations made by others (Foa, Franklin, Perry, & Herbert, 1996; Hackmann, Surawy, & Clark, 1998; Hirsch & Clark, 2004; Strauman, 1989; Wells & Papageorgiou, 1998).

Finally, socially anxious individuals have been shown to engage in higher levels of PEP than nonanxious controls (Abbott & Rapee, 2004; Dannahy & Stopa, 2007; Edwards, Rapee, & Franklin, 2003). Moreover, this PEP is characterized by negative self-relevant information (Edwards et al., 2003; Mellings & Alden, 2000; Rapee & Abbott, 2007). Contrary to cognitive

theories, however, research addressing the hypothesized effect of PEP, i.e., to increase negative biases in memories of social events, has yielded only weak, inconsistent findings. A detailed summary of this body of work follows.

## **Memory Biases**

Cognitive theorists assume that because socially anxious individuals selectively attend to threat-relevant information, they should display negatively biased memories of social events. Three main bodies of research have examined the hypothesized memory biases: verbal studies, facial recognition studies, and autobiographical memory studies. Each will be discussed below.

**Verbal studies.** In verbal studies, participants are presented with neutral words and words relating to anxiety-provoking stimuli (*Error! Reference source not found.*). They are then directed to recall as many words as possible to test explicit memory bias, or are given word completion tasks to test implicit memory bias. Self-referent encoding tasks are often used in which participants are directed to imagine the cues in relation to themselves. Studies that compared SAD and nonanxious control participants (NAC) using recall tasks found no difference in memory of threat and non-threat words (Becker, Roth, Andrich, & Margraf, 1999; Cloitre, Cancienne, Heimberg, Holt, & Liebowitz, 1995; Lundh & Öst, 1997; Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994). Moreover, whereas depressed undergraduates recalled an equal number of positive and negative adjectives, both socially anxious and control undergraduates recalled more positive than negative adjectives (Sanz, 1996). Recognition and word-completion tasks also revealed no difference between SAD and NAC (Cloitre et al., 1995; Lundh & Öst, 1997; Rapee et al., 1994).

An exception to this pattern of results was a study by Amir, Foa, and Coles (2000) in which participants rated the volume of white noise that was played over social-threat or neutral

sentences. Although the subsequent sentence recognition task found no difference between SAD and NAC, SAD participants rated the noise volume as less loud for social-threat sentences than for neutral sentences, suggesting an implicit memory bias. This result is consistent with the cognitive models of social anxiety but is an exception in the verbal memory research.

**Table 1.** Verbal studies of memory bias in SAD.

Study	Sample	Method	Main Findings
<i>Recall Procedures</i>			
Rapee et al. (1994) (Study 1)	32 SAD 21 NAC	Free recall of social threat, physical threat, positive, and neutral words	Physical threat words were recalled the best and neutral words were recalled the worst by both groups
Rapee et al. (1994) (Study 2)	20 SAD 19 Undergraduate hi-SA 21 Undergraduate lo-SA	Cued-recall of social-threat and neutral words	Both anxious and nonanxious groups recalled more neutral words than threat words
Lundh and Öst (1997)	45 SAD 45 NAC	Self-referent imagery encoding task followed by cued-recall of social-threat, physical threat, positive, and neutral words	No difference between SAD and NAC
Sanz (1996)	9 Undergraduate DEP 13 Undergraduate SA 13 Undergraduate NAC	Self-referent and phonetic encoding of positive and negative adjectives from four content categories: socially anxious, depressive, both depressive and socially anxious, and both depression- and social anxiety-irrelevant, followed by free recall	Both SAD and NAC recalled more positive adjectives than negative adjectives from the self-referent encoding, no difference in the valence of the adjectives recalled with the phonetic encoding; DEP recalled an equal number of positive and negative adjectives from both types of encoding task
Becker et al. (1999)	30 SAD 31 NAC	Self-referent imagery encoding task followed by free recall of neutral, positive, speech-related, and general anxiety words	No difference between SAD and NAC
Cloitre et al. (1995)	21 SAD 21 NAC	Perceptual and semantic encoding of positive, neutral, and threat words, followed by free recall	Neutral words were recalled more poorly than positive or threat words, no difference between SAD and NAC for type of words recalled

Study	Sample	Method	Main Findings
<b><i>Recognition Procedures</i></b>			
Rapee et al. (1994) (Study 1)	32 SAD 21 NAC	Recognition of social threat, physical threat, positive, and neutral words	No difference between SAD and NAC based on word category
Rapee et al. (1994) (Study 2)	20 SAD 19 Undergraduate hi-SA 21 Undergraduate lo-SA	Word-completion of social threat and neutral words	Both anxious and nonanxious groups recognized more neutral words than threat words
Lundh and Öst (1997)	45 SAD 45 NAC	Self-referent imagery encoding task followed by word-completion of social-threat, physical threat, positive, and neutral words	No difference between SAD and NAC
Cloitre et al. (1995)	21 SAD 21 NAC	Perceptual and semantic encoding of positive, neutral, and threat words, followed by high-speed recognition	Neutral words were recalled more poorly than positive or threat words, no difference between SAD and NAC for type of words recalled
<b><i>Other Procedures</i></b>			
Amir et al. (2000)	19 SAD 20 NAC	Ratings of volume of white noise and sentence recognition	SAD rated the noise volume as less loud for social-threat sentences than for neutral sentences, no difference between SAD and NAC on the recognition task

Note: SAD = Social Anxiety Disorder; NAC = nonanxious control; SA = social anxiety; DEP = Depression.

**Facial recognition studies.** Some researchers have suggested that memory biases may not occur in studies using verbal stimuli because the stimuli are not relevant to the concerns of participants (e.g., Lundh, Thulin, Czyzykow, & Öst, 1998). Lundh et al. (1998) found a recognition bias for faces perceived to be “safe” in participants with panic disorder, suggesting that memory biases were more apparent when stimuli relate to the specific concerns of the participants. This study suggested that facial recognition studies might reveal memory bias in socially anxious participants, despite the lack of support from verbal studies.

A summary of facial recognition studies can be seen in **Error! Reference source not found.** Lundh and Öst (1996a) found that after participants rated faces based on the quality of interaction they expected if they met the person in real life, anxious and nonanxious participants did not differ in the extent to which they remembered faces of those with whom they expected to have poor interactions. In a similar study, however, when participants rated faces as critical or accepting of others’ shortcomings, SAD participants recognized more of the faces that they had rated as critical than those they had rated as accepting, whereas NAC participants had a tendency to recognize more accepting faces (Lundh & Öst, 1996b). Furthermore, a recent study using an emotion face dot-probe task suggested that memory biases in social anxiety may be explained by comorbid depression (Lemoult & Joormann, 2012).

To summarize, although verbal memory research demonstrated the presence of explicit and implicit memory biases for some anxiety disorders, there is little evidence for memory biases in individuals with social anxiety (Coles & Heimberg, 2002). However, these methodologies are prey to limitations. For example, it is not clear whether the encoding tasks and stimuli activated fear. If not, no memory bias would be expected because the “threat” information would not be perceived differently than non-threat information. This concern is addressed by facial recognition



studies because the stimuli used in such studies are thought to be more closely related to the fears of socially anxious individuals. Nonetheless, results have been inconsistent. Moreover, neither verbal nor facial recognition tasks are able to distinguish between encoding bias and retrieval bias, i.e., it cannot be determined whether the participants are encoding the information differently or whether the bias occurs in the retrieval and reconsolidation process.

**Table 2.** Facial recognition studies of memory bias in SAD.

Study	Sample	Method	Main Findings
Lundh and Öst (1996a)	20 SAD 20 NAC	Recognition of faces rated on expected quality of interaction	SAD expected to have a poorer quality of interaction than NAC did, no difference between SAD and NAC in the extent to which they remembered the faces of those with whom they expected to have a poor interaction
Lundh and Öst (1996b)	20 SAD 20 NAC	Recognition of faces rated as accepting or critical	SAD recognized more of the faces that they had rated as critical than those they had rated as accepting, NAC had a tendency to recognize more of the accepting faces
LeMoult and Joormann (2012)	25 SAD 15 SAD with DEP 33 NAC	Dot-probe and recognition tasks with happy, sad, angry, disgusted, and neutral faces	No difference between SAD and NAC in attention to angry faces, SAD with DEP group attended away from supraliminally presented angry faces; both SAD and SAD with DEP groups recognized fewer angry faces than NAC; SAD with DEP group showed the only significant correlation between attention bias in the dot-probe task and memory in the recognition task

Note: SAD = Social Anxiety Disorder; NAC = nonanxious control; SAD with DEP = Social Anxiety Disorder with comorbid Depression.

**Autobiographical studies.** Cognitive theorists hypothesize that selective attention to negative information will also result in negative biases in the recall of autobiographical memories. Studies on this topic use cued recall tasks, in which participants relate an autobiographical memory in response to cue words (*Error! Reference source not found.*). Various researchers have examined the valence, detail, and self-referent content of the memories recalled. Little evidence of memory bias was found in memory valence. Specifically, free recall of feedback given after an imagined speech task revealed no difference between SAD and NAC (Rapee et al., 1994) nor did SAD participants retrieve more negative memories than NAC in response to cues (Rapee et al., 1994; Wenzel, Jackson, & Holt, 2002). Moreover, Wenzel, Werner, Cochran, and Holt (2004) found that nonanxious undergraduate participants actually recalled more negative memories when cued by social threat words, although this effect was attenuated when controlling for self-reported depression.

Researchers who examined the level of memory detail report inconsistent results. Some studies reported that socially anxious participants had less detailed positive memories than nonanxious undergraduates (D'Argembeau et al., 2006; Moscovitch, Gavric, Merrifield, Bielak, & Moscovitch, 2011) whereas others found no significant difference between the number of detailed memories recalled by anxious and control participants (Heidenreich, Junghanns-Royack, & Stangier, 2007; Wenzel et al., 2004). Finally, several studies indicated that the memories of SAD participants contained more self-referential information than NAC, especially memories of social situations (Anderson, Goldin, Kurita, & Gross, 2008; D'Argembeau et al., 2006).

The inconsistent findings on autobiographical memory may be in part due to the characteristics being examined. Some researchers measured the level of affect associated with autobiographical memories, whereas others examined the specificity or perspective of the

memory. These studies also suffer methodological problems concerning measurement of autobiographic memories. None of these studies addressed how long ago the memory occurred, which could impact features of the memory (Coles, Turk, & Heimberg, 2002). In addition, autobiographical memory paradigms do not include an objective referent against which to compare the retrieved memory. Thus, it cannot be determined whether the memories are accurate representations of events, i.e., whether the participant failed to encode information correctly or displays selective retrieval. Finally, these paradigms may be vulnerable to the avoidance behaviours that characterize social anxiety. Autobiographical studies ask participants to recall anxiety-provoking information that they are motivated to avoid (Coles & Heimberg, 2002), and may therefore artificially reduce the number of negative memories reported by socially anxious individuals, obscuring the presence of any memory bias.

**Table 3.** Autobiographical memory studies of memory bias in SAD.

Study	Sample	Method	Main Findings
Rapee et al. (1994) (Study 3)	33 SAD 21 NAC	Free recall of feedback on imagined speech task	Both SAD and NAC recalled more negative components overall, NAC recalled the most negative components
Rapee et al. (1994) (Study 4)	33 SAD 21 NAC	Autobiographical memories of self or other (close friend or sibling) cued with social situation cue words or non-social situation neutral cue words	No difference between SAD and NAC in the number of negative memories recalled
Wenzel et al. (2002)	16 SAD 17 NAC	Social threat and neutral cue words	Greater number of memories cued by social threat words were characterized by negative affect for SAD than for NAC (weak effect), SAD did not retrieve a greater percentage of memories cued by social threat words than NAC
Wenzel et al. (2004)	15 Undergraduate SAD 17 Undergraduate NAC	Social threat, positive, and neutral cue words	NAC recalled more negative memories when cued by social threat words, effect was attenuated when controlling for self-reported depression; no difference between SAD and NAC in the degree of generality of the memories recalled, NAC retrieved more general memories when cued with neutral or positive words than when cued with social threat words, no difference in generality for SAD based on cue type

Study	Sample	Method	Main Findings
D'Argembeau et al. (2006)	17 SAD 17 NAC	Positive social event, negative social event, positive non-social event, and negative non-social event memories	SAD reported less sensory detail in their memories of social events than NAC, no difference between SAD and NAC for memories of non-social events; memories of SAD contained more self-referential information than NAC, SAD remembered more self-referential information for social events than for non-social events
Moscovitch et al. (2011)	41 Undergraduate hi-SA 39 Undergraduate lo-SA	Interview to elicit positive and negative images and memories of anxiety-provoking and non-anxiety provoking situations	Lo-SA recalled a balanced ratio of positive and negative images, hi-SA recall more negative images than positive; lo-SA were more likely to endorse than deny both positive and negative memories whereas hi-SA endorsed negative memories and denied positive memories; hi-SA recalled less episodic detail in their positive memories than did lo-SA
Heidenreich et al. (2007)	18 SAD 18 DEP 18 NAC	Positive and negative cue words	No significant difference between the number of specific memories recalled by SAD, DEP, and NAC
Anderson et al. (2008)	42 SAD 27 NAC	Negative social situations	SAD used more self-referential, anxiety-related, and sensory/perceptual words when describing negative memories than NAC did

Note: SAD = Social Anxiety Disorder; NAC = nonanxious control; SA = social anxiety; DEP = Depression.

## Post-Event Processing

Although research on memory per se has not produced promising results, several studies raised the possibility that memory biases may be related to post-event processing (PEP). PEP is defined as the repeated retrieval, reconstruction, and detailed review of one's performance after a social situation. During PEP, socially anxious individuals tend to focus on negative aspects of the event, including their anxious feelings and negative self-perceptions. This selective focus is hypothesized to increase the salience of negative information, ultimately resulting in negative changes in the memory of the event (Brozovich & Heimberg, 2008; Edwards et al., 2003; Mellings & Alden, 2000; Rapee & Abbott, 2007).

A handful of studies have examined the effect of PEP on memory change (*Error! Reference source not found.*). When participants engaged in an unplanned speech task, those with social anxiety engaged in more negative PEP than NAC (Abbott & Rapee, 2004; Edwards et al., 2003; Perini et al., 2006), were more engaged with their negative thoughts, found the thoughts more distressing, and felt they had less control over their thoughts than NAC (Perini et al., 2006). Moreover, whereas the self-ratings of NAC became more positive over the subsequent week, the ratings of individuals with SAD remained unchanged (Abbott & Rapee, 2004). Researchers have also examined PEP following a 'getting acquainted' conversation with a confederate. Socially anxious undergraduates were found to engage in more PEP and to make more negative ratings of their performance (Brozovich & Heimberg, 2011; Dannahy & Stopa, 2007). Notably, in a subsequent session they also made more negative ratings of their performance and more negative predictions about future performance than NAC, which is consistent with the notion that their view of their performance became more negative over time (Dannahy & Stopa, 2007). In an undergraduate sample, Wong and Moulds (2010) found that

PEP, independent of social anxiety, uniquely predicted the strength of conditional beliefs about social evaluation (e.g., “If people see me anxious, they’ll put me down”), and unconditional beliefs about the self (e.g., “People think I’m boring”). This supports the involvement of PEP maintaining negative thoughts and beliefs characteristic of social anxiety. Furthermore, trait levels of PEP were found to moderate the relationship between social anxiety and change in self-rated performance over one week in socially anxious participants but not in NAC (Brozovich & Heimberg, 2011).

In contrast to the above studies, Edwards et al. (2003) gave performance feedback to participants after a speech task. Although, socially anxious participants recalled more negative feedback than NAC participants, their negative memory bias did not increase over the subsequent week which suggested that the bias may have occurred during encoding (Edwards et al., 2003). In summary, studies of PEP and memory are not entirely consistent in that they variously suggest that PEP maintains, increases, or has no effect on memory for social events. Nonetheless, there is sufficient support for the idea that cognitive activity after an event can influence one’s later judgement of that event to warrant further study.



**Table 4.** Post-Event Processing studies in SAD.

Study	Sample	Method	Main Findings
Edwards et al. (2003)	26 Undergraduate hi-SA 27 Undergraduate lo-SA	Unplanned 3 minute speech, received positive and negative feedback, recall feedback after one week interval	Hi-SA engaged in more PEP over the week, recalled more negative feedback than lo-SA; no increase in negative memory bias over the week
Abbott and Rapee (2004)	43 SAD 30 NAC	Unplanned 3 minute speech on any topic, rate performance after one week interval	SAD rated their performance more negatively at both times, reported more negative PEP during the week than NAC; self-ratings of NAC became more positive over the week, SAD ratings were unchanged
Perini et al. (2006)	40 SAD 20 NAC	Unplanned 3 minute speech on any topic, rate performance after one week interval	SAD engaged in more negative PEP, more engaged with negative thoughts, found thoughts more distressing, had less control over thoughts than NAC; perception of performance mediated relationship between SA and PEP
Dannahy and Stopa (2007)	25 Undergraduate hi-FNE 25 Undergraduate lo-FNE	Anxiety ratings and predictions of performance before and after 'getting acquainted' conversation with confederate, rate anxiety and predict performance after one week interval	Hi-FNE reported more PEP, made more negative ratings and predictions of performance over time
Wong and Moulds (2010)	47 Undergraduate lo-FNE 69 Undergraduate moderate-FNE 64 Undergraduate hi-FNE	Self-report questionnaire on excessively high standards for social performance, conditional beliefs about social evaluation, unconditional beliefs about the self; repeated after one week interval	PEP not uniquely related to high standards belief, PEP predicted stronger conditional and unconditional beliefs
Brozovitch and	33 Undergraduate	'Getting acquainted' conversation with	SAD rated their performance more

Study	Sample	Method	Main Findings
Heimberg (2011)	SAD 31 Undergraduate NAC	confederate, write about experience while focusing on self or other, rate performance after one week interval	negatively at both times, trait level of PEP moderated relationship between SA and evaluation of performance for SAD but not for NAC

Note: SA = social anxiety; PEP = post-event processing; SAD = Social Anxiety Disorder; NAC = nonanxious control; FNE = Fear of Negative Evaluation.

## **State of Current Research**

Although cognitive theorists hypothesize that socially anxious individuals should show memory biases favoring negative information, current research is inconclusive. Work with verbal memory has assessed both implicit and explicit memory biases through recognition and recall paradigms. These studies have failed to support the presence of memory biases with few exceptions. Research with facial stimuli has also had limited success. Autobiographical memory studies suggest that the memories of socially anxious individuals may include more self-referential information and that their positive memories may lack detail. However, there is a paucity of studies, and the results require replication. Thus, only in the PEP literature is support found for potential memory biases in social anxiety. These studies consistently show that socially anxious individuals engage in more PEP than NAC. A few preliminary findings indicate that PEP may operate to maintain or worsen perceptions of one's performance. However, little research has examined how the memories of socially anxious individuals change over time.

Work by Abbott and Rapee (2004) and others addressed some of the limitations of other memory study paradigms. The tasks used in these studies were highly relevant to socially anxious participants, ensured that the stimuli were salient enough to be considered threatening, and provided an objective reference point to which the participant's memory could be compared. More work is required, however, to examine the memory component of cognitive models of social anxiety. Specifically, memory needs to be examined over time to distinguish whether and how changes occur. Moreover, while most research has focused on negative memories, it is also important to assess whether positive memories changed over time. A discussion of the relationship between social anxiety and positive affect and cognitions follows.

## **Social Anxiety and Positive Cognitions**

Researchers find that socially anxious individuals experience less positive affect and have fewer positive experiences relative to non-socially anxious individuals (Brown, Chorpita, & Barlow, 1998; Kashdan & Steger, 2006). They express fewer positive emotions (Turk, Heimberg, Luterek, Mennin, & Fresco, 2005) and report a reduced capacity to savour positive experiences (Eisner, Johnson, & Carver, 2009). Socially anxious individuals have also been shown to become anxious following positive feedback and to believe that positive social outcomes are not only less likely but also more emotionally costly (Gilboa-Schechtman, Franklin, & Foa, 2000; Weeks, Heimberg, Rodebaugh, Goldin, & Gross, 2012; Weeks, Heimberg, & Rodebaugh, 2008). This reaction to positive evaluation has been hypothesized to reflect a fear that others will hold higher expectations in future interactions (Gilboa-Schechtman et al., 2000; Wallace & Alden, 1997). Moreover, when they do experience positive events they interpret them in a negative manner, a cognitive tendency that might be expected to maintain low positive affect (Alden, Taylor, Mellings, & Laposa, 2008). These studies suggest that socially anxious individuals do not respond to and encode positive events in the same way as nonanxious individuals. It is possible that negative PEP leads to discounting or reappraising memories of positive events over time, leading to further degradation of positive affect. Another possibility is that non-socially anxious individuals' perceptions of positive events become even more positive over time resulting in hedonic enhancement, whereas socially anxious individuals' memories remain unchanged. These possibilities still require research, as extant work on PEP has focused on negative affect and memories.

## Current Study

The current study focuses on change in memories of ostensibly positive events in socially anxious participants. Participants engaged in an unexpected speech task for three minutes, following which they received either objectively positive or neutral performance feedback via rating scales. Participants reported what they remembered about the feedback at two time points: Time 1 shortly after receiving the feedback and Time 2 one week later. Anxiety symptoms, positive and negative affect, perception of performance, and levels of PEP were measured. In keeping with the literature described above, participants with high levels of social anxiety were expected to rate their performance more negatively, engage in more PEP during the week, and experience greater state anxiety after the speech task than participants with low social anxiety. The primary goal of this study was to investigate whether memories of feedback changed over time. In the current study, memory is defined as the ability to recognize whether a feedback item was previously presented (*Recognition* scores) and to recall the valence of the feedback item (*Valence* scores). Scores at Time 1 were considered to represent encoding of the feedback information, whereas Time 2 scores reflect recall of the information.

My specific hypotheses were that: 1.) Social anxiety would predict increased negativity in recalled feedback valence over time. Furthermore, the social anxiety main effect would be modified by a social anxiety X condition interaction such that social anxiety would be associated with significantly more change in the positive feedback condition. 2.) Social anxiety would predict greater engagement in negative PEP over the week, but not in positive PEP. This main effect would be modified by a social anxiety X condition interaction such that social anxiety would predict more negative PEP and less positive PEP following positive feedback. 3.) Negative PEP would mediate the relationship between social anxiety and change in recalled

feedback, particularly in the positive feedback condition. In addition to my main hypotheses, I was interested in exploring a possible relationship between social anxiety and errors of commission, i.e., falsely recalling items as having been presented in the original feedback. In absence of previous work, there was no specific hypothesis about this relationship.

## Method

### Participants

A total of 145 undergraduate participants recruited from the Human Subject Pool at the University of British Columbia completed the study. Eleven additional participants attended the first session but did not return for the second session and thus were not included in analyses. There were no significant differences between participants who returned and those who did not on Time 1 measures. Participants received partial course credit toward a psychology course for their participation. The mean age of the sample was 20.22 years ( $SD = 2.80$ ). The sample consisted of 74.64% females. Of the sample, 50.72% self-identified as Caucasian, 23.91% self-identified as East Asian, and 25.37% self-identified with other cultures. All participants spoke English as a first or primary language. Seven participants with significant amounts of missing data (i.e., three or more missing feedback item ratings at either Time 1 or 2) were removed from analyses, resulting in 138 participants. Excluded participants were from both conditions and their scores were scattered across levels of social anxiety.

### Materials

**Social Phobia Scale (SPS; Mattick & Clarke, 1998).** The SPS is 20-item self-report measure of fear of being scrutinized by others during routine activities (*Appendix A*). Participants indicate how characteristic each statement is of themselves on a five-point scale from 0 (*Not at all*) to 4 (*Extremely*). The SPS has demonstrated high internal consistency and test-retest reliability in both clinical and undergraduate samples (e.g., Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Mattick & Clarke, 1998). The scale has good convergent validity with measures of social fear and discriminates between clinical groups as well as between clinically

socially anxious and control samples (Mattick & Clarke, 1998). In the current sample, Cronbach's  $\alpha = .91$ .

**Thoughts Questionnaire (Edwards et al., 2003).** The Thoughts Questionnaire measures the tendency to engage in positive and negative PEP after participation in a speech task (*Appendix B*). Participants indicate how frequently they have thought about aspects of their speech during the week following the speech task. The questionnaire consists of 16 negative rumination items, 11 positive rumination items<sup>1</sup>, and 2 general items to which participants respond on a five-point scale from 0 (*Never*) to 4 (*Very often*). The positive subscale ( $\alpha = .79$ ), negative subscale ( $\alpha = .94$ ), and total scale ( $\alpha = .90$ ) have demonstrated acceptable to excellent internal consistency for undergraduate samples (Edwards et al., 2003). In the present study, this scale is used to measure PEP regarding a specific performance task rather than levels of PEP in general. The positive subscale ( $\alpha = .90$ ), negative subscale ( $\alpha = .92$ ), and total scale ( $\alpha = .93$ ) demonstrated high internal consistency in the current sample.

**Public Speaking Performance Measure (Rapee & Lim, 1992).** The Public Speaking Performance Measure, self-rating version, is a 17-item subjective measure of public speaking performance (*Appendix C*). Participants rate 12 specific and 5 global aspects of their speech performance on a five-point scale from 0 (*Not at all*) to 4 (*Very much*). The global items ( $\alpha = .79$ ) and specific items ( $\alpha = .86$ ) have demonstrated acceptable to good internal consistency in clinical samples (Rapee & Lim, 1992). Scores were calculated by reversing appropriate items and summing, with higher scores indicating better performance. In the current sample, the

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<sup>1</sup> One item of the positive subscale ("The feedback was positive") was removed prior to analyses as it was considered to reflect feedback manipulation rather than positive PEP. One item from the positive subscale ("That the feedback was accurate") and one from the negative subscale ("That the feedback was inaccurate") were removed prior to analyses as they were considered to reflect believability rather than PEP.



specific items ( $\alpha = .80 - .81$ ) and global items ( $\alpha = .81 - .87$ ) demonstrated acceptable internal consistency at each time point.

**State-Trait Anxiety Inventory - 6 (STAI-6; Marteau & Bekker, 1992).** The STAI-6 is a brief measure of state anxiety composed of six items drawn from the State Trait Anxiety Inventory (STAI; Spielberger & Sydeman, 1994) (*Appendix D*). Participants indicate the degree to which they are currently experiencing each item on a four-point scale from 1 (*Not at all*) to 4 (*Very much*). The six items demonstrate acceptable internal consistency ( $\alpha = .82$ ) and good concurrent validity with the full STAI for participants with normal and elevated levels of anxiety (Marteau & Bekker, 1992). The STAI-6 correlates  $r = .95$  with the full length STAI and serves as an acceptable short-form of the original measure. The scale demonstrated acceptable internal consistency at each time point for the current sample ( $\alpha = .80 - .82$ ).

**Depression Anxiety Stress Scales – Depression subscale (DASS-D; Lovibond & Lovibond, 1995).** The DASS-D was included to control for depressive symptoms and assess whether results are specific to social anxiety or consistent with other forms of negative affect. The short form version of the DASS-D is a seven-item self-report subscale that assesses symptoms of depression (*Appendix E*). Participants rate how applicable each item is to them on a four-point scale from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*). The DASS has good convergent and discriminant validity in clinical and community samples (Antony, Bieling, Cox, Enns, & Swinson, 1998). The subscale has excellent internal consistency ( $\alpha = .91$ ) for undergraduate samples (Lovibond & Lovibond, 1995). The short-form version of the DASS-D was chosen because it has fewer items, a cleaner factor structure, and smaller correlations between factors (Antony et al., 1998). In the current sample, Cronbach's  $\alpha = .91$ .

**Feedback Measure.** Feedback was provided in the form of 14 bipolar visual analogue scales (*Appendix G*). The scale was based on feedback items used by Edwards et al. (2003), which were selected to represent concerns related to social anxiety and evaluative items of public speaking ability. Each item of feedback used by Edwards et al. (2003) corresponds to one scale in the present study, with anchors denoting the positive and negative ends of the visual analogue scale. The bipolar scale format is used to maintain standardization and to enhance the believability of the feedback. Neutral feedback consisted of 10 items rated at the middle of the scale, two items rated on the positive side, and two items rated on the negative side. Positive feedback consisted of 10 items rated on the positive side of the scale, two items rated at the middle, and two items rated on the negative side. The inconsistent feedback items were included to enhance the believability of the feedback. As such, they were treated as filler items and were not included in analyses.

**Memory of Feedback Measure.** Participants indicated the valence of the feedback on 14 bipolar visual analogue scales and 10 dummy scales not included in the original feedback (*Appendix H*). The measure also included the option to indicate that the scale was not included in the feedback they received. Four scores were derived from the measure at each time point.

*Recognition* refers to the total number of the 10 condition congruent items (i.e., positive feedback items in the positive condition, neutral feedback items in the neutral condition) that were correctly recognized as having been presented. *Valence* refers to the valence rating of any condition congruent items that were recognized as having been presented. The mean of these ratings were calculated for analyses. *False Recognition* refers to the total number of the 10 dummy items that were falsely recalled as having been presented. *False Valence* refers to the valence rating of any dummy items that were falsely recalled as having been presented. The

mean of these ratings were calculated for analyses. The recognition scores were included to examine whether social anxiety influenced recognition of items, whereas the valence scores pertain to the perceived positivity or negativity of the feedback.

**Feedback Believability.** At the end of the second session, participants indicated how believable the feedback was. Following the procedure of Edwards et al. (2003), participants rated the believability of the feedback on a five-point scale from 0 (*Unbelievable*) to 4 (*Very believable*).

**Positive and Negative Affect Schedule Short Form (I-PANAS-SF; Thompson, 2007).** The I-PANAS-SF was included for supplemental analyses of mood-dependent memory. The I-PANAS-SF is a brief measure of positive and negative affect composed of two independent five-item subscales drawn from the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) (*Appendix F*). Participants indicate the extent to which they are currently experiencing each item on a five-point scale from 1 (*Very slightly*) to 5 (*Extremely*). The positive affect ( $\alpha = .78$ ) and negative affect ( $\alpha = .76$ ) subscales have acceptable internal consistency and correlate well with the full length PANAS (Thompson, 2007). In the current sample, the positive affect ( $\alpha = .75 - .82$ ) and negative affect ( $\alpha = .66 - .70$ ) demonstrated adequate internal consistency at both time points.

## **Procedure**

Participants were informed that the purpose of the study was to examine the relationship between self-perception and mood. Two sessions were conducted one week apart, with participants assessed individually. All measures were completed with paper and pencil. In session one, an experimenter provided information about the procedures and elicited the potential participants' informed consent. After providing demographic information, participants engaged

in a 3-minute impromptu speech on any topic of their choice except their anxiety or their participation in the study. Choice of topic was used to control for participants' level of knowledge and familiarity with the topic (Rapee & Lim, 1992). Participants were told that an independent judge was rating their performance skills from a videotape of the speech. They were directed to focus on the camera during the task while the experimenter remained in the room to indicate when three minutes had elapsed. Similar speech task procedures have been used in prior research to assess memory and PEP (e.g., Abbott & Rapee, 2004) and have been found to trigger more PEP for socially anxious participants than interaction tasks (Kiko et al., 2012). Immediately after the speech task, participants completed the STAI-6 and the Public Speaking Performance Measure.

Half of the participants, chosen at random, received positive feedback, while the other half received neutral feedback. After receiving feedback, participants waited outside the room in order to remove them from the environment briefly before the first Memory of Feedback measure. Participants were told that the final questionnaires are being prepared, and completed the Memory of Feedback measure, PANAS, and another STAI-6 upon returning to the room. In session two, participants completed the Memory of Feedback measure, STAI-6, and PANAS for a second time. They also completed the Public Speaking Performance Measure, Thoughts Questionnaire, SPS, and the DASS at the end of the second session. Finally, participants indicated the believability of the feedback and the purpose of the research was explained.

## Results

### Descriptive Statistics

The means and standard deviations for the sample's demographic and symptom measures are presented in **Error! Reference source not found.****Error! Reference source not found..**

Independent samples t-tests indicated that there were no significant differences between conditions on age, gender, social anxiety, PEP, or depression. A correlation matrix of the primary descriptive measures is presented in **Error! Reference source not found..**

**Table 5.** Means and standard deviations for demographic and symptom measures.

Measure	Total sample	Neutral Condition	Positive Condition
Age	20.22 (2.80)	20.06 (2.40)	20.38 (3.13)
Gender (% female)	74.64%	71.64%	77.46%
SPS	14.75 (11.09)	13.97 (12.65)	15.49 (9.43)
Student Norms	14.1 (10.2)		
TQ			
- Positive PEP	8.65 (7.04)	8.56 (6.73)	8.73 (7.36)
- Negative PEP	14.56 (11.41)	14.76 (11.46)	14.38 (11.44)
DASS	3.74 (4.17)	4.25 (4.68)	3.26 (3.61)

Note: SPS = Social Phobia Scale; TQ = Thoughts Questionnaire; PEP = post-event processing; DASS = Depression Anxiety Stress Scales – Depression subscale.

**Table 6.** Intercorrelations of primary descriptive measures.

	1.	2.	3.	4.	5.	6.
1. SPS	-	.13	.66***	-.30***	.00	-.07
2. TQ Positive PEP		-	.38***	.10	.05	.16
3. TQ Negative PEP			-	-.21*	-.16	-.19*
4. Mean <i>Change in Valence</i>				-	-.11	-.07
5. Mean <i>False Valence</i> Time 1					-	.79***
6. Mean <i>False Valence</i> Time 2						-

Note: SPS = Social Phobia Scale; TQ = Thoughts Questionnaire; PEP = post-event processing.

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

## Preliminary Analyses

Participants with higher social anxiety were expected to experience more state anxiety and to rate their performance more negatively. Linear regression analysis revealed that SPS scores significantly predicted state anxiety, measured by the STAI-6, immediately after the speech task ( $b = .11$ ,  $SE = .02$ ,  $t(134) = 4.87$ ,  $p < .001$ ), after recalling feedback at Time 1 ( $b = .11$ ,  $SE = .02$ ,  $t(134) = 4.64$ ,  $p < .001$ ), and after recalling feedback at Time 2 ( $b = .12$ ,  $SE = .02$ ,  $t(134) = 5.01$ ,  $p < .001$ ). SPS also significantly predicted Public Speaking Performance Measure scores at Time 1 ( $b = -.41$ ,  $SE = .07$ ,  $t(134) = -5.67$ ,  $p < .001$ ) and at Time 2 ( $b = -.43$ ,  $SE = .06$ ,  $t(136) = -6.98$ ,  $p < .001$ ). As predicted, participants with higher social anxiety experienced more state anxiety throughout the procedures and rated their own performance more negatively.

To assess whether participants initially encoded information correctly, the relationships of Time 1 *Recognition* and Time 1 *Valence* with social anxiety were examined. The means and standard deviations of the *Recognition* scores are presented in **Error! Reference source not found.** Hierarchical linear regression analyses were conducted using the SPSS macro MODPROBE (Hayes, 2015) with mean centered SPS score entered as the focal predictor and dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator for each analysis. Mean *Recognition* at Time 1 and mean *Valence* at Time 1 were entered as dependent variables in two separate analyses. The overall model predicting *Recognition* was non-significant,  $R^2 = .05$ ,  $F(3, 134) = 2.14$ ,  $p = .10$ . There was no significant main effect of SPS ( $\beta = .10$ ,  $SE = .09$ ,  $t(136) = 1.18$ ,  $p = .24$ ). Condition was significantly related to the number of items recognized ( $\beta = .19$ ,  $SE = .17$ ,  $t(136) = 2.21$ ,  $p < .05$ ), however the interaction term was not significant ( $\beta = -.12$ ,  $SE = .18$ ,  $t(134) = -.69$ ,  $p = .49$ ). The overall model predicting *Valence* was significant,  $R^2 = .84$ ,  $F(3, 134) = 233.15$ ,  $p < .001$ ) (**Error! Reference source not found.**). There



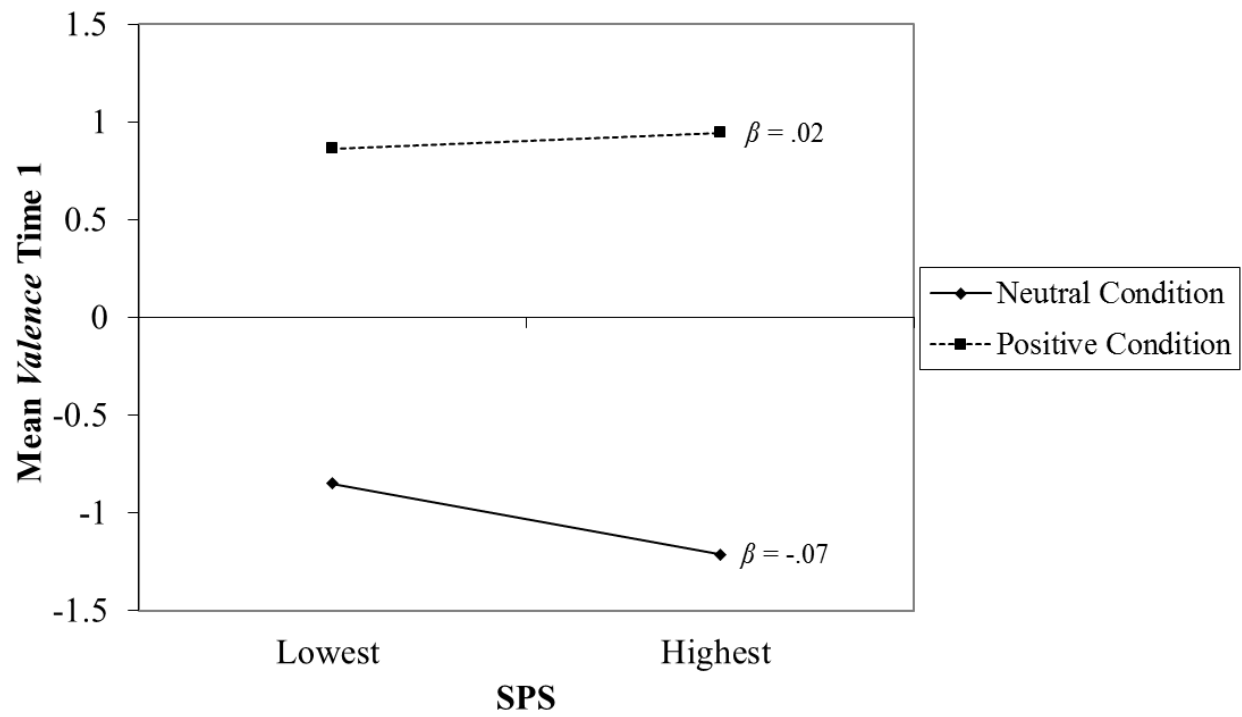
was a significant main effect of condition ( $\beta = .91$ ,  $SE = .07$ ,  $t(136) = 26.34$ ,  $p < .001$ ). SPS was not significantly related to the valence of recognized items at Time 1 ( $\beta = .03$ ,  $SE = .09$ ,  $t(136) = .29$ ,  $p = .77$ ) and the interaction term was not significant ( $\beta = .08$ ,  $SE = .07$ ,  $t(134) = 1.18$ ,  $p = .24$ ). Thus, social anxiety did not predict increased negativity at Time 1, suggesting that social anxiety did not affect encoding of the feedback, as reflected in participants' immediate ability to recall the information accurately.

To examine if the feedback was believable, hierarchical linear regression was used to assess whether there were significant relationships between believability, social anxiety, and condition. Mean centered SPS score was entered as the focal predictor, dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator, and believability rating as the dependent variable. The overall model predicting believability from SPS scores was significant,  $R^2 = .07$ ,  $F(3, 132) = 3.35$ ,  $p < .05$  (*Error! Reference source not found.*). There was a significant main effect of SPS ( $\beta = .22$ ,  $SE = .08$ ,  $t(134) = 2.67$ ,  $p < .01$ ). Condition was not significantly related to believability ( $\beta = .03$ ,  $SE = .17$ ,  $t(134) = .30$ ,  $p = .76$ ), and the interaction term was not significant ( $\beta = -.30$ ,  $SE = .17$ ,  $t(132) = -1.69$ ,  $p = .09$ ). The conditional effects calculated with MODPROBE (Hayes, 2015) indicated that in the neutral condition, SPS significantly predicted believability ( $\beta = .33$ ,  $SE = .11$ ,  $t(132) = 3.14$ ,  $p < .01$ ), whereas in the positive condition SPS was not significantly related to believability ( $\beta = .04$ ,  $SE = .14$ ,  $t(132) = .26$ ,  $p = .80$ ). These results indicated that positive feedback was equally believable, regardless of the participant's level of social anxiety. However, higher levels of social anxiety was associated with perceiving the neutral feedback as more believable.

**Table 7.** Means and standard deviations for *Recognition* scores.

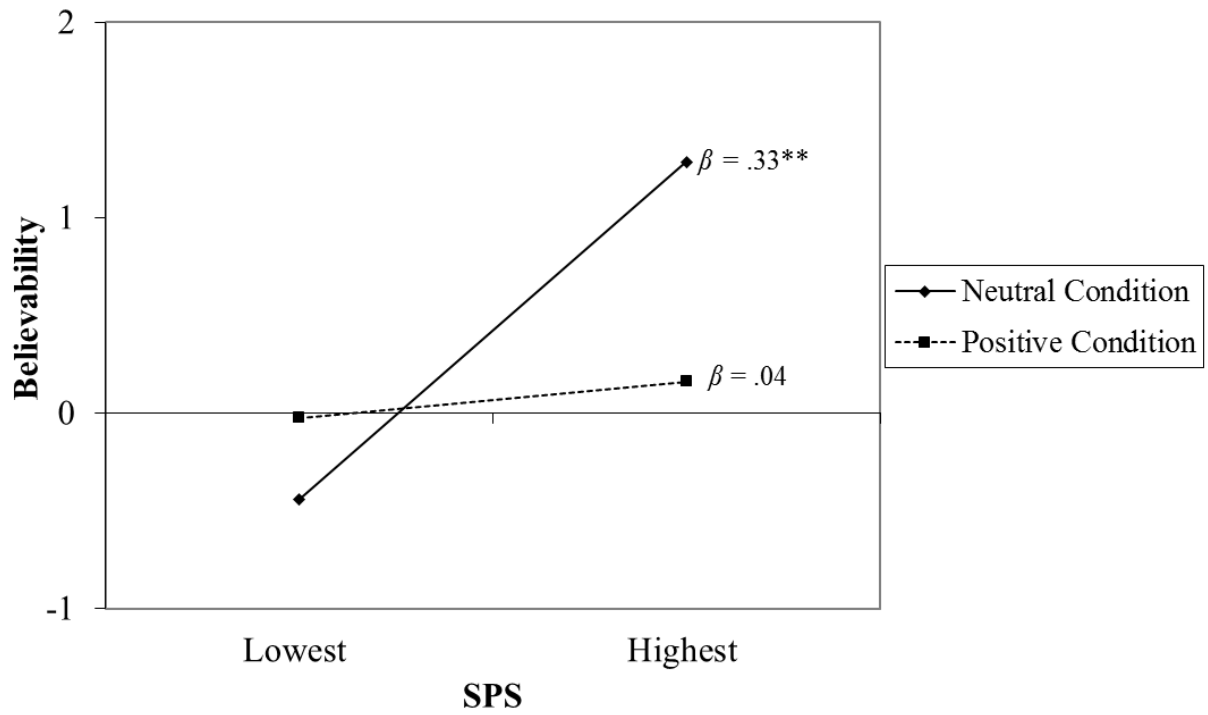
Measure	Total sample	Neutral Condition	Positive Condition
<i>Recognition</i> Time 1	8.17 (1.54)	7.88 (1.68)	8.45 (1.34)
<i>Recognition</i> Time 2	7.20 (1.91)	7.00 (1.97)	7.38 (1.84)

**Figure 1.** Main effect of condition on recall valence at Time 1.



Note: SPS = Social Phobia Scale.

**Figure 2.** Main effect of SPS on believability.



Note: SPS = Social Phobia Scale.

$^{**} p < .01$

## Main Analyses

Hierarchical linear regression analyses were conducted using the SPSS macro MODPROBE (Hayes, 2015) to investigate the relationships between social anxiety, condition, *Recognition* and *Valence* scores, and PEP. To examine hypothesis 1, I computed *Change in Valence*, the difference between Time 2 and Time 1 on the *Valence* scores of each presented condition congruent feedback item. Higher scores indicated increased positive valence. I then conducted a hierarchical linear regression analysis in which mean *Change in Valence* was entered as the dependent variable. Mean centered SPS score was entered as the focal predictor and dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator. The overall model predicting change in recall valence was significant,  $R^2 = .21$ ,  $F(3, 134) = 12.03$ ,  $p < .001$  (**Error! Reference source not found.**). There was a main effect of both SPS ( $\beta = -.30$ ,  $SE = .08$ ,  $t(136) = -3.62$ ,  $p < .001$ ) and condition ( $\beta = -.30$ ,  $SE = .16$ ,  $t(136) = -3.73$ ,  $p < .001$ ), as well as a significant interaction between SPS and condition ( $\beta = -.43$ ,  $SE = .16$ ,  $t(134) = -2.72$ ,  $p < .01$ ). The SPS X condition interaction contributed a significant amount of additional variance, over and above their individual effects,  $\Delta R^2 = .04$ ,  $F(1, 134) = 7.37$ ,  $p < .01$ . The conditional effects calculated with MODPROBE (Hayes, 2015) indicated that in the neutral condition, SPS was not significantly related to change in recall valence ( $\beta = -.12$ ,  $SE = .10$ ,  $t(134) = -1.20$ ,  $p = .23$ ), whereas in the positive condition SPS significantly predicted change in recall valence ( $\beta = -.55$ ,  $SE = .13$ ,  $t(134) = -4.35$ ,  $p < .001$ ). These results indicated that participants with higher levels of social anxiety displayed negatively biased recall for positive feedback.

To test hypothesis 2, mean centered SPS score was entered as the focal predictor, dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator, and the

negative and positive subscales of the Thoughts Questionnaire as dependent variables in two separate analyses. The overall model predicting *negative* PEP was significant,  $R^2 = .44$ ,  $F(3, 134) = 34.72$ ,  $p < .001$  (**Error! Reference source not found.**). There was a significant main effect of SPS ( $\beta = .66$ ,  $SE = .07$ ,  $t(136) = 10.19$ ,  $p < .001$ ). Condition was not significantly related to negative PEP ( $\beta = -.02$ ,  $SE = .17$ ,  $t(136) = -.20$ ,  $p = .85$ ) and the interaction term was non-significant ( $\beta = .04$ ,  $SE = .13$ ,  $t(134) = .28$ ,  $p = .78$ ). The overall model predicting *positive* PEP was non-significant,  $R^2 = .03$ ,  $F(3, 134) = 1.16$ ,  $p = .33$ . There was no significant main effect of SPS ( $\beta = .13$ ,  $SE = .09$ ,  $t(136) = 1.52$ ,  $p = .13$ ) or condition ( $\beta = .02$ ,  $SE = .17$ ,  $t(136) = .27$ ,  $p = .79$ ). The interaction term was non-significant ( $\beta = .19$ ,  $SE = .18$ ,  $t(134) = 1.08$ ,  $p = .28$ ). These results indicated that social anxiety was associated with higher levels of negative PEP and that this relationship was not affected by the feedback received.

To examine hypothesis 3 that PEP would mediate the relationship between social anxiety and recall valence, moderated mediation analyses were conducted using the SPSS macro PROCESS (Hayes, 2014). Four requirements must be met to demonstrate mediation (Baron & Kenny, 1986). The independent variable must predict the dependent variable; the independent variable must predict the mediator; the mediator must predict the dependent variable; and the relationship between the independent variable and the dependent variable must be reduced when controlling for the mediator. Mean centered SPS score was entered as the independent variable, dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator, mean *Change in Valence* as the outcome variable, and both the negative and positive subscales of the Thoughts Questionnaire as mediators.

The overall model was significant,  $R^2 = .25$ ,  $F(5, 132) = 8.76$ ,  $p < .001$  (**Error! Reference source not found.**). The direct effect of SPS predicting recall change was significant in the

positive condition ( $\beta = -.50$ ,  $SE = .14$ ,  $t(132) = -3.49$ ,  $p < .001$ ) but not in the neutral condition ( $\beta = -.03$ ,  $SE = .12$ ,  $t(132) = -.26$ ,  $p = .80$ ). SPS significantly predicted negative PEP ( $\beta = .66$ ,  $SE = .07$ ,  $t(136) = 10.19$ ,  $p < .001$ ) but did not predict positive PEP ( $\beta = .13$ ,  $SE = .09$ ,  $t(136) = 1.52$ ,  $p = .13$ ). When SPS was held constant, positive PEP significantly predicted recall change ( $\beta = .21$ ,  $SE = .08$ ,  $t(132) = 2.51$ ,  $p < .05$ ) but negative PEP was not significantly related to change ( $\beta = -.15$ ,  $SE = .11$ ,  $t(134) = -1.38$ ,  $p = .17$ ). None of the conditional indirect effects was significant (see **Error! Reference source not found.**). In summary, neither positive nor negative PEP mediated the effect of SPS on the change in valence of items recalled in the positive condition.

Finally, I was interested in examining the relationship between social anxiety and errors of commission. The means and standard deviations of the *False Recognition* scores are presented in **Error! Reference source not found.** Separate analyses were conducted to compare social anxiety to *False Recognition* and *False Valence*. Mean centered SPS score was entered as the focal predictor and dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator for each analysis. In the first set of analyses, mean *False Recognition* at Time 1 and Time 2 were separately entered as dependent variables. At Time 1, the overall model was non-significant,  $R^2 = .03$ ,  $F(3, 134) = 1.40$ ,  $p = .25$ . There was no significant main effect of SPS ( $\beta = -.05$ ,  $SE = .09$ ,  $t(136) = -.53$ ,  $p = .60$ ) or condition ( $\beta = -.01$ ,  $SE = .17$ ,  $t(136) = -.07$ ,  $p = .91$ ). The interaction term was significant ( $\beta = .35$ ,  $SE = .18$ ,  $t(134) = 1.98$ ,  $p < .05$ ). The SPS X condition interaction contributed a significant amount of additional variance, over and above their individual effects,  $\Delta R^2 = .03$ ,  $F(1, 134) = 3.92$ ,  $p < .05$ . The conditional effects calculated with MODPROBE (Hayes, 2015) indicated that SPS was not significantly related to change in false recall valence in either the neutral ( $\beta = -.17$ ,  $SE = .11$ ,  $t(134) = -1.62$ ,  $p = .11$ ) or the positive condition ( $\beta = .18$ ,  $SE = .14$ ,  $t(134) = -1.25$ ,  $p = .21$ ). At Time 2, the overall model was

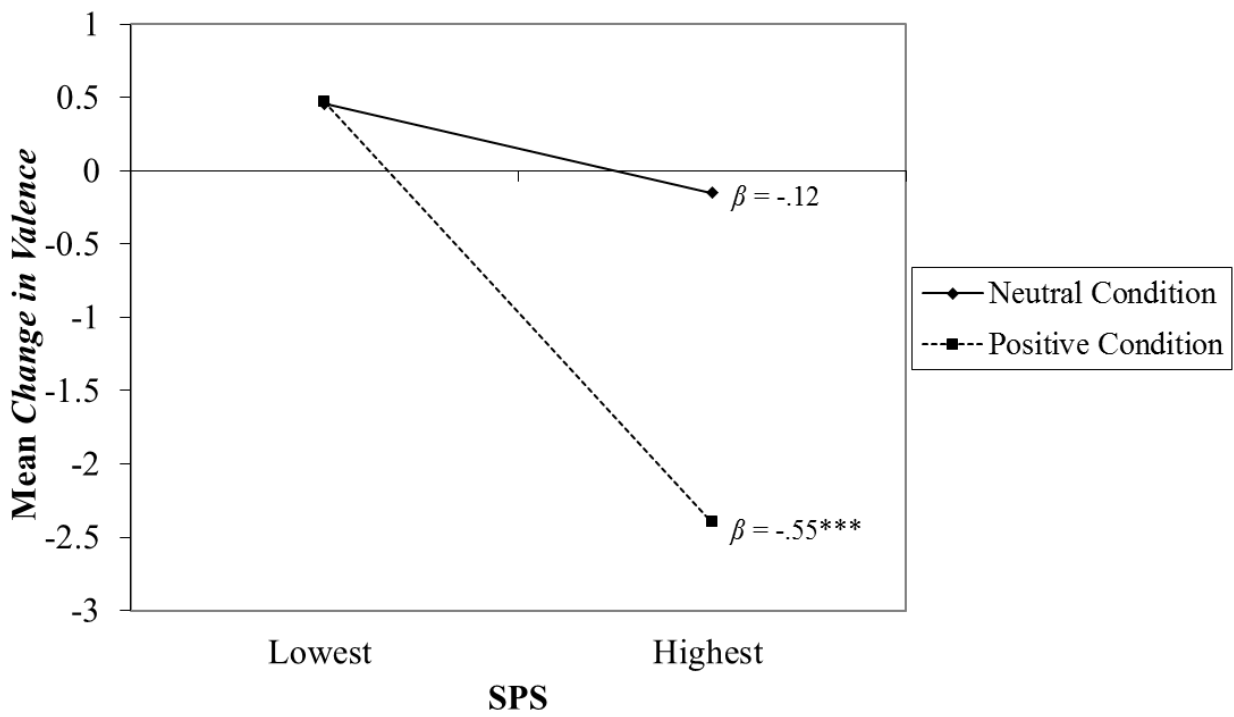
non-significant,  $R^2 = .0004$ ,  $F(3, 134) = .02$ ,  $p = 1.0$ . There was no significant main effect of SPS ( $\beta = .01$ ,  $SE = .09$ ,  $t(136) = .07$ ,  $p = .94$ ) or condition ( $\beta = .01$ ,  $SE = .17$ ,  $t(136) = .16$ ,  $p = .88$ ). The interaction term was non-significant ( $\beta = .03$ ,  $SE = .18$ ,  $t(134) = .14$ ,  $p = .89$ ). These results indicated that social anxiety was not associated with the total number of commission errors.

To assess valence, mean *False Valence* at Time 1 and Time 2 were separately entered as dependent variables. At Time 1, the overall model was significant,  $R^2 = .58$ ,  $F(3, 129) = 59.25$ ,  $p < .001$  (**Error! Reference source not found.**). There was a significant main effect of condition ( $\beta = .76$ ,  $SE = .11$ ,  $t(131) = 13.340$ ,  $p < .001$ ). SPS was not significantly related to mean *False Valence* at Time 1 ( $\beta = .00$ ,  $SE = .09$ ,  $t(131) = -.002$ ,  $p = 1.0$ ) and the interaction term was not significant ( $\beta = .08$ ,  $SE = .12$ ,  $t(129) = .68$ ,  $p = .50$ ). At Time 2, the overall model was significant,  $R^2 = .51$ ,  $F(3, 132) = 45.70$ ,  $p < .001$  (**Error! Reference source not found.**). There was a significant main effect of condition ( $\beta = .69$ ,  $SE = .12$ ,  $t(134) = 11.16$ ,  $p < .001$ ). SPS was not significantly related to mean *False Valence* at Time 2 ( $\beta = -.07$ ,  $SE = .09$ ,  $t(134) = -.86$ ,  $p = .39$ ) and the interaction term was not significant ( $\beta = -.19$ ,  $SE = .13$ ,  $t(132) = -1.50$ ,  $p = .13$ ). The conditional effects calculated with MODPROBE (Hayes, 2015) indicated that in the neutral condition, SPS was not significantly related to *False Valence* ( $\beta = -.07$ ,  $SE = .08$ ,  $t(132) = -.85$ ,  $p = .40$ ), whereas in the positive condition SPS significantly predicted the valence of commission errors ( $\beta = -.26$ ,  $SE = .10$ ,  $t(132) = -2.60$ ,  $p < .05$ ). Furthermore, I computed *Change in False Valence*, the difference between Time 2 and Time 1 on the *False Valence* scores of any dummy items that were falsely recalled as having been presented. Higher scores indicated increased positive valence. Mean *Change in False Valence* was then entered as the dependent variable. The overall model predicting change in recall of false valence was non-significant,  $R^2 = .03$ ,  $F(3, 120) = 1.32$ ,  $p = .27$ . There was no significant main effect of SPS ( $\beta = -.05$ ,  $SE = .09$ ,  $t(122) = -$



.53,  $p = .59$ ) or condition ( $\beta = .03$ ,  $SE = .18$ ,  $t(122) = .14$ ,  $p = .89$ ), nor was there a significant interaction between SPS and condition ( $\beta = -.35$ ,  $SE = .18$ ,  $t(120) = -1.90$ ,  $p = .06$ ). Thus, in the positive feedback condition, higher levels of social anxiety were associated with perceiving falsely remembered items as having been more negative at Time 2.

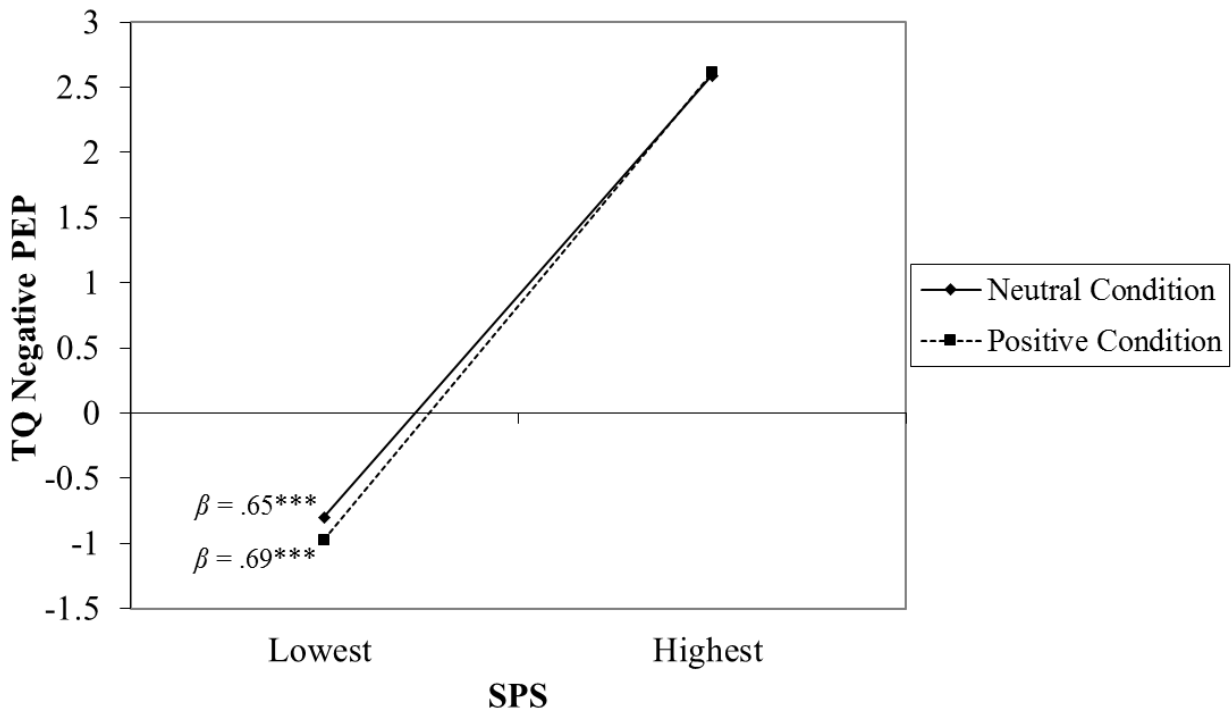
**Figure 3.** Interaction of SPS, condition, and change in recall valence.



Note: SPS = Social Phobia Scale.

\*\*\*  $p < .001$

**Figure 4.** Main effect of SPS on negative PEP.



Note: TQ = Thoughts Questionnaire; PEP = post-event processing; SPS = Social Phobia Scale.

\*\*\*  $p < .001$

**Figure 5.** Mediation model for SPS, negative and positive PEP, and change in recall valence.

Indirect effects of TQ Positive

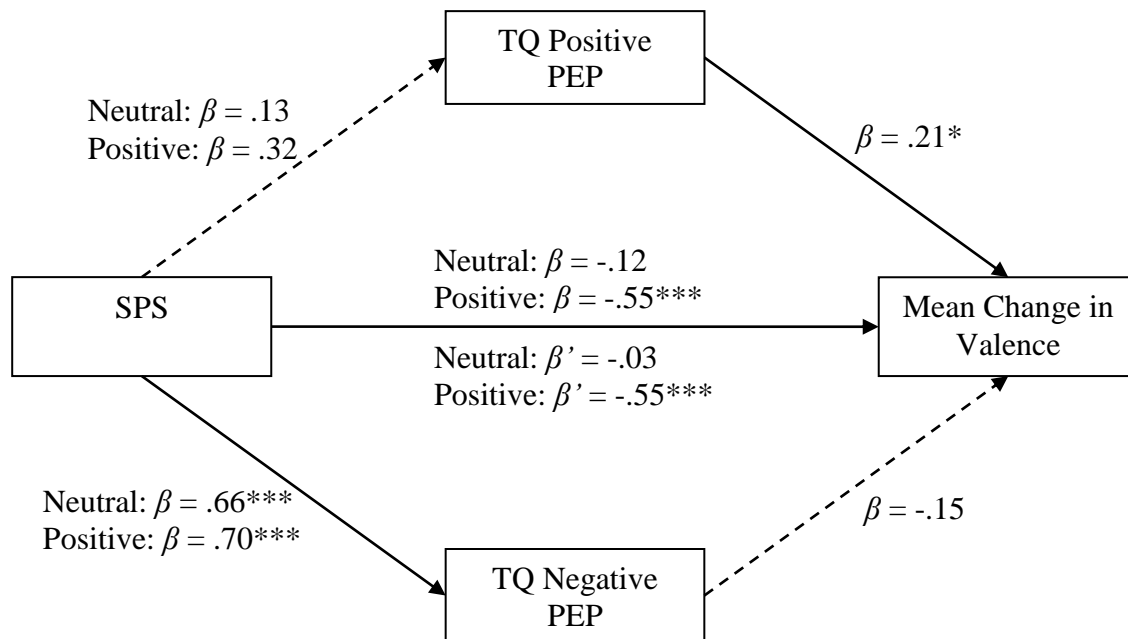
Neutral:  $\beta = .01$  ( $CI_{95} = -.02 - .08$ )

Positive:  $\beta = .05$  ( $CI_{95} = -.003 - .15$ )

Indirect effects of TQ Negative

Neutral:  $\beta = -.10$  ( $CI_{95} = -.22 - .02$ )

Positive:  $\beta = -.10$  ( $CI_{95} = -.27 - .02$ )



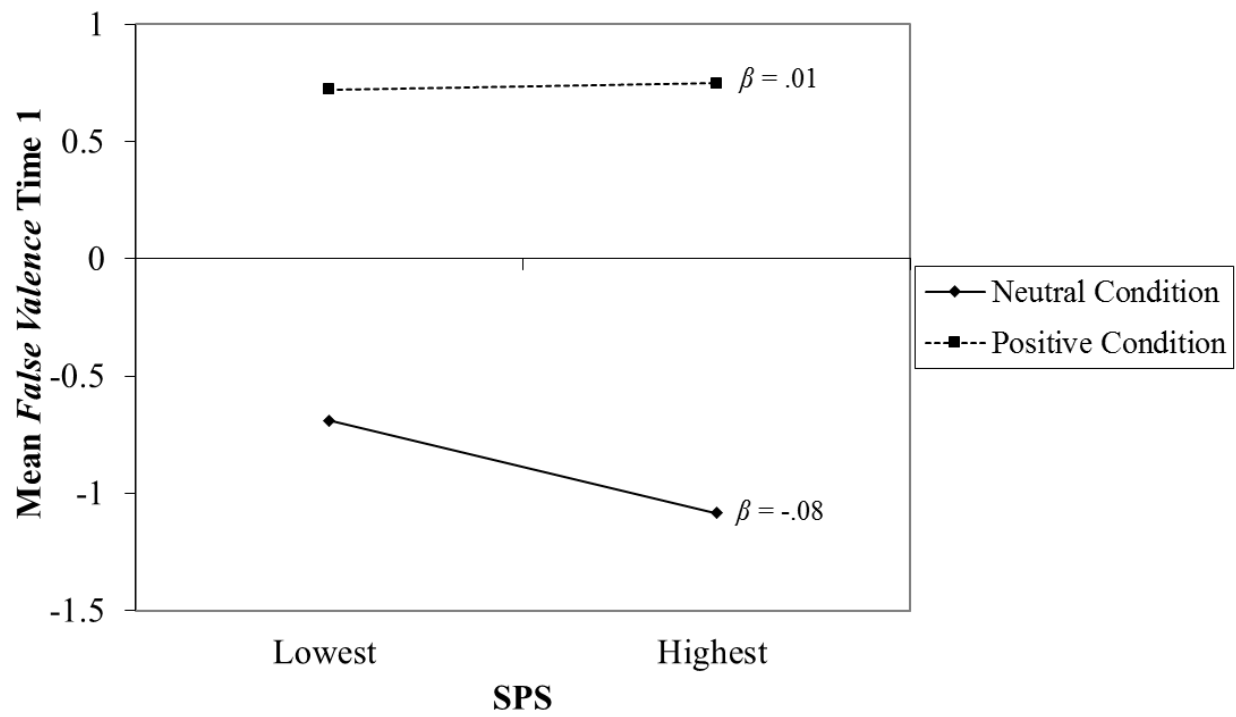
Note: TQ = SPS = Social Phobia Scale; Thoughts Questionnaire; PEP = post-event processing.

\*  $p < .05$ , \*\*\*  $p < .001$

**Table 8.** Means and standard deviations for *False Recognition* scores.

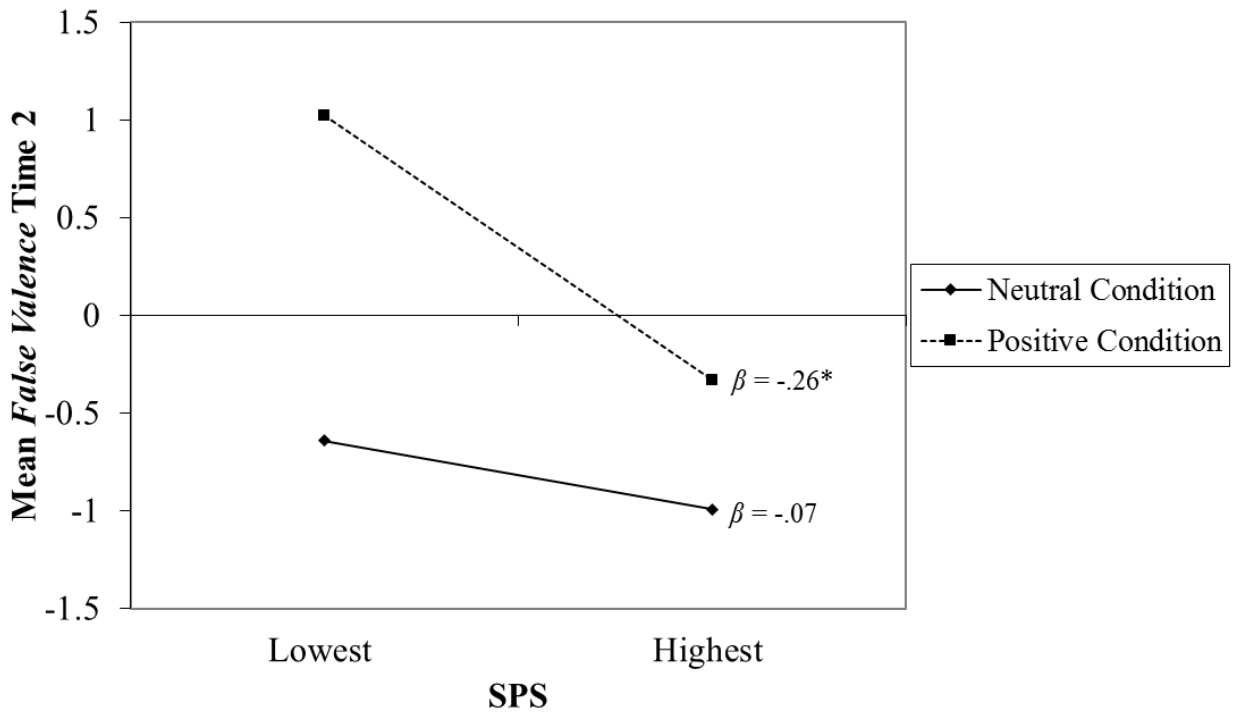
Measure	Total sample	Neutral Condition	Positive Condition
<i>False Recognition</i> Time 1	5.85 (2.74)	5.87 (2.89)	5.83 (2.61)
<i>False Recognition</i> Time 2	4.53 (2.65)	4.49 (2.95)	4.56 (2.35)

**Figure 6.** Main effect of condition on *False Valence* at Time 1.



Note: SPS = Social Phobia Scale.

**Figure 7.** Main effect condition on *False Valence* at Time 2.



Note: SPS = Social Phobia Scale.

\*  $p < .05$

## Secondary Analyses

Due to the non-significant moderated mediation analyses of PEP, post-hoc secondary analyses were conducted to explore other potential mediators of the social anxiety-memory relationship. It was hypothesized that affect at the time of recall might mediate this relationship, although this does violate the temporal sequence assumption for mediation since the I-PANAS-SF was completed at the same time point as the memory measure. Moderated mediation analyses were conducted using the SPSS macro PROCESS (Hayes, 2014). Requirements for mediation are listed in the main analyses above. Mean centered SPS score was entered as the independent variable, dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator, mean *Change in Valence* as the outcome variable, and both the positive affect and negative affect subscales of the I-PANAS-SF at Time 2 as mediators.

The overall model was significant,  $R^2 = .21$ ,  $F(5, 132) = 7.15$ ,  $p < .001$  (**Error! Reference source not found.**). The direct effect of SPS predicting recall change was significant in the positive condition ( $\beta = -.55$ ,  $SE = .13$ ,  $t(132) = -4.08$ ,  $p < .001$ ) but not in the neutral condition ( $\beta = -.11$ ,  $SE = .10$ ,  $t(132) = -1.13$ ,  $p = .26$ ). SPS did not significantly predict positive affect ( $\beta = .03$ ,  $SE = .09$ ,  $t(136) = .30$ ,  $p = .77$ ) but did predict negative affect ( $\beta = .38$ ,  $SE = .08$ ,  $t(136) = 4.77$ ,  $p < .001$ ). When SPS was held constant, neither positive affect ( $\beta = -.03$ ,  $SE = .08$ ,  $t(132) = -.36$ ,  $p = .72$ ) nor negative affect ( $\beta = -.01$ ,  $SE = .08$ ,  $t(134) = -.07$ ,  $p = .95$ ) significantly predicted recall valence change. None of the conditional indirect effects was significant (see **Error! Reference source not found.**). Thus, affect at the time of recall did not mediate the relationship between SPS and recall valence change.

A second moderated mediation analysis was conducted to assess whether the difference in believability accounted for the effects of SPS on recall valence. It is possible that, despite the



lack of significant slope in the positive condition, individuals with greater performance anxiety were more skeptical about the positive feedback. Mean centered SPS score was entered as the independent variable, dummy coded condition variable (neutral feedback = 0, positive feedback = 1) as the moderator, mean *Change in Valence* as the outcome variable, and believability as the mediator. The overall model was significant,  $R^2 = .22$ ,  $F(4, 131) = 9.44$ ,  $p < .001$  (**Error! Reference source not found.**). The direct effect of SPS predicting recall change was significant in the positive condition ( $\beta = -.59$ ,  $SE = .13$ ,  $t(131) = -4.62$ ,  $p < .001$ ) but not in the neutral condition ( $\beta = -.12$ ,  $SE = .10$ ,  $t(131) = -1.19$ ,  $p = .24$ ). SPS significantly predicted believability ( $\beta = .22$ ,  $SE = .08$ ,  $t(134) = 2.67$ ,  $p < .01$ ). When SPS was held constant, believability was not significantly related to recall change ( $\beta = .005$ ,  $SE = .08$ ,  $t(131) = .06$ ,  $p = .95$ ). None of the conditional indirect effects was significant (see **Error! Reference source not found.**). Thus, believability did not account for the relationship between SPS and recall valence change.

**Figure 8.** Mediation model for SPS, positive and negative affect, and change in recall valence.

Indirect effects of I-PANAS-SF Positive subscale

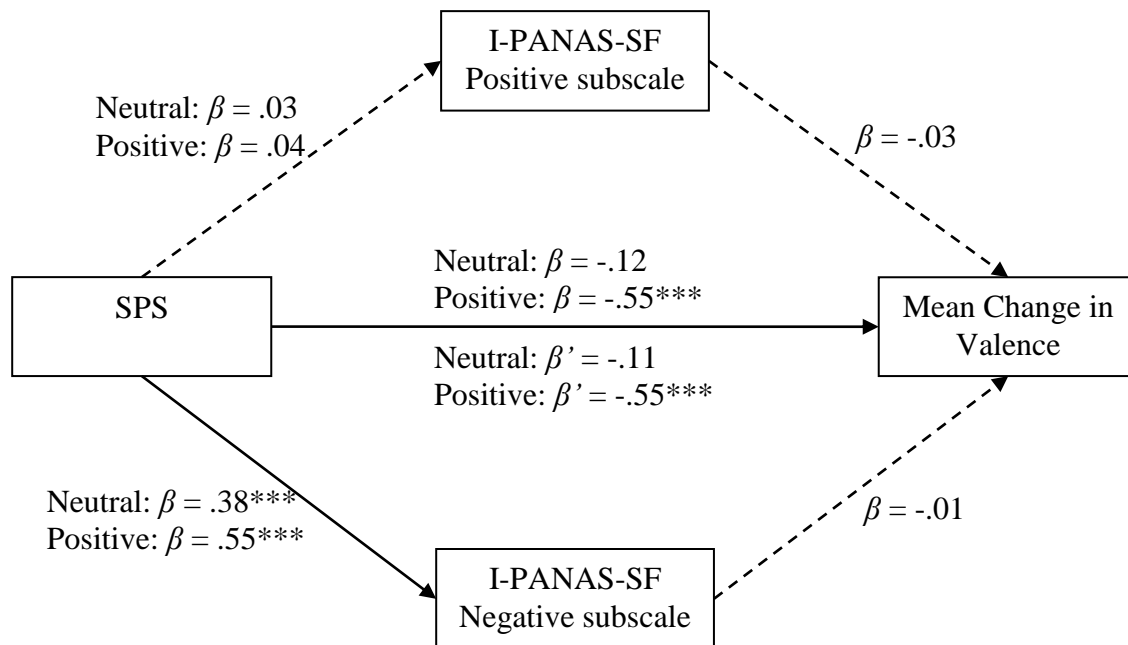
Neutral:  $\beta = -.0002$  (CI<sub>.95</sub> = -.02 - .01)

Positive:  $\beta = -.0004$  (CI<sub>.95</sub> = -.03 - .02)

Indirect effects of I-PANAS-SF Negative subscale

Neutral:  $\beta = -.002$  (CI<sub>.95</sub> = -.07 - .07)

Positive:  $\beta = -.003$  (CI<sub>.95</sub> = -.09 - .10)



Note: SPS = Social Phobia Scale; I-PANAS-SF = Positive and Negative Affect Schedule Short Form.

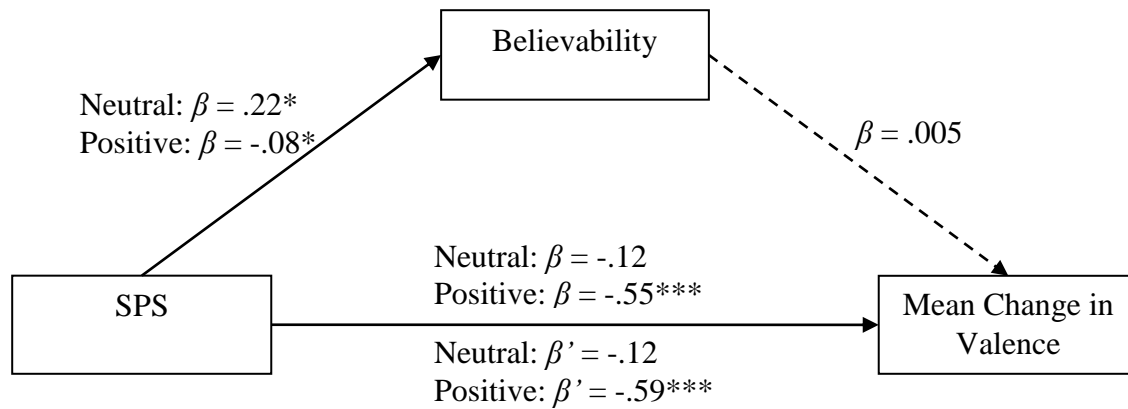
\*\*\*  $p < .001$

**Figure 9.** Mediation model for SPS, believability, and change in recall valence.

Indirect effects of believability:

Neutral:  $\beta = .002$  ( $CI_{.95} = -.05 - .06$ )

Positive:  $\beta = .0002$  ( $CI_{.95} = -.02 - .03$ )



Note: SPS = Social Phobia Scale.

\*  $p < .05$ , \*\*\*  $p < .001$

## Discussion

The current study examined the relationship between social anxiety and memory. Extant literature has provided inconclusive support for a negative memory bias in social anxiety posited by cognitive theorists. Moreover, limited research has examined the memories of socially anxious individuals over time. In the present study, undergraduate participants received positive or neutral feedback on their performance in an unexpected speech task, following which they reported their memory of the feedback at two time points: after a five-minute delay and one week later. The results of this study provide evidence for biased recall of social performance task feedback.

Preliminary analyses examined whether participants initially encoded the feedback accurately. Social anxiety scores did not significantly predict either the number of items that were correctly recognized as having been presented or the valence of these items at Time 1. It can be inferred from these results that the participants were attentive to the feedback and were able to encode the feedback information accurately. Moreover, the results suggest that participants with higher social anxiety did not demonstrate an encoding bias, indicating that changes in memory only became apparent over time. This effect, if replicated, might in part explain the inconsistencies in previous memory studies. To examine whether memories changed over time, I compared recall valence at Time 2 to valence at Time 1. Social anxiety scores significantly predicted the change in recall valence over the course of one week and this effect was moderated by feedback condition. This finding supports the memory bias proposed by cognitive theorists (Clark & Wells, 1995; Rapee & Heimberg, 1997). Although social anxiety was unrelated to valence at Time 1, suggesting that participants accurately encoded the information, by Time 2, higher levels of social anxiety predicted an increase in the negativity of

the memories of positive feedback. The fact that a significant recall bias was found in the present study may be due to the high threat-relevance of the task compared to the verbal or visual stimuli used in some memory research. A speech task is a highly anxiety provoking social event for individuals with social anxiety, as evidenced by the relation between SPS and state anxiety in the current study. Moreover, as socially anxious individuals have been shown to respond with fear to both positive and negative feedback (Weeks, Heimberg, Rodebaugh, & Norton, 2008), the feedback manipulation is also highly threat-relevant.

In the current study, the effect of social anxiety on change in recall valence was driven primarily by the positive condition. Social anxiety was not related to a significant recall bias in the neutral condition. In contrast, social anxiety was associated with a negative recall bias after receiving positive feedback. These results suggest that social anxiety is associated with the erosion of positive information over time, which may explain why socially anxious individuals do not benefit from positive experiences in the same way as nonanxious individuals (e.g., Gilboa-Schechtman et al., 2000). Furthermore, this is in line with the findings that socially anxious individuals do not savour positive experiences and experience low positive affect (Eisner et al., 2009). One explanation for this pattern of results is that socially anxious individuals may have had difficulty reconciling the positive feedback they received with a negative self-image, leading to a change in recall in order to bring it more in line with their self-image.

It was also hypothesized that social anxiety would predict more negative PEP than positive PEP over the week and that this effect would be modified by feedback condition. The results of the present study indicated that higher levels of social anxiety were associated with higher levels of negative PEP but that this was not affected by the feedback they received. This is consistent with previous research findings that socially anxious participants engage in higher

levels of PEP which is predominantly negative (Abbott & Rapee, 2004; Edwards et al., 2003). The finding that condition did not moderate the relationship between anxiety and PEP suggests that socially anxious participants engage in both types of PEP after both positive and negative events. This implies that for socially anxious individuals, PEP is not necessarily influenced by external social events and is a routine response regardless of how the individual interprets the event (Clark & Wells, 1995).

Counter to the hypothesized mediating effect of PEP in the relationship between anxiety and memory, moderated mediation analysis was non-significant. Although social anxiety was correlated with negative PEP levels, it did not account for the effect on memory change. One explanation for this finding is that the undergraduate participants in the current study may have had low levels of task-specific negative PEP. However, in a clinical sample in a previous study by Abbott and Rapee (2004), the mean level of negative PEP as rated on a similarly modified version of the Thoughts Questionnaire was 17.4 ( $SD = 10.8$ ), which is comparable to the present sample mean of 14.56 ( $SD = 11.41$ ). Thus, it is unlikely that the non-significant role of PEP is due to low levels of task-specific PEP in the current study. Moreover, this finding is in line with results of an earlier study by Edwards et al. (2003) who found no relation between the extent of PEP and negative recall bias.

Given the non-significant mediating role of PEP, post-hoc secondary analyses were conducted to explore other possible mediators of the effect of social anxiety on recall valence. Mood at the time of recall was examined; however, results were non-significant. Mediation by believability of the feedback was also non-significant. Thus, the social anxiety related change in recall valence did not appear to arise because greater social anxiety was associated with a negative mood or a tendency to disbelieve the positive feedback more than the neutral feedback.

Moderation analyses were also conducted to examine whether social anxiety predicted errors of commission. The Memory of Feedback measure included 10 dummy items that had not been included in the original feedback. Social anxiety was not related to the number of commission errors, suggesting that higher social anxiety was not associated with a change in the content of the feedback that participants remembered. In the positive condition, social anxiety was associated with the valence of the commission errors that were made at Time 2 in that greater social anxiety was associated with a tendency to perceive even non-presented items more negatively after receiving positive feedback. This effect was driven by the positive condition in the same manner as the effect of social anxiety on recall bias. This suggests that not only does the positive information in memory erode over time in SAD but that when additional information is inserted, it is of a more negative valence.

### **Limitations and Future Directions**

The results of the current study provide evidence for a memory bias in social anxiety, however there are some limitations. The present study used an undergraduate student sample, so results may not be generalizable to the general population or to individuals with clinical levels of social anxiety. Future studies should replicate these results with both a more representative sample and in clinically anxious populations.

The methodology of the present study provides an alternative explanation for the finding that the effect of social anxiety on recall valence is driven by the positive feedback condition. The feedback and memory forms included a single anchor mark at the centre of the visual analogue scales. This may have acted as a memory aid for the items that were rated at this point (i.e., neutral items). In comparison, there was no such anchor near the positive rating, which may have allowed a greater degree of memory change in the positive condition. A follow-up study

could remove this anchor at the middle of the scale to assess whether the effect of social anxiety is present in both conditions.

It would also be interesting to examine how memories of positive events change for socially anxious individuals at additional time points. The current study assessed memory at only two time points and thus cannot present a complete picture of how quickly memories change or whether additional change occurs with more time. These results should also be replicated with other social tasks and other types of feedback. For example, memories of feedback from a confederate after a social interaction task would be highly relevant for socially anxious individuals, facilitating the expression of a memory bias.

Three possible mediators of the relationship between social anxiety and memory were examined in the present study: PEP, affect at the time of memory recall, and feedback believability. Given the non-significant moderated mediation results of the present study, future research might seek to examine other possible mediators. For example, a negative self-image may make it more difficult for socially anxious individuals to accept positive feedback, leading to those memories being revised over time to align more consistently with their self-image. Other factors that may also play a role in this relationship, including trait PEP and self-esteem, should also be investigated.

These results suggest that socially anxious individuals experience an erosion of positive information in their memories, which may explain why positive social events do not lead to lessening anxiety. Determining ways to maintain the positivity of memories may be useful for individuals who struggle to incorporate positive experiences into their self-image. Recent work by Hulme, Hirsch, and Stopa (2012) demonstrated that holding a positive self-image in mind while feelings of social rejection are induced leads to higher levels of explicit self-esteem than



holding a negative self-image. Similar techniques could be used with memories; socially anxious clients could learn to draw up positive rather than negative memories in order to maintain that positive information and possibly modify the low positive affect associated with social anxiety.

## **Conclusion**

The current study builds on recent work on post-event processing of negative events by examining a memory bias for social performance feedback. The results demonstrate the novel finding that socially anxious individuals have increased negativity in the valence of recalled feedback. These findings are consistent with the memory bias posited by cognitive theorists that has been elusive in research. The non-significant mediation by PEP poses further questions regarding this relationship. Additionally, social anxiety predicted negative valence in errors of commission in the positive condition, a novel finding which should be replicated in future research.

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## Appendices

### Appendix A: Social Phobia Scale (SPS)

Please indicate the degree to which you feel the statement is characteristic or true of you.

	0	1	2	3	4
	<i>Not at all</i>	<i>Slightly</i>	<i>Moderately</i>	<i>Very</i>	<i>Extremely</i>
1. I become anxious if I have to write in front of other people	0	1	2	3	4
2. I become self-conscious when using public toilets	0	1	2	3	4
3. I can suddenly become aware of my own voice and of others listening to me	0	1	2	3	4
4. I get nervous that people are staring at me as I walk down the street	0	1	2	3	4
5. I fear I may blush when I am with others	0	1	2	3	4
6. I feel self-conscious if I have to enter a room where others are already seated	0	1	2	3	4
7. I worry about shaking or trembling when I'm watched by other people	0	1	2	3	4
8. I would get tense if I had to sit facing other people on a bus or a train	0	1	2	3	4
9. I get panicky that others might see me to be faint, sick or ill	0	1	2	3	4
10. I would find it difficult to drink something if in a group of people	0	1	2	3	4
11. It would make me feel self-conscious to eat in front of a stranger at a restaurant	0	1	2	3	4
12. I am worried people will think my behaviour odd	0	1	2	3	4
13. I would get tense if I had to carry a tray across a crowded cafeteria	0	1	2	3	4
14. I worry I'll lose control of myself in front of other people	0	1	2	3	4
15. I worry I might do something to attract the attention of others	0	1	2	3	4
16. When in an elevator I am tense if people look at me	0	1	2	3	4
17. I can feel conspicuous standing in a queue	0	1	2	3	4
18. I get tense when I speak in front of other people	0	1	2	3	4
19. I worry my head will shake or nod in front of others	0	1	2	3	4
20. I feel awkward and tense if I know people are watching me	0	1	2	3	4



## Appendix B: Thoughts Questionnaire

Please rate each statement as to how often you thought about that aspect *in the time since you gave your speech*.

*I thought about this in the past week:*

	0 <i>Never</i>	1 <i>Not often</i>	2 <i>Sometimes</i>	3 <i>Often</i>	4 <i>Very often</i>
1. My speech was good	0	1	2	3	4
2. I could have done much better	0	1	2	3	4
3. How anxious I felt	0	1	2	3	4
4. That the feedback was accurate	0	1	2	3	4
5. I should have chosen a different topic	0	1	2	3	4
6. The investigator liked me	0	1	2	3	4
7. That the feedback was inaccurate	0	1	2	3	4
8. If my blushing/sweating/dry mouth/shaking was obvious	0	1	2	3	4
9. How well I handled it	0	1	2	3	4
10. How bad my speech was	0	1	2	3	4
11. I made a fool of myself	0	1	2	3	4
12. The feedback was positive	0	1	2	3	4
13. How much I enjoy these situations	0	1	2	3	4
14. How I always do badly in this type of situation	0	1	2	3	4
15. How bad the feedback was	0	1	2	3	4
16. I must have looked stupid	0	1	2	3	4
17. How smoothly it all went	0	1	2	3	4
18. How self-conscious I felt	0	1	2	3	4
19. What a failure I was	0	1	2	3	4
20. That I chose an interesting topic	0	1	2	3	4
21. How many mistakes I made	0	1	2	3	4
22. How confident I felt	0	1	2	3	4
23. I came across as self-assured	0	1	2	3	4
24. How awkward I felt	0	1	2	3	4
25. That I was at my best	0	1	2	3	4
26. How fast my heart was pounding	0	1	2	3	4
27. I didn't make a good impression	0	1	2	3	4
28. Other aspects of the situation	0	1	2	3	4
29. The situation overall	0	1	2	3	4

### Appendix C: Public Speaking Performance Measure

We would like you to rate yourself on the features listed below. For each feature, please circle the appropriate number to indicate how you felt you actually performed. Please answer as honestly as you can – your evaluation will remain completely confidential.

	0	1	2	3	4
	<i>Not at all</i>	<i>Slightly</i>	<i>Moderately</i>	<i>Much</i>	<i>Very much</i>
1. Content was understandable	0	1	2	3	4
2. Kept eye contact with audience	0	1	2	3	4
3. Stuttered	0	1	2	3	4
4. Had long pauses (more than 5 seconds)	0	1	2	3	4
5. Fidgeted	0	1	2	3	4
6. “Um”ed and “Ah”ed	0	1	2	3	4
7. Had a clear voice	0	1	2	3	4
8. Seemed to tremble or shake	0	1	2	3	4
9. Sweated	0	1	2	3	4
10. Blushed	0	1	2	3	4
11. Face twitched	0	1	2	3	4
12. Voice quivered	0	1	2	3	4
13. Appeared confident	0	1	2	3	4
14. Appeared nervous	0	1	2	3	4
15. Kept audience interested	0	1	2	3	4
16. Generally spoke well	0	1	2	3	4
17. Made a good impression	0	1	2	3	4

### Appendix D: State-Trait Anxiety Inventory – 6 (STAI-6)

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the most appropriate number to the right of the statement to indicate how you feel *right now, at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	1	2	3	4
	<i>Not at all</i>	<i>Somewhat</i>	<i>Moderately</i>	<i>Very much</i>
1. I feel calm	1	2	3	4
2. I am tense	1	2	3	4
3. I feel upset	1	2	3	4
4. I am relaxed	1	2	3	4
5. I feel content	1	2	3	4
6. I am worried	1	2	3	4

## Appendix E: Depression Anxiety Stress Scales – Depression subscale (DASS-D)

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the most appropriate number to the right of the statement to indicate how you feel *right now, at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	0	1	2	3
	<i>Did not apply to me at all</i>	<i>Applied to me to some degree, or some of the time</i>	<i>Applied to me to a considerable degree, or a good part of the time</i>	<i>Applied to me very much, or most of the time</i>
1. I felt that life was meaningless.	0	1	2	3
2. I felt that I had nothing to look forward to.	0	1	2	3
3. I couldn't seem to experience any positive feeling at all.	0	1	2	3
4. I was unable to become enthusiastic about anything.	0	1	2	3
5. I felt that I wasn't worth much as a person.	0	1	2	3
6. I felt down-hearted and blue.	0	1	2	3
7. I found it difficult to work up the initiative to do things.	0	1	2	3

## Appendix F: Positive and Negative Affect Schedule Short Form (I-PANAS-SF)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the most appropriate number to the right of the word to indicate how you feel *right now, at this moment*.

	1	2	3	4	5
	<i>Very slightly or not at all</i>	<i>A little</i>	<i>Moderately</i>	<i>Quite a bit</i>	<i>Extremely</i>
1. Upset	1	2	3	4	5
2. Hostile	1	2	3	4	5
3. Alert	1	2	3	4	5
4. Ashamed	1	2	3	4	5
5. Inspired	1	2	3	4	5
6. Nervous	1	2	3	4	5
7. Determined	1	2	3	4	5
8. Attentive	1	2	3	4	5
9. Afraid	1	2	3	4	5
10. Active	1	2	3	4	5

## Appendix G: Feedback

Avoided eye contact	Maintained eye contact
----- -----	
Strained posture	Natural posture
----- -----	
Voice too soft	Good volume of voice
----- -----	
Did not smile	Smiled
----- -----	
Stammered	Did not stammer
----- -----	
Insincere	Sincere
----- -----	
Socially unskilled	Socially skilled
----- -----	
Repetitive	Not repetitive
----- -----	
Appeared tense	Appeared relaxed
----- -----	
Monotonous voice	Expressive voice
----- -----	
Displayed shaking/tremor	No shaking/tremor
----- -----	
Lacked warmth	Was warm
----- -----	
Audience attention wandered	Held audience attention
----- -----	
Unimaginative	Imaginative
----- -----	

## Appendix H: Memory of Feedback Measure

Mark each scale to indicate the feedback you received after your speech or check the box if the scale did not appear in your feedback.

<input type="checkbox"/>	Avoided eye contact	-----	Maintained eye contact
<input type="checkbox"/>	Strained posture	-----	Natural posture
<input type="checkbox"/>	Lacked confidence	-----	Appeared confident
<input type="checkbox"/>	Voice too soft	-----	Good volume of voice
<input type="checkbox"/>	Pace too fast	-----	Good pace
<input type="checkbox"/>	Did not smile	-----	Smiled
<input type="checkbox"/>	Stammered	-----	Did not stammer
<input type="checkbox"/>	Insincere	-----	Sincere
<input type="checkbox"/>	Socially unskilled	-----	Socially skilled
<input type="checkbox"/>	Fidgeted	-----	Did not fidget
<input type="checkbox"/>	Not enthusiastic	-----	Enthusiastic
<input type="checkbox"/>	Repetitive	-----	Not repetitive
<input type="checkbox"/>	Appeared tense	-----	Appeared relaxed
<input type="checkbox"/>	Monotonous voice	-----	Expressive voice
<input type="checkbox"/>	Mumbled	-----	Clear voice
<input type="checkbox"/>	Displayed shaking/tremor	-----	No shaking/tremor
<input type="checkbox"/>	Did not cope well	-----	Coped well

<input type="checkbox"/>	Lacked warmth	Was warm
	-----	-----
<input type="checkbox"/>	Closed posture	Open posture
	-----	-----
<input type="checkbox"/>	Disjointed	Fluent
	-----	-----
<input type="checkbox"/>	Disorganized content	Well-organized content
	-----	-----
<input type="checkbox"/>	Audience attention wandered	Held audience attention
	-----	-----
<input type="checkbox"/>	Unimaginative	Imaginative
	-----	-----
<input type="checkbox"/>	Not entertaining	Entertaining
	-----	-----