

EXAMINING MENTAL IMAGERY AND POST-EVENT PROCESSING
AMONG SOCIALLY ANXIOUS INDIVIDUALS

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ABSTRACT

Social anxiety disorder (SAD) is characterized by an intense fear of negative evaluation from others in social and/or performance situations. Research has demonstrated that socially anxious individuals' post-event processing, or post-mortem review of social situations, often affects their levels of anxiety, negative emotions, interpretations, and memories of events (Brozovich & Heimberg, 2008). Furthermore, research has shown that processing negative descriptions using imagery is more emotion-evoking than semantic processing of the same material (Holmes & Mathews, 2005; Holmes & Mathews, 2010). The present study investigated post-event processing involving mental imagery and its effects on mood, anxiety, and potentially biased interpretations of social and nonsocial events. Socially anxious and non-anxious participants were told they would give a 5 min impromptu speech at the end of the experimental session. They were then randomly assigned to one of three manipulation conditions: post-event processing imagery (PEP-Imagery), post-event processing semantic (PEP-Semantic), or a Control condition. In the post-event processing conditions, participants recalled a past anxiety-provoking speech and thought about the anticipated speech either using imagery (PEP-Imagery) or focusing on their meaning (PEP-Semantic). Following the condition manipulation, participants completed a variety of affect, anxiety, and interpretation measures. Consistent with our predictions, socially anxious individuals in the PEP-Imagery condition displayed greater anxiety than individuals in the other conditions immediately following the induction and before the anticipated speech task. Socially anxious individuals in the PEP-Imagery condition also interpreted ambiguous scenarios in a more socially anxious manner than individuals in the Control condition.

The impact of imagery during post-event processing in social anxiety and its implications for cognitive-behavioral interventions are discussed.

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CHAPTER 1 INTRODUCTION

Social anxiety disorder (SAD) is characterized by an intense fear of negative evaluation from others in social and/or performance situations according to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR, American Psychiatric Association, 2000)*. Socially anxious individuals' heightened concerns about their performance in social situations leads them to brood about social situations after an event, a self-focused thought process often referred to as post-event processing (Brozovich & Heimberg, 2008; Clark & Wells, 1995; Heimberg, Brozovich, & Rapee, 2010; Rapee & Heimberg, 1997). Socially anxious individuals are thought to engage in post-event processing following a social event or when they are anticipating another upcoming social event. The content of one's self-focused thoughts while engaging in post-event processing often includes negative images and perceptions of the self in the social situation and memories of other social situations. The most cited cognitive-behavioral models of SAD (Clark & Wells, 1995; Rapee & Heimberg, 1997) describe how post-event processing leads individuals to perceive themselves in a more negative manner. The models conceptualize post-event processing as an interim process between one's interpretation and memory, and as a result, post-event processing may increase anticipatory anxiety and negative interpretation biases for future social situations.

Socially anxious individuals are also overly concerned about being humiliated or embarrassed in social situations. This fear is often demonstrated in socially anxious individuals' mental images of themselves in social situations (Hackmann, Clark, & McManus, 2000; Hackmann, Surawy, & Clark, 1998). Socially anxious individuals'

negative visual imagery may perpetuate their anxiety experience. Post-event processing and negative or distorted imagery are clearly salient features in SAD and may play important roles in the maintenance of the disorder. Therefore, the present research examined the impact of these processes on individuals with high levels of social anxiety, to continue progress toward a more complete conceptualization of the disorder.

Post-Event Processing

Several studies have examined post-event processing among socially anxious individuals using self-report, diary, and experimental manipulations (for a review, see Brozovich & Heimberg, 2008). Research has demonstrated that socially anxious individuals' post-event processing, or post-mortem review, often affects their levels of anxiety, other negative emotions, and interpretations of events (Abbott & Rapee, 2004; Edwards, Rapee, & Franklin, 2003; Kashdan & Roberts, 2007; Kocovski, MacKenzie, & Rector, 2011; McEvoy & Kingsep, 2006; Perini, Abbott, & Rapee, 2006; Rachman, Gruter-Andrew, Shafran, 2000). The process also appears to distort socially anxious individuals' memory for events over time so that these events are recalled in a more negative light (Abbott & Rapee, 2004; Mellings & Alden, 2000; Morgan, 2010; Morgan & Banjeree, 2008) and more from an observer perspective (Coles, Turk, & Heimberg, 2002). There is additional evidence that socially anxious individuals are more likely than non-anxious individuals to recognize negatively biased feedback about their performance after post-event processing (Cody & Teachman, 2010).

A few studies in the post-event processing literature are of note for the present study. Abbott and Rapee (2004) conducted a study examining individuals' self-reported

post-event processing following a speech task. They asked individuals seeking treatment for SAD and non-anxious participants to complete several anxiety and mood questionnaires at the beginning of the study. Next, participants gave a 3 min impromptu speech to a video camera on a topic of their choice. They were told that the speech would be evaluated by an independent judge. Following the speech, participants completed Rapee and Lim's (1992) Speech Performance Questionnaire (SPQ), a measure evaluating their perception of their performance. One week later participants completed a post-event processing questionnaire and another SPQ to measure levels of post-event processing throughout the week and their perception of their performance.

Socially anxious individuals displayed more negative evaluation of their performance in the speech compared to the non-anxious participants at the session, and this difference was maintained over the one-week interval. Non-anxious participants, on the other hand, showed a significant improvement in their evaluations of their performance over the week. Furthermore, socially anxious individuals engaged in more negative post-event processing over the week than the non-anxious individuals. These results were replicated by Perini et al. (2006) in a follow-up study. They also found that individuals' evaluation of their performance (i.e., SPQ ratings) mediated the relationship between social anxiety and post-event processing. Therefore, the two studies provide evidence that socially anxious individuals negatively evaluated their performance in social situations and engaged in negative post-event processing during a one-week interval, more so than non-anxious individuals following a speech task.

Another study conducted by Mellings and Alden (2000) examined whether threatening individuals with a second interaction increased levels of anticipatory anxiety

(regarding the upcoming second interaction) and post-event processing (regarding the first, previous social interaction). High and low socially anxious students engaged in an unstructured 10 min social interaction with a confederate of the opposite gender. Participants then completed questionnaires measuring self-focused attention, anxiety, physiological symptoms, and anxiety-related behaviors. The next day, participants returned for another session and were assigned to either an anticipation condition or a control condition. In the anticipation condition, participants were told that they would have to interact with another person in front of an audience. The anticipation condition was a deception, which the authors utilized in order to elevate levels of anticipatory anxiety among the participants. In the control condition, participants were not told that they would have a second interaction. After the manipulation, participants recalled information about the previous day's social interaction in a free recall task and a structured recall task asking for specific information about the confederate and the room in which the interaction took place the day before. They also completed the Rumination Questionnaire (RQ), a five-item measure created by the authors, to assess the degree of post-event processing in the previous 24-hr interval.

The analysis of the results revealed that the manipulation was not successful. The individuals in the anticipation condition did not engage in greater levels of post-event processing. Overall, however, there was a significant group effect. Individuals with high levels of social anxiety displayed greater levels of post-event processing than non-anxious individuals. RQ scores predicted recall of negative self-related information on the open-ended recall measure but not on the structured memory task. RQ scores also predicted negative bias in self-judgments and recall of anxiety-related sensations at the

follow-up. Thus, one can conclude from these results that post-event processing following a social interaction reinforces negative self-appraisals of one's performance and contributes to memory biases found in highly socially anxious individuals.

These studies support the notion that post-event processing is a phenomenon in which many socially anxious individuals engage following social situations. Social interactions or performance situations are often ambiguous and demand some sort of interpretation, therefore increasing the likelihood that one will engage in a post-mortem review. If individuals have high levels of social anxiety, it is likely post-event processing will become negative and perseverative. Post-event processing appears to maintain negative interpretations that one might have about oneself and leads to retrieval of other negative memories. The question still remains, however, whether there are certain components of post-event processing that are particularly maladaptive.

Self-focused Thought Processes More Broadly

At this point, it is necessary to begin examining elements of post-event processing to determine which aspects are most detrimental for socially anxious individuals who engage in this self-focused activity. However, it is useful to investigate some of the research on self-focused thoughts in other disorders to aid in the understanding and conceptualization of post-event processing and how it is unique to social anxiety. Self-focused thought is a phenomenon that has been studied in numerous mood and anxiety disorders (Borkovec, Metzger, & Pruzinsky, 1986; McEvoy, Mahoney, & Moulds, 2010; Mor & Winquist, 2002; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Spurr & Stopa, 2002; Watkins, 2008). For example, research concerning rumination in depression has

demonstrated that there are adaptive and maladaptive forms of rumination (Joormann, Dkane, & Gotlib, 2006; Treynor, Gonzalez, & Nolen-Hoeksema, 2003; Watkins, 2008). When depressed or dysphoric individuals ruminate about the broad meaning of a situation (brooding), they become more depressed compared to ruminating about the process or experience of an event (reflective) (e.g., Rimes & Watkins, 2005). Depressed individuals who show a maladaptive brooding ruminative style display heightened cognitive biases compared to depressed individuals who show a reflective pondering ruminative style (Joormann et al., 2006; Treynor et al., 2003). Thus, at least as evidenced in the literature on depression, there seem to be adaptive and maladaptive forms of self-focused thought. The same may be true for post-event processing in social anxiety, a question which will be addressed in the present study. However, we do not assert that the constructs underlying the maladaptive aspect of rumination are the same that underlie maladaptive post-event processing.

Manipulations of Post-event Processing

Only a few studies to date have manipulated aspects of post-event processing. In one study, high and low socially anxious individuals were asked to think about a recent ambiguous social situation and then randomly assigned to one of three different post-event processing conditions: a positive or negative post-event processing task or a distraction task (Field & Morgan, 2004). In the positive condition, participants were asked to focus on the positive elements of the situation, whereas in the negative condition, participants were asked to focus on the negative elements. In the distraction condition, participants simply read some text. Following the manipulation, participants freely

recalled several specific events or experiences and completed the Post-event Processing Questionnaire (PEPQ; Rachman et al., 2000). Regardless of the post-event processing manipulation, individuals with elevated levels of social anxiety recalled more negative and shameful memories. Surprisingly, the socially anxious individuals in the negative post-event processing condition rated their anxious and shameful memories as more calming. The researchers did not expect this outcome, although they suggest that it might provide some explanation of the reinforcing qualities of post-event processing. However, this finding arose from a single-item rating, and its reliability is thus open to question. Replication of these results is necessary before further discussion.

A study conducted by Vassilopoulos and Watkins (2009) examined different types of self-focused thoughts among students with high and low levels of social anxiety. The authors hypothesized that like differences found in the study of rumination in depression (Rimes & Watkins, 2005), socially anxious individuals would produce more negative self-judgments when thinking in an analytical ruminative manner compared to an experiential ruminative manner. Participants were randomly assigned to one of two induction conditions: an analytical and an experiential self-focused condition. Both conditions included a list of items taken from Nolen-Hoeksema and Morrow's (1993) rumination induction. Sample items asked participants to think about "the way you feel inside" or "the physical sensations in your body." The main difference between the conditions was the instructional set. Participants in the analytical condition were asked to think about the meaning, causes, and consequences of the items, whereas participants in the experiential condition were asked to think about the experience and the "quality of

what you sense” (Vassilopoulos & Watkins, 2009, p. 184). Participants completed a series of global self-judgments before and after the self-focused thought manipulations.

The results supported the authors’ hypotheses. The socially anxious individuals in the experiential self-focused condition showed decreases in their negative self-judgments. On the other hand, there were no significant changes in individuals’ negative self-judgments in the analytical self-focused condition. This study provides preliminary support for the notion that there are differences in analytical versus experiential self-focused thoughts in social anxiety as well as depression; however, the type of self-focused thinking involved was more akin to rumination than post-event processing.

In a similar study, Morgan and Banerjee (2008, Experiment 2) asked college students with high and low levels of anxiety to engage in post-event processing in either a ruminative or reflective manner. Participants initially completed the Autobiographical Memory Questionnaire (AMQ) and other self-report measures and then were randomly assigned to one of two post-event processing conditions: rumination or reflection. The individuals were instructed to visualize and imagine themselves on the first day of a new job and then focus on twelve statements in either condition. The rumination condition involved statements that were repetitive and passive in nature, “I dwell on how I came across to others during the lunch break.” The reflection condition consisted of statements that suggested an openness to experience feelings, “I feel like doing something enjoyable so I feel better my first day.” Following the post-event processing induction participants chose the two statements that were most similar to how they would feel in that situation. Then they recalled the memories they had generated on the AMQ.

Socially anxious individuals in the rumination condition recalled more anxiety-provoking memories on the AMQ than the other three groups. The high socially anxious individuals in the reflection condition did not display any differences in autobiographical recall compared to the low socially anxious individuals in either condition. These findings coincide with those of Vassilopoulos and Watkins (2009); however, the main findings were in support of the detrimental effects of the rumination condition. One concern about the study is that the reflective induction appeared to involve more positive statements than the ruminative induction. It would be beneficial in the future to try to tease apart valence from response style, so that phrases used to induce a reflective response style suggest openness to experience any emotion, not just positive ones.

In addition, Brozovich and Heimberg (2011) conducted a study with high and low socially anxious students. Participants engaged in a 12 min conversation with a confederate while being videotaped. They were then randomly assigned to a self-focused or other-focused post-event processing writing task. In the self-focused post-event processing task, participants were asked to write about how they performed in the situation. In the other-focused post-event processing task, they were asked to evaluate the confederate during the interaction. After the manipulation, participants completed a variety of memory tasks and evaluated their performance. They also completed the measures during a one week follow-up phone call. Overall, the post-event processing manipulation did not produce any significant differences between the groups on measures of anxiety, mood, evaluation of performance, or memory. However, trait levels of post-event processing mediated the relationship between social anxiety and individuals' evaluation of their performance at the one-week follow-up. As a result, the study

demonstrated that trait post-event processing among socially anxious individuals has an impact on performance evaluations; however, there was no support for differences between self-focused versus other-focused post-event processing.

There still remains the question of whether there are other specific elements, unique to post-event processing in social anxiety, that are disadvantageous to one's mood, anxiety, or interpretations of social situations. Post-event processing is a more delimited process than the self-focused thoughts like those examined by Vassilopoulos and Watkins (2009) in the context of rumination, as it focuses, more or less, on the person's reaction to specific social situations. It is also difficult to interpret whether the results in the study conducted by Morgan and Banerjee (2008) were driven by valence or processing style. Furthermore, the distinction between self- versus other-focused post-event processing did not appear to capture much variance in the study by Brozovich and Heimberg (2011), nor did the results of the study by Field and Morgan (2004) shed much light. It is useful to review some of the basic components that have been theorized to underlie post-event processing to further pursue this question.

Examining Components Driving Post-event Processing

Ingram (1990) asserts that self-focused thoughts and attention are specific to different disorders because of the particular content or schemata associated with each disorder. SAD has a distinctive presentation, and there are likely various cognitive processes involved in post-event processing in SAD that differ from other disorders. As discussed earlier, the primary concern is a fear of negative evaluation from a perceived audience (American Psychiatric Association, 2000; Rapee & Heimberg, 1997). Two

concepts at the core of socially anxious individuals' fear include a public self-focus and distorted mental imagery of the self. We discuss each of these constructs and how the two may be intertwined.

Public self-focus.

First, socially anxious individuals tend to have a public self-focus, which social and clinical psychology researchers have described as focusing on thoughts and behaviors that take into account others' anticipated reactions or desires, as well as one's outward appearance and behavior as viewed by the audience (Carver & Scheier, 1981; Spurr & Stopa, 2002). In a meta-analysis examining studies of self-focused attention in mood and anxiety disorders, Mor and Winquist (2002) found that social anxiety was related to public self-focused attention. This finding directly corresponds to descriptions in the most commonly cited cognitive-behavioral models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997). The Clark and Wells (1995) model discusses how socially anxious individuals process the "self as a social object" (p.70) in social situations, directly in line with a public self-focus. Similarly, the Rapee and Heimberg (1997) model describes a "mental representation of the self as seen by the audience" (p. 744), which is activated when a socially anxious individual perceives an audience in a social situation. It explains that socially anxious individuals have a predominantly negative mental representation of themselves based on what they believe the audience perceives. Both models contend that socially anxious individuals believe the audience to be inherently critical and to hold excessively high expectations. Moreover, the meta-analysis conducted by Mor and Winquist (2002) revealed that, unlike self-focused attention in social anxiety, rumination in depression was more related to private self-

focus, which was defined as thoughts about private, autonomous, and egocentric goals. Thus, it appears that public self-focus of attention and thoughts are salient factors specific to socially anxious individuals' processing of social situations.

Imagery.

Another important aspect of socially anxious individuals' fear of negative evaluation involves mental imagery. Research has demonstrated the intense fear of humiliation is often incorporated into socially anxious individuals' mental images of themselves in social situations, such as having visual images that they are blushing brightly or dripping streams of sweat (Hackmann et al., 2000). Socially anxious individuals have reported experiencing spontaneous images that are negative, recurrent, and involve multiple sensory modalities (Hackmann et al., 1998, 2000; Hackmann & Holmes, 2004). The images also tend to have origins in memories of events that occurred at the time the person first began having difficulty with social anxiety (Hackmann et al., 1998, 2000; Hackmann & Holmes, 2004) and are likely characterized as self-defining memories (Conway, Singer, & Tagini, 2004). Socially anxious individuals may recall these salient images of themselves, and the negative visual imagery may perpetuate the anxiety they experience.

The previously mentioned cognitive-behavioral models of social anxiety disorder also elaborate on the role of imagery and how it contributes to the maintenance of the disorder (Clark & Wells, 1995; Rapee & Heimberg, 1997). The model proposed by Clark and Wells (1995) posits that anxious individuals are more likely to view themselves from a third party's point of view, or an observer perspective. It asserts that individuals incorporate this information into either a felt sense or an image of themselves in the

social situation. It suggests that socially anxious individuals may have a generic image of themselves in social situations based on a conglomeration of images of how they think they have appeared in a range of social situations. Conversely, they may have a specific image of themselves depending on a feeling that is activated in a particular social situation. In any event, individuals' beliefs and assumptions about themselves and their behavior in a social situation are influenced by this image of self that they hold in mind.

The Rapee and Heimberg (1997) model highlights the mental representation of the self as seen by the audience as the point at which socially anxious individuals engage an image. The authors argue that this mental representation is likely formed from numerous inputs: past memories of the self, physiological sensations, social feedback from the audience, and current information about one's appearance. The amount of each input is unique to the individual. Individuals' past memories of themselves are likely pieced together to form a general image of how they look as well as behave in a situation. The average image of past memories likely serves as the "base image" for individuals' mental representation of the self as seen by the audience when entering a social situation. Rapee and Heimberg (1997) further propose that the base image is modified depending on other inputs. For example, physiological sensations are often perceived by the individual in the situation. These are likely magnified and incorporated into the mental representation of the self as seen by the audience (i.e., from an observer perspective). Additionally, physical flaws or other areas about which one is self-conscious at the current time, such as one's nose or complexion, are other possible inputs. This information is likely amplified and integrated into the individual's mental representation of the self as seen by the audience. Furthermore, this mental representation can be

colored by the feedback that individuals receive from the audience or perceive that they receive from the audience. They might perceive that individuals are not interested in them or are not making eye contact. This information may either be real or perceived but may be incorporated into the current mental representation of the self as seen by the audience. Overall, the cognitive-behavioral models of social anxiety disorder provide several ways in which one's image in a social situation can be altered by various inputs and how imagery plays an important function in SAD. They also demonstrate that public self-focused attention and imagery are interconnected in socially anxious individuals' conceptions.

Relation to current study.

The present study was designed to examine potential factors underlying post-event processing in social anxiety and whether there are certain components that are maladaptive. In particular, we were interested in the role of imagery in post-event processing in social anxiety because SAD is the one anxiety disorder that features vivid imagery of oneself in potentially threatening social situations (Clark & Wells, 1995; Hackmann et al., 2000; Rapee & Heimberg, 1997). Also, as described above, we believe that imagery and public self-focused attention are highly enmeshed constructs in social anxiety and are likely fueling individuals' negative evaluation of themselves.

Imagery and Emotion

Researchers studying imagery and emotion have asserted that affective imagery activates a primitive conceptual network that evokes a fearful physiological and behavioral response, the same conceptual network that is activated when confronted with

a threatening stimulus (Lang, 1979). The response to affective imagery is apparent in all individuals; however, it is intensified among anxious individuals (McTeague et al., 2009). Several studies have demonstrated that imagery elicits stronger emotional responses than verbal processing (e.g., Acosta & Vila, 1990; Holmes, & Mathews, 2010; Lang, Levin, Miller & Kozak, 1983; Vrana, Cuthbert, & Lang, 1986).

More recently, in an attempt to clarify the difference in emotion evocation between imagery and verbal processing, Holmes and Mathews (2005) conducted two experiments. Specifically, the authors examined the theory that imagery elicits negative emotional responses more strongly than verbal processing. In the first experiment, they randomized 24 community volunteers to an imagery condition or a verbal-semantic condition. All participants listened to 100 descriptions of situations with either a negative physical or psychosocial ending. The participants in the imagery condition were asked to imagine the situation as vividly as possible, picturing themselves in the image. The participants in the verbal-semantic condition were asked to focus on the words and their meaning in the description. The participants completed a number of measures including the State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Individuals' state anxiety levels significantly differed depending on the condition to which they were assigned. In particular, the individuals in the imagery condition experienced greater increases in anxiety than the individuals in the verbal-semantic condition.

This preliminary study warranted replication, and the authors wanted to stringently test this hypothesis by adding a control condition with benign descriptions. Therefore, in the second experiment, they used the same 100 descriptions resulting in a

negative outcome and added 100 benign descriptions that individuals would either image or semantically process. They also increased their sample size by including 51 community volunteers. Once again they found evidence for the same pattern. The individuals in the negative-imagery condition showed greater increases in anxiety than the individuals in the negative-semantic condition. As one would suspect, there were no differences between the conditions when individuals were presented with benign descriptions. It is unclear whether emotions other than anxiety were affected by the task, since the STAI was the only measure of affect. It does appear from these studies that imagery of negative outcomes elicits more anxiety than verbal processing of the same material, at least in samples of community volunteers.

To examine whether imagery processing affects emotions other than anxiety, particularly positive emotions, Holmes, Mathews, Dalgleish, and Mackintosh (2006) conducted another study with similar methodology. They asked 26 community volunteers to listen to 100 descriptions, half of which ended positively and the other half of which ended in a neutral manner. Once again the participants were randomized to either image the descriptions or think about their semantic meaning. Participants completed the STAI and the positive affect scale (PA) of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Individuals in the imagery condition exhibited greater increases in PA and a greater reduction in state anxiety than the individuals in the semantic processing condition. Individuals in the semantic condition showed a significant decrease in positive affect. It is unclear at this point why this occurred, and the authors pointed out that this finding would need replication for further explanation. In all, the

study provided concise evidence that utilizing imagery to process positive material has a more enhancing effect on mood than semantic processing.

In a subsequent study, Holmes, Coughtrey, and Connor (2008) also manipulated the perspective of one's imagery compared to semantically processing positive descriptions. They were interested in testing whether processing material in an imagery condition from an observer perspective compared to a field perspective either dampened or promoted one's positive emotions when hearing the descriptions. An observer perspective is when someone sees the situation as if from an audience member's point of view. A field perspective is when someone sees a situation as if through their own eyes. The distinction between observer and field perspective has been studied extensively in the social anxiety literature with the general finding that socially anxious individuals tend to take an observer perspective in social situations and that recall of these situations includes negative imagery (Coles et al., 2002; Hackmann et al., 1998; Wells, Clark, & Ahmad, 1998). The authors randomized 78 undergraduate students to one of three conditions: observer perspective-imagery, field perspective-imagery, and semantic processing. The students listened to 100 descriptions that ended with positive outcomes. The participants also completed the PA scale of the PANAS, as well as measures of depression and use of imagery in their daily lives.

As the authors predicted, type of imagery processing affected positive affect. That is, individuals in the field perspective-imagery condition showed significant increases in their positive affect, whereas individuals in the observer perspective-imagery condition showed evidence of decreasing positive affect, as did individuals in the semantic processing condition. Observer-perspective imagery and semantic processing of

material dampened individual's positive affect even when listening to scenarios with positive outcomes. Field-perspective imagery processing differed from verbal processing, whereas observer-perspective processing did not. Thus, the type of imagery perspective matters with respect to positive affect.

The studies discussed thus far have provided some compelling information regarding the impact of imagery and its effects on emotion. Based on the findings from this literature, we were interested in whether imagery contributes to the intensity of one's emotional experience if it is incorporated in post-event processing. We will discuss how this relates to the elements of the experimental design below.

Retrospective and Prospective Thought

We also were interested in examining how anticipatory processing of anxiety-provoking events is intertwined with post-event processing of similar past events. Early on, Ingvar (1985) discussed how imagining future events necessitates memory retrieval of past events. Several social anxiety researchers have also discussed how anticipatory processing activates post-event processing and the retrieval of memories for similar situations (Brozovich & Heimberg, 2008; Clark & Wells, 1995; Heimberg et al., 2010; Mellings & Alden, 2000; Rapee & Heimberg, 1997). These postulations have been supported more recently in the neuroscience literature (Schacter, Addis, & Buckner, 2007). Schacter et al. reviewed several studies involving positron emission tomography and functional magnetic resonance imaging of brain regions involved when individuals retrieve specific memories or imagine future events. They found that the same brain regions are involved in remembering past events and imagining future ones: the

prefrontal and medial temporal lobes and specific posterior regions (i.e., the precuneus and the retrosplenial cortex) are activated for both episodic memory and prospective thought. Schacter et al. (2007) discuss how the emerging research on these brain regions supports their “constructive episodic simulation hypothesis,” which emphasizes how imagining future situations requires reshuffling and putting together pieces of information from past memories (p. 659). They also discuss that memory is a constructive process by nature, and one of its main purposes is to provide information for future events. These recent neural findings are quite convincing and underscore the interaction between one’s retrospective and prospective thoughts.

The neuroscience findings fit with our conceptualization of post-event processing as an interaction between recollecting past events and anticipating a future social anxiety-evoking event (Brozovich & Heimberg, 2008; Heimberg et al., 2010). We aim to test how engaging in post-event processing related to an unpleasant or anxiety-evoking past event when anticipating a threatening social event affects one’s mood, anxiety, and interpretation biases.

Combined Cognitive Biases

When discussing the cognitive-behavioral models of SAD, we discussed the complex nature of cognitive processes interacting with one another (Clark & Wells, 1995; Rapee & Heimberg, 1997). Post-event processing and imagery may evoke or influence other cognitive processes such as interpretations of events. Hirsch, Clark, and Mathews (2006) laid out these interconnections when they introduced the combined cognitive biases hypothesis. This hypothesis simply states that cognitive biases do not operate in

isolation, but rather are one part of a set of processes. The combined cognitive biases hypothesis points out to researchers that we are limiting our knowledge of social anxiety by only investigating one process at a time. It will be more useful to examine how cognitive processes, such as post-event processing and imagery, impact other cognitive biases in the broader picture. This is of particular importance in the current study regarding the relationships among post-event processing, imagery, and interpretations.

The Present Study

With this in mind, we set out to test the interplay between post-event processing, imagery, interpretation biases, and evaluation of one's performance in an anticipated social anxiety-evoking event. To do so, first we informed high and low socially anxious participants they would be asked to give a speech at the end of the experimental session. A speech or social interaction threat is a frequent manipulation in the social anxiety literature (Mansell & Clark, 1999; Mansell, Clark, Ehlers, 2003; Mansell, Clark, Ehlers, & Chen, 1999; Mellings & Alden, 2000). We anticipated the manipulation would likely induce socially anxious symptoms and thoughts, varying in intensity by individuals' trait levels of speech anxiety. Previous research has shown that a speech threat has served as a catalyst for some of the other cognitive biases we would be measuring throughout the session (Mansell & Clark, 1999; Mansell et al., 2003; Mansell et al., 1999). Second, we directed individuals to engage in post-event processing about a past speech or to engage in other activities that would prevent them from doing so (i.e., Post-event Processing conditions vs. Control condition). Furthermore, we varied the type of post-event processing concerning a past speech in which individuals engaged prior to the speech (i.e.,

post-event processing focused on imagery, PEP-Imagery; or post-event processing focused on semantic representation, PEP-Semantic). The PEP-Imagery, PEP-Semantic, and Control conditions allowed us to test the effects of combining imagery and post-event processing compared to semantic post-event processing or a control condition in the context of anticipating a potentially anxiety-evoking event. We examined the effects of these manipulations on individuals' anxiety, mood, interpretations of ambiguous situations, and their expected performance in the anticipated speech.

Hypotheses related to emotional arousal

1. It was expected that individuals high in social anxiety in the PEP-Imagery condition would show increases in emotional arousal, as evidenced by increases in anxiety and other negative emotions.
2. Individuals high in social anxiety in the PEP-Imagery condition would show greater increases in their emotional arousal compared to the other five groups (i.e., socially anxious individuals in the PEP-Semantic condition, socially anxious individuals in the Control condition, non-anxious individuals in the PEP-Imagery condition, non-anxious individuals in the PEP-Semantic condition, and non-anxious individuals in the Control condition).
3. Individuals high in social anxiety would show greater increases in emotional arousal in the PEP-Semantic condition compared to individuals low in social anxiety in the PEP-Semantic condition. Furthermore, we anticipated individuals high in social anxiety would show greater increases in emotional

arousal in the Control condition compared to individuals low in social anxiety in the Control condition.

4. It was expected that socially anxious individuals in either PEP condition would show greater changes in emotional arousal than socially anxious individuals in the Control condition.
5. Individuals low in social anxiety in the PEP-Imagery condition would have moderately greater emotional responses than participants low in social anxiety in the other two conditions.

Hypotheses regarding prediction of speech performance

6. It was expected that socially anxious individuals in the PEP-Imagery condition would predict they would perform more poorly in the upcoming speech than socially anxious individuals in the PEP-Semantic condition or Control condition.
7. Individuals high in social anxiety in any of the three conditions would predict they would perform more poorly in the upcoming speech than individuals low in social anxiety in any of the conditions.
8. Individuals low in social anxiety in the PEP-Imagery condition would have moderately more negative evaluations of their upcoming speech performance compared to participants low in social anxiety in the other two conditions.

Hypotheses regarding disambiguating social scenarios

9. Socially anxious individuals in the PEP-Imagery condition would disambiguate social scenarios in a more anxious or negative manner than socially anxious individuals in the other two conditions.
10. Individuals high in social anxiety in any of the three conditions would disambiguate social scenarios in a more anxious or negative manner than individuals low in social anxiety in any of the conditions.
11. Individuals high in social anxiety in any of the three conditions would disambiguate social scenarios in a more anxious or negative manner compared to nonsocial scenarios, more so than individuals low in social anxiety.
12. Socially anxious individuals in the PEP-Imagery condition would rate the anxious and negative continuations of the social scenarios as more similar to themselves than socially anxious individuals in the other two conditions.
13. Socially anxious individuals in any of the three conditions would rate the anxious and negative continuations of the social scenarios as more similar to themselves than low socially anxious individuals in any of the three conditions.

Hypotheses regarding other interpretation biases

14. It was anticipated the socially anxious individuals in the PEP-Imagery condition would show greater interpretation biases than socially anxious individuals in the other two conditions, as evidenced by their interpretation biases for social situations.

15. Individuals high in social anxiety in any of the three conditions were expected to demonstrate greater interpretation biases, as evidenced by their interpretation biases for social situations, than individuals low in social anxiety in any of the conditions.
16. Individuals high in social anxiety in any of the three conditions would show greater interpretation biases for social situations compared to nonsocial scenarios, more so than individuals low in social anxiety.

CHAPTER 2 METHOD

Participants

Undergraduate students enrolled in psychology classes at Temple University received research credits for completing a variety of questionnaires online. Based on their responses to the screening questionnaires for this study (see *Questionnaires* and *Procedure for Selection*), students were invited to participate in the study for research credits, extra credit, or monetary compensation. They were told the study consisted of filling out some questionnaires and taking part in a brief role play. They signed up for the study time slots on a web-based research portal. The sample consisted of 114 participants. The participants were representative of the demographic diversity of the student body at Temple University.

Statistical Power

Power calculations were conducted using GPower 3.0.10, a general power analysis computer program (Faul, Erdfelder, Lang, & Buchner, 2007). To calculate the sample size for the present study, we set the statistical parameters for two-tailed tests with an alpha level of $p = .05$ and power = .80. Since the present study design was unique in its incorporation of social anxiety, post-event processing and imagery, we relied on previous research to choose an appropriate effect size.

Cohen's (1977) d or Pearson's r (Rodgers & Nicewander, 1988) were calculated from data published in relevant literature to estimate the likely between-subject effect sizes for some of the dependent variables. A Cohen's d of .20 is considered small, .50 is considered moderate, and .80 is considered large. A Pearson's r of .10 is considered

small, .30 is considered moderate, and .50 or greater is considered large. Foremost, the previous study conducted by Brozovich and Heimberg (2011), using a similar student sample and dependent measures (i.e., the SPQ, PEPQ, and PANAS), demonstrated a greater than moderate effect size ($d = .63$). Holmes and Mathews (2005) and Holmes et al. (2006) examined imagery and verbal processing conditions and the effects on emotions using the STAI and PANAS. Effect sizes for these studies ranged from $r = .49$ to $r = .56$, with an average large effect size of $r = .52$. In addition, experiential versus analytical self-focused thought processes and their effects on judgments among socially anxious individuals were investigated by Vassilopoulos and Watkins (2009). They also included a social anxiety dependent measure, the Fear of Negative Evaluation Scale (FNE; Watson & Friend, 1969) and a depression measure, the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The effect size for the main outcome was $r = .33$, a moderate effect. Taken together, the available data indicate that using a larger than moderate effect size for a power analysis is appropriate and that the above analyses are conservative. Therefore, we decided to use a slightly greater than moderate effect size for the present study. The GPower program uses the f effect size, with $f = .10$ being a small effect, $f = .25$ being a moderate effect, and $f = .40$ being a large effect. We entered specifications of a two-tailed test with $p = .05$, effect size $f = .30$, and power = .80 into GPower calculations. This resulted in a recommended overall sample of 111 participants. In order to ensure equal cell sizes, we recruited a sample of 114 participants and assigned 19 participants to each of the six cells in the design.

Materials

Induction materials: Post-event processing.

The Semantic and Imagery post-event processing conditions instructed participants to reflect on a speech they gave in the past, as well as to think about the speech they were about to give, and to write about them. These instructions were intended to have participants engage in post-event processing, or a post-mortem review of an anxiety-evoking event. The instructions were also intended to invite anticipatory processing of the upcoming speech, since post-event processing is likely to involve an interchange between thoughts about past and future events.

In the semantic post-event processing condition, participants were asked to think about the meaning of how they performed in a past anxiety-provoking speech. For example, we instructed participants to think about: *“What does your performance mean to you? What does it mean if you were anxious? Try to focus on comprehending the situation and what this says about you as person. What implications does it hold for the performance you will give today?”*(The full set of instructions may be found in Appendix C). The semantic condition instructions were intended to induce participants to brood about the overall quality of their past performance and what it might have meant for their upcoming performance.

In the imagery post-event processing condition, participants were asked to use imagery when thinking about how they performed in a past anxiety-provoking speech. They were asked to describe the mental images as vividly as possible. Some of the instructions were *“Visually imagine what happened and describe it in words. What things do you notice vividly in your mental image?”*(The full set of instructions may be found in

Appendix A). The imagery condition instructions were intended to induce participants to recall the situation as vividly as possible so that it would be maximally engaging.

Participants were also prompted to think about the anticipated speech using imagery.

The participants had 8 min to write their descriptions of the past and upcoming speaking events in each post-event processing condition. They were instructed to focus on the instructions and answer each of the questions that were posed to them.

Induction Materials: Control condition.

Participants in the control condition were asked to complete a series of tasks involving working memory processes (The full set of instructions may be found in Appendix A, the materials may be found in Appendix B). They completed a task similar to the digit symbol subtest on the Wechsler Adult Intelligence Scale-Third Edition (WAIS-III), called letter symbol coding. They also completed a task that is similar to the symbol search task on the WAIS-III. The tasks were intended to keep participants' attention on the cognitive load pertaining to the task, while making quick decisions. Participants were instructed to perform the tasks to the best of their ability in the time allotted. They worked on the tasks for 8 min.

Scenarios.

Ten social and 10 nonsocial scenarios were created; some were adapted from Matthews and Mackintosh (2000), and others were developed by the author and Paula T. Hertel for another study (Hertel, Brozovich, Joormann, & Gotlib, 2008). In the previous study, each scenario ended in an ambiguous manner and participants with SAD completed the stories with their own interpretations. Examples include:

The Wedding Reception [Social Scenario from Mathews & Mackintosh, 2000]:

Your friend asks you to give a speech at her wedding reception. You prepare some remarks and when the time comes, get to your feet. As you speak, some people in the audience start to laugh.

The Exercise Regime [Nonsocial Scenario]:

You want to start jogging again and plan to go out every morning before work. On the first morning, you have run a short distance before you notice that it's chilly. You forgot to bring gloves.

Each of the scenarios includes three sentences; together, the sentences express a total of five idea units. In the previous study, the idea units were rated by three blind raters to determine how many details of the original story were recalled by the participants. For example, *the wedding reception* scenario included the following five idea units: prepare remarks, it is time, get to feet, you speak, people laugh; similarly, *the exercise regime* description included the following idea units: first morning, run short distance, you notice something, chilly, forgot gloves. We mention the idea units here simply to point out that each scenario contained equivalent amounts of content.

For the present study, we developed a self-report interpretation measure, the Choose Your Own Ending Questionnaire, using these scenarios and offering the scenario endings previous participants had generated as possible endings. As mentioned before, three blind raters were trained to code and score the continuations for the scenarios for Hertel et al. (2008). The raters coded the participants' continuations of the scenarios as belonging to one of four categories: socially anxious, negative, neutral, or positive. A

socially anxious classification was assigned if the participant continued the scenario by expressing fear of embarrassment, fear of being judged or of being observed by others, or discomfort involving other people in the situation (e.g., *I feel so embarrassed at this party*). This category also included the experience of physical symptoms that were related to the social situation (e.g., *I can feel my face turning red while I'm talking*). The negative category was used for continuations that reflected negative cognitions and feelings unrelated or not clearly related to social anxiety (e.g., *I feel so bad—this happens all the time*). Continuations were rated as neutral if they did not reflect emotion or symptoms of disorders (e.g., *people are always late*). Finally, the positive category was used for continuations that reflected some positive emotion (e.g., *I am so glad because I have time to read my book now*). Measures of agreement were computed for each scenario and each pair of raters; average $\kappa = .67$.

For the current study, we selected previous participant-generated continuations for the scenarios from each valence category (i.e., social anxiety, negative, neutral, and positive) as rated by the judges in Hertel et al. (2008). Participants in the present study were asked to rate each ending on a one-to-seven Likert-type scale of how “like me” or “unlike me” the ending seemed. The participants’ ratings for these scenarios served as a dependent variable in the study to measure interpretation biases (The Choose Your Own Ending Questionnaire may be found in Appendix C).

Questionnaires.

All questionnaire measures may be found in Appendix D. First, participants were selected based on their scores on the *Personal Report of Communication Apprehension* (PRCA; McCroskey, 1982) and the *Beck Depression Inventory, 2nd edition* (BDI-II; Beck et al.,

1996). The PRCA measures anxiety during situations that involve verbal communication, particularly public speaking situations. Therefore, it measures public speaking anxiety, which is a particular concern in socially anxious samples. The measure consists of 24 items that participants rate on Likert-type scales from 1 = “*Strongly agree*” to 5 = “*Strongly disagree*.” Individual items include “*I am tense and nervous while participating in group discussion*” and “*Certain parts of my body feel very tense and rigid while giving a speech*.” The PRCA has demonstrated good predictive validity in that it has been found to predict anxiety, withdrawal, and avoidance in public speaking situations (Beatty, 1987; Beatty, Balfantz, & Kuwabara 1989) and has shown very good internal consistency, Cronbach’s alpha = .90 and .88, in an undergraduate sample (Rodebaugh, 2004) and the current study, respectively. Inclusion in the socially anxious group required a score of 78 or above on the PRCA. To be included in the non-anxious group, participants needed to have a PRCA score ≤ 54 , recommended by Rodebaugh (2004) for selection of a sample with normative levels of social anxiety.

To measure levels of dysphoria, participants completed another screening measure, the *Beck Depression Inventory, 2nd edition* (BDI-II; Beck et al. 1996). The BDI-II is an updated version of the *Beck Depression Inventory* (BDI; Beck, Rush, Shaw, & Emery, 1979). Its 21 items are rated on a scale from 0-3 and were generated to assess the symptoms of depression listed in the DSM-IV (American Psychiatric Association, 1994), including cognitive, affective, and somatic components. Beck et al. (1996) reported high internal consistency of the measure among college students, alpha = .93, and outpatients, alpha = .92, with high one-week test-retest reliability among outpatients, $r = .93$, as well as good convergent and discriminant validity. The measure also displayed good internal

consistency within this sample, $\alpha = .89$. In addition to meeting the PRCA cutoff, inclusion in the socially anxious group was contingent on a score of less than 27 on the BDI-II. This score was recommended by Sloan et al. (2002) to decrease false positive diagnoses of clinical depression among those with anxiety disorders. It allowed individuals in the socially anxious group to have moderate symptoms of depression but increased the probability that our findings were a function of social anxiety rather than depression. Participants in the non-anxious group needed to have a BDI-II score that fell well within the range of minimal depression, that is, a score ≤ 13 (Beck et al., 1996).

The participants also completed the *Social Interaction Anxiety Scale* (SIAS; Mattick & Clarke, 1998), another measure of social anxiety. The SIAS assesses anxiety in dyads and groups. Its 20 items are rated on a scale from 0 = “*not at all characteristic*” to 4 = “*extremely characteristic.*” Sample items include “*When mixing socially, I am uncomfortable*” and “*I get nervous if I have to speak with someone in authority.*” The scale has demonstrated good internal consistency, Cronbach’s alpha’s ranging from .88-.94, as well as 4- and 12-week test-retest reliability, r ’s = .92 (Mattick & Clarke, 1998). The SIAS had good internal consistency in this study as well, $\alpha = .86$. Individuals with social anxiety disorder demonstrated higher SIAS scores than did individuals with other anxiety disorders, undergraduate students, and members of a community sample (Brown et al., 1997; Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Mattick & Clarke, 1998).

We also assessed state anxiety changes throughout the session by having participants complete the *Brief State Anxiety Measure* (BSAM; Berg, Shapiro, Chambless, & Ahrens, 1998). The BSAM is a six-item questionnaire derived from the 20-item state

form of the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). Berg et al. (1998) reported good internal consistency and a high correlation with the full 20-item scale ($r = .93$). The BSAM also displayed good internal consistency in Berg et al. (1998), $\alpha = .83$, in Rodebaugh (2004), α 's $> .75$, and in the current study (α 's ranging from .83 to .91 at the five administrations). The six items included in the measure are *relaxed, steady, strained, comfortable, worried, and tense*. Participants rated their current states on Likert-type scales (e.g., 1 = "not at all", 4 = "very much so").

Participants also completed the *Positive and Negative Affect Schedule* (PANAS; Watson et al., 1988). The PANAS is a 20-item questionnaire composed of two 10-item scales comprised of words that describe feelings or emotions that are rated on a scale from 1 = 'very slightly or not at all' to 5 = 'extremely.' Participants were asked to complete these ratings based on the "extent you feel this way right now." One scale measures positive affect (PA; sample items: 'enthusiastic,' 'interested,' and 'proud'), whereas the other measures negative affect (NA; sample items: 'guilty,' 'irritable,' and 'afraid'). The measure has shown good convergent validity and external validity in a sample of undergraduates, r 's ranging from .76 to .92 (Watson et al., 1988). The PANAS has demonstrated good internal consistency in a sample of 18-29 year olds, α 's = .75 and .86 for PA and NA (Mackinnon et al., 1999). In the current sample, it also demonstrated good internal consistency (α 's ranging from .89 to .94 for the PA scale and .81 to .91 for the NA scale for the five administrations).

The *Extended Version of the Post-Event Processing Questionnaire* (Extended-PEPQ; Fehm, Hoyer, Schneider, Lindemann, & Klusmann, 2008) was administered at the beginning of the session. The Extended-PEPQ is based upon the original PEPQ, a 13-

item questionnaire (Rachman et al., 2000). The Extended-PEPQ is an 18-item questionnaire that assesses how much and how often participants engage in post-event processing following a social event. It asks participants to think about a social situation of personal relevance in the past six months, and items are rated from 0 = *not at all* to 100 = *completely or frequently*. Sample items include ‘*Did your memories and thoughts about the event keep coming into your head even when you did not wish to think about it again?*’ and ‘*Did the thoughts about the event ever interfere with your concentration?*’ When participants completed the Extended-PEPQ, they were asked to identify a relevant social situation in the past six months to consider from a list of situations (e.g., talking in front of a group, being at a party). The Extended-PEPQ has demonstrated good internal consistency, $\alpha = .90$, in a sample of adults (Fehm et al., 2008), and in the current sample, $\alpha = .92$. It also exhibited good convergent and discriminant validity (Fehm et al., 2008).

Participants also completed the *Speech Performance Questionnaire* (SPQ; Rapee & Lim, 1992). The SPQ is a 17-item questionnaire that asks individuals to rate their performance while giving a speech. Individuals rated the items on Likert-type scales from 0 = “*not at all*” to 4 = “*very much*.” The items include physical symptoms such as “*sweated*” and “*blushed*” as well as performance-related items such as “*generally spoke well*” and “*made a good impression*.” Previous research using the SPQ has shown that it has good internal consistency and inter-rater reliability among two or more raters (Rapee & Hayman, 1996; Rodebaugh & Chambless, 2002). It showed strong internal consistency in the current study as well, $\alpha = .93$.

In addition, the *Interpretation Questionnaire: Self-relevant version* (Amir, Foa, & Coles, 1998) was administered. The questionnaire is a modified version of a questionnaire used by Butler and Mathews (1983). It consists of 12 ambiguous scenarios: Six social and six nonsocial. An example of a social situation is “*You see a group of friends having lunch, they stop talking when you approach,*” whereas an example of a nonsocial situation is “*You get your cable bill and notice that...*” Participants were provided with three possible endings to the situations, a positive, negative, and neutral ending. An example positive ending is “*They are about to ask you to join them.*” An example negative ending is “*They are saying negative things about you,*” and a neutral ending is “*They just ended their conversation.*” The participants rated how “like me” or “unlike me” each ending was if it were to occur in their minds if they were in that situation. This measure has shown good internal consistency with $\alpha = .85$ (Amir et al., 1998). For the current sample, internal consistency was moderate to good (α 's ranging from .83 to .77 to .57 for the negative, positive, and neutral subscales, respectively).

Participants also completed imagery measures. First, they filled out the *Spontaneous Use of Imagery Scale* (SUIS; Reisberg, Pearson, & Kosslyn, 2003). This is a 12-item questionnaire regarding the daily use of spontaneous imagery. Each item is rated on a 1-5 Likert-type scale, with 1 = “*never appropriate*” and 5 = “*completely appropriate*.” Sample items include: “*If I am looking for new furniture in a store, I always visualize what the furniture would look like in particular places in my home*” and “*When I first hear a friend's voice, a visual image of him or her almost always springs to*

mind.” This measure has not been studied with regards to validity or reliability. It displayed moderate internal consistency in the current sample, $\alpha = .70$.

Participants also completed the *Vividness of Visual Imagery Questionnaire*; (VVIQ; Marks, 1973), a measure of one’s ability to visualize scenes. It is composed of 16 items that individuals visualize with their eyes open and then with their eyes closed. Individuals rate the vividness of each visualization on a scale from one to five, where 1 = “*Perfectly clear and as vivid as normal vision*” and 5 = “*No image at all, you only ‘know’ that you are thinking of an object.*” Sample items on the VVIQ include visualizing a rising sun, a familiar person’s face, and a country scene. The VVIQ has been used in previous clinical and non-clinical populations to assess imagery ability and has shown good convergent and discriminant validity as well as strong internal consistency, alpha’s ranging from .75 to .90 (Dean & Morris, 2003; Holmes & Mathews, 2005; Kosslyn et al., 1996; McNally, Clancy, Barrett, & Parker, 2005). The internal consistency for this sample was strong, $\alpha = .94$. In addition, participants in the PEP-imagery condition completed a modified VVIQ. They were asked to rate how well they imaged the items they thought about during the PEP-imagery condition. There was also good internal consistency for the modified version, $\alpha = .90$.

Procedure

Procedure for selection.

We administered the PRCA and BDI-II to psychology students who completed a battery of inventories online or in class. They received research credit, extra credit, or monetary compensation for doing so. Students who met the inclusion criteria for the socially

anxious or non-anxious groups based on their scores on the PRCA and BDI-II were recruited to participate in the study. There were no selection criteria based on participants' gender, ethnic background, economic status, or other significant descriptors.

Undergraduate students met with the primary investigator or an undergraduate research assistant in a large room in the Adult Anxiety Clinic or elsewhere in Weiss Hall. Participants were run in groups of 10 or fewer.

Initial Measures.

Participants completed consent forms and the initial measures before the experiment began. These included a demographic questionnaire and measures of anxiety and mood, such as the PRCA, SIAS, PANAS and BDI-II. Participants also completed questionnaires regarding their ability to use imagery and their daily use of imagery, the VVIQ and the SUIIS, respectively. Then they completed the Extended PEPQ and the first state anxiety measure, the BSAM. Once all the participants completed these forms, the experimenter further informed them of the nature of the study (See full set of instructions in Appendix A).

Speech Threat.

Participants were told that they would be asked to prepare and give a 5 min speech as part of the study. They were told the speech was to be given towards the end of the session, but that there would be several other tasks to complete beforehand. They were informed that they would deliver the speech individually while being videotaped with the experimenter in the room. A video cart and podium were visible in the room, and they were told that this was where they would be giving the speech. They were told that the

videotape would be reviewed by a panel of experts in both social anxiety and public speaking:

One of the judges on the panel is a full professor of psychology who has devoted his career to the study of social anxiety. Social anxiety occurs when individuals are fearful of situations in which they might be evaluated by others, such as public speaking or party situations. He will be evaluating your verbal and non-verbal signs and symptoms of social anxiety. Another expert judge is a professor from the Linguistics department, who will be evaluating your speech tone, mannerisms, and prosody, or how smoothly you speak. He will be rating these attributes to determine your speaking abilities. The final judge is an expert speech coach who will rate the overall composition of your speech and your delivery.

The participants were told that they would be informed of their speech topic and have 3 min to prepare closer to the time of delivery. The participants then completed their second BSAM and PANAS.

Inductions.

Participants were informed in the semantic post-event processing and imagery post-event processing conditions that they would be completing a writing task. They were instructed to write about a situation in the past when they felt anxious, tense, or nervous about giving a speech. We suggested they choose a situation that was quite salient by saying “try and remember a speaking situation in which you felt keyed up or on edge and thought about it a lot before or afterwards.” The experimenter checked with all the

participants to ensure they had a specific situation in mind. When all participants in the group acknowledged they had such a situation in mind, the experimenter proceeded with the instructions. Next, the experimenter described the semantic or imagery post-event processing instructions, depending on the condition to which the group had been randomized. Participants were told to also think about how the past event influenced their current thoughts about the meaning (i.e., PEP-Semantic condition) or their current imagery (i.e., PEP-Imagery) of the anticipated speech. Participants had 8 min to complete the writing task. Afterwards they completed a third BSAM and PANAS. Individuals in the PEP-Imagery condition also completed another modified VVIQ to see if there were differences in individuals' ability to image during the manipulation.

Participants in the Control condition were given instructions for the working memory tasks. They were told that one purpose of this study was to measure how well people can concentrate in the present moment. They were timed for 2 min intervals for each task, each of which was administered twice, and told that their improvement on the tasks would be measured and studied by an independent rater. Participants worked on the tasks for 8 min. Afterwards they completed a third BSAM and PANAS.

Speech Preparation.

Next, participants were informed of their speech topic. They were given 3 min to prepare their speech. They had a few blank sheets of paper to write notes, an outline, or a script. Afterwards, they completed a fourth BSAM and PANAS.

Interpretation Measures.

Participants received a packet of various interpretation tasks, the first of which was the Choose Your Own Ending Questionnaire. They were told that we were interested in

choosing materials for another study in the future that was examining how self-relevant the stories were to individuals:

You have been given a set of 20 scenarios that have more than one ending. In a previous study, we had participants generate their own endings to the stories. We are interested in finding the best endings to the stories so that they will be relevant to the most people. We want you to think of yourself as the main character in each scenario. We would like you to rate each ending according to how much it is “like you” or “unlike you” on a one to seven scale.

The participants then completed the questionnaire developed by the author in which they chose endings to ambiguous scenarios adopted from Mathews and Mackintosh (2000) and Hertel et al. (2008).

Other questionnaires.

Following the interpretation task, participants completed the SPQ and the Interpretation Questionnaire. They then completed a fifth BSAM and PANAS.

Conclusion of Speech Manipulation.

Participants were told that the experimenter withheld some information earlier. They were informed that only a percentage of people in the study would have to give a speech, not every participant. They each drew a slip of paper out of bag letting them know to which condition they had been assigned. The experimenter let them know this was randomly determined when they signed up for the study and were given a study ID number. Participants who did not have to give a speech were allowed to leave. Those who were required to give a speech did so individually while being videotaped with the

experimenter in the room. This manipulation was included to make sure that participants did not talk at a later time to other potential participants and undo the speech threat manipulation. The present study did not use data from the speech itself. All participants left the study with a debriefing form through which they were informed about the nature of the study. They were told to contact the primary investigator if they had any further questions. No participants contacted the primary investigator following their participation.

CHAPTER 3 RESULTS

Preliminary Analyses

All demographic information is provided in Table 1. The high and low socially anxious individuals did not significantly differ on any of the demographic variables, all p 's > .05. There were marginal differences between the groups on whether English was their first language and their marital status. A somewhat higher proportion of socially anxious participants compared to the non-anxious participants were not native English speakers. Also, a very small proportion of non-anxious individuals were married, whereas none of the socially anxious individuals were married. All scores on questionnaire measures are presented in Table 2. As we anticipated on the basis of our selection criteria, the two groups of participants differed on measures of social anxiety and depression (PRCA, BDI-II, SIAS, all p 's < .001). The high and low socially anxious participants reported similar levels of spontaneous use of imagery as measured by their scores on the SUI. The Vividness of Visual Imagery Questionnaire (VVIQ) measures the clarity of individuals' images when they imagine scenes with their eyes open and then with their eyes closed. Overall, the non-anxious individuals reported having significantly clearer images compared to the socially anxious individuals. Examining the subscales of the VVIQ revealed that this difference was driven by the finding that the high socially anxious individuals reported their images were less vivid than the low socially anxious individuals when they had their eyes open. However, the groups reported similar degrees of vividness when they visualized images with their eyes closed. The groups differed in their predictions of how well they would perform during the anticipated speech based

Table 1

Demographic Characteristics and Mean Questionnaire Scores for the Socially Anxious and Control Samples.

	Socially Anxious	Low Anxious	test statistic	<i>p</i>
<i>n</i>	57	57		
Gender	17 M, 40 F	17 M, 40 F		
Age mean (<i>SD</i>)	20.23 (2.6)	20.47 (3.3)	$t(112) = .44$.659
In a relationship	42.1%	45.6%	$\chi^2 (1, N = 114) = .14$.706
Married	0%	5.3%	$\chi^2 (1, N = 114) = 3.08$.079
Race / Ethnicity*			$\chi^2 (1, N = 114) = 0.00$	1.00
African American	12.3%	29.8%		
Asian American	17.5%	8.8%		
Caucasian	52.6%	52.6%		
Hispanic	8.8%	3.5%		
Mixed	8.8%	3.5%		
Other	0%	1.8%		
College Class*			$\chi^2 (3, N = 114) = 3.35$.341
Freshman	35.1%	35.1%		
Sophomore	29.8%	24.6%		
Junior	12.3%	24.6%		

Senior	21.0%	14.0%	
Graduate	0%	1.7%	
Transfer	0%	1.8%	
Born in US	78.9%	87.7%	$\chi^2 (1, N = 114) = 1.58$.209
English Not 1 st language	19.3%	7.0%	$\chi^2 (1, N = 114) = 3.76$.052

Note. In a relationship = percentage of participants in a romantic relationship, Married = percentage of participants who are married, Born in US = percentage of participants born in the United States, English Not 1st language = percentage of participants whose first language is not English, SD = Standard Deviation. Chi-square analyses for Race and College Class were completed on collapsed cells because of low expected frequencies. The test of group differences for Race compared Caucasians and Non-Whites. The test of group differences for College Class involved Freshman, Sophomore, Junior, and Senior & Above.

Table 2

Means and Standard Deviations for Questionnaire Scores of the Socially Anxious and Control Samples at Baseline.

	Socially Anxious M (SD)	Control M (SD)	test statistic	<i>p</i> value
PRCA	88.6 (7.5)	45.42 (8.0)	$t(112) = -29.78$	<.001
BDI-II	13.0 (7.5)	4.2 (3.8)	$t(83.4) = -7.87$	<.001
SIAS	35.9 (11.7)	9.6 (5.4)	$t(78.8) = -15.40$	<.001
SUIS	3.3 (0.7)	3.4 (0.5)	$t(112) = 1.12$.266
VVIQ-EO	39.7 (12.3)	33.7 (12.0)	$t(111) = -2.61$.010
VVIQ-EC	37.5 (14.3)	32.8 (15.2)	$t(111) = -1.67$.098
VVIQ-TOTAL	77.2 (23.1)	66.6 (21.6)	$t(111) = -2.51$.013
SPQ	30.5 (9.5)	50.9 (7.3)	$t(111) = 12.83$	<.001
PEPQ	54.8 (23.3)	33.0 (17.6)	$t(112) = -5.63$	<.001

Note. PRCA= Personal Report of Communication Apprehension, BDI-II = Beck Depression Inventory, 2nd Edition, SIAS = Social Interaction Anxiety Scale, SUIS = Subjective Use of Imagery Scale, VVIQ-EO = Vividness of Visual Imagery Questionnaire – Eyes Open, VVIQ – EC = Vividness of Visual Imagery Questionnaire –

Eyes Closed, $VVIQ - TOTAL = VVIQ - EC + VVIQ - EO$, SPQ = Speech Performance Questionnaire, PEPQ = Extended-Post-event Processing Questionnaire.

on their ratings on the Speech Performance Questionnaire. Socially anxious individuals predicted they would perform less well than non-anxious individuals. The high and low socially anxious groups also differed in their baseline levels of post-event processing on the Extended-PEPQ; socially anxious individuals were more inclined to ruminate about a social event after the fact than their non-anxious counterparts.

Anxiety and Mood

To examine individual fluctuations in anxiety levels over the course of the experimental session, we administered the Brief State Anxiety Measure at five different times throughout the session. A $2 \times 3 \times 5$ repeated measures analysis of variance (ANOVA) was conducted on BSAM scores to test hypotheses 1-5. These hypotheses predicted that socially anxious participants in the PEP-Imagery condition would show the greatest increases in anxiety and emotional arousal over the course of the session, followed by the socially anxious participants in the PEP-Semantic condition and those in the Control condition. The between-subjects factors were group (socially anxious or non-anxious participants) and condition (PEP-Imagery, PEP-Semantic, or Control). The within-subjects factor was time ($1 =$ beginning of the session, $2 =$ after the speech threat, $3 =$ after the manipulation, $4 =$ after the speech preparation period, $5 =$ end of the session). Since the Mauchly's Test of Sphericity was significant, $p < .001$, the Huynh-Feldt correction was implemented for the following results. It has been

proposed that the Huynh-Feldt correction is appropriate to use when the estimates of sphericity are greater than 0.75 (Field, 2005), which was the case here. There was a significant main effect of time, $F(3.2, 342.2) = 33.04, p < .001$, and a significant main effect of group, $F(1, 106) = 81.54, p < .001$. There were also significant interactions of time x group, $F(3.2, 342.2) = 10.94, p < .001$, and time x condition, $F(6.5, 342.2) = 2.42, p = .02$. These significant effects contributed to a significant 3-way interaction of time x group x condition, $F(6.5, 342.2) = 2.05, p = .05$. Since the 3-way interaction encompassed the other significant main effects and interactions, we focused our follow-up testing on the 3-way interaction. To explain the interaction, we examined time by condition within socially anxious and non-anxious participants separately.

A repeated measures ANOVA was completed on the BSAM scores for socially anxious participants alone, with time as the within-subjects factor and condition as the between-subjects factor. Once again Mauchly's Test of Sphericity was significant, $p = .001$, and the estimated sphericity value was greater than 0.75, so the Huynh-Feldt correction was applied. There was a main effect of time, $F(3.3, 172.2) = 30.04, p < .001$, and a significant interaction of time x condition, $F(6.6, 172.2) = 3.05, p = .006$. Next, to examine the time by condition interaction, we conducted five one-way ANOVAs on the BSAM scores for each time point, with condition as the between-subjects factor. These analyses revealed a significant difference between the conditions after the condition manipulation (time 3), $F(2, 56) = 6.71, p = .002$, as well as at the end of the session, before they anticipated giving the speech (time 5), $F(2, 55) = 4.51, p = .016$. The analyses of the other time points did not reach significance, p 's > 0.22 . We conducted follow-up independent samples t -tests with Bonferonni corrections ($.05/3 = .017$) to break

down the condition effect at each time point (see Figure 1). When investigating time 3, the time period after the PEP-Semantic or PEP-Imagery writing conditions or the Control task was completed, there was a significant difference between socially anxious individuals' anxiety ratings in the PEP-Semantic condition ($M = 14.6, SD = 4.5$) and the PEP-Imagery condition ($M = 18.8, SD = 3.2$), $t(36) = -3.44, p = .001$. The means illustrate that socially anxious individuals in the PEP-Imagery condition reported being significantly more anxious after the writing task than socially anxious individuals in the PEP-Semantic condition. In addition, socially anxious individuals in the PEP-Imagery condition reported significantly greater anxiety than those in the Control condition ($M = 15.2, SD = 4.3$), $t(36) = 3.13, p = .003$. There was not a significant difference in anxiety levels when comparing individuals in the PEP-Semantic and Control conditions,

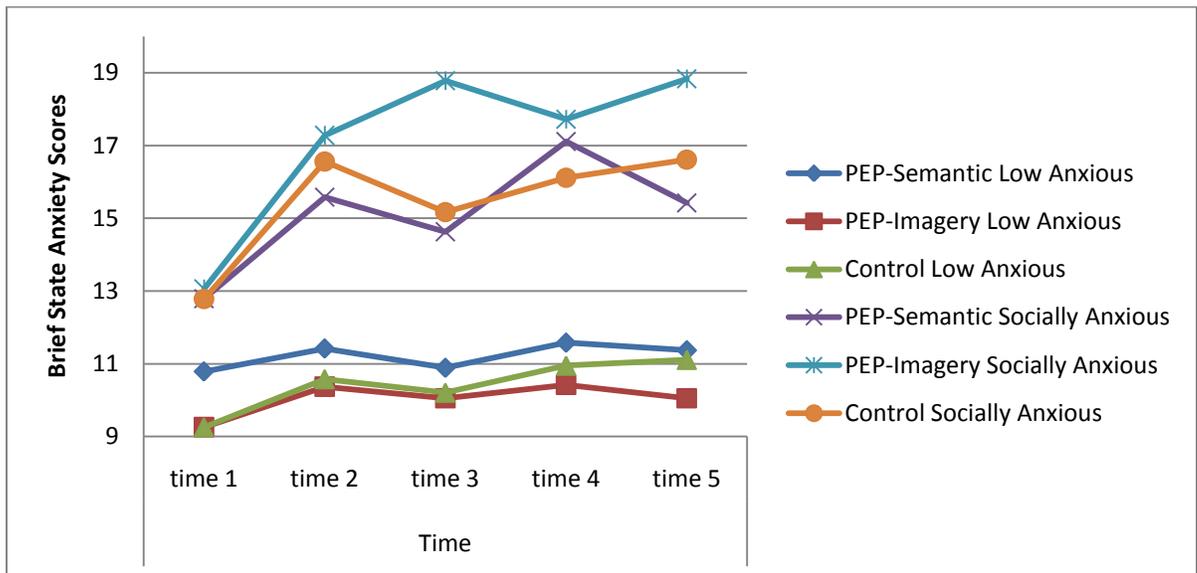


Figure 1. Brief State Anxiety Measure (BSAM) scores throughout the session for PEP-Imagery, PEP-Semantic, and Control conditions by group (a three-way interaction).

$t(36) = -0.41, p = .69$. Next, we examined socially anxious individuals' anxiety levels at time 5, when they had completed all other measures and were anticipating they would be giving a speech at the end of the experimental session. The follow-up independent t -tests showed that socially anxious individuals in the PEP-Imagery condition were significantly more anxious ($M = 18.8, SD = 3.0$) than the socially anxious individuals in the PEP-Semantic condition ($M = 15.4, SD = 4.5$), $t(36) = -2.94, p = .006$. There was also a trend towards a significant difference between the ratings of the PEP-Imagery condition and the Control condition ($M = 16.6, SD = 3.9$), $t(35) = 2.17, p = .037$. Once again the anxiety ratings between individuals in the PEP-Semantic versus the Control condition did not significantly differ, $t(35) = -0.87, p = .39$. Therefore, the pattern of the BSAM results for the socially anxious individuals was that those who were in the PEP-Imagery condition showed a greater increase in anxiety after the Imagery induction (time 3) and when anticipating the speech at the end of the session (time 5) than the socially anxious individuals in the PEP-Semantic and Control conditions, who did not differ.

Next, a repeated measures ANOVA was conducted on the BSAM scores for non-anxious participants, with the within-subjects of time and between-subjects factor of condition. The test of sphericity was significant, $p < .001$, and the sphericity estimate was less than 0.75, so a Greenhouse-Geisser correction was employed. There was a significant main effect for time, $F(2.8, 149.6) = 4.93, p = .003$. The non-anxious participants' anxiety ratings increased a small amount across time, but in general, stayed in a relatively narrow range at the lower end of the spectrum. The time x condition interaction was not significant, $F(5.5, 149.6) = 0.52, p = .779$.

We also investigated changes in positive and negative affect throughout the experimental session. A 2*3*5 repeated measures ANOVA was conducted on the positive subscale of the PANAS to further test hypotheses 1-5. Again, these hypotheses predicted that the socially anxious participants in the PEP-Imagery condition would display the greatest changes in their emotions compared to the socially anxious participants in the other conditions and the control participants. The between-subjects factors were group (socially anxious or non-anxious) and condition (PEP-Imagery, PEP-Semantic, or Control). The within-subjects factor was time (1 = beginning of the session, 2 = after the speech threat, 3 = after the manipulation, 4 = after the speech preparation period, 5 = at the end of session). Mauchly's Test of Sphericity was significant, $p < .001$, and a Greenhouse-Geisser correction was used for the following analyses. There was a significant main effect of time, $F(2.5, 267.0) = 25.58, p < .001$, a main significant effect of group, $F(1, 105) = 44.02, p < .001$, and a significant time x group interaction, $F(2.5, 267.0) = 5.21, p = .003$. Follow-up paired samples t -tests with Bonferonni corrections ($.05/4 = .0125$) were conducted to further investigate the significant interaction effect (see Figure 2). When looking at the socially anxious participants' responses, which were generally lower than the responses of non-anxious participants, there was a significant decline in their levels of positive affect from the beginning of the session (time 1) to after the speech threat (time 2), $t(56) = 5.06, p < .001$ ($M = 22.2, SD = 6.8; M = 18.4, SD = 6.4$, respectively), as well as a trend from after the speech preparation period (time 4) to the end of the session (time 5), $t(53) = 2.39, p = .020$ ($M = 17.4, SD = 5.8; M = 16.4, SD = 5.8$ respectively). The non-anxious participants showed a similar decline in positive affect from time 4 ($M = 26.89, SD = 10.0$) to time 5 ($M = 25.8, SD = 10.1$), $t(56) = 2.79, p$

= .007. Their positive PANAS scores also decreased from the time after the manipulation (time 3, $M = 28.3$, $SD = 9.6$) to the time after the speech preparation (time 4, $M = 26.9$, $SD = 10.0$), $t(56) = 3.21$, $p = .002$.

Similarly, a repeated measures ANOVA was conducted on the negative subscale of the PANAS, with a within-subjects factor of time and between-subjects factors of group and condition. Once again Mauchly's Test of Sphericity was significant, and a Greenhouse-Geisser correction was utilized. A similar pattern emerged in the analyses of responses to the negative subscale; there was a significant main effect of time, $F(2.6, 276.8) = 13.36$, $p < .001$, and a significant main effect of group, $F(1, 105) = 62.98$, $p < .001$. There was also a significant time x group interaction $F(2.6, 276.8) = 11.96$, $p < .001$. Follow-up paired-sample t -tests with Bonferonni correction ($.05/4 = .0125$) were examined within each group (see Figure 3). For the socially anxious individuals, whose responses were generally more negative than the responses of non-anxious participants, an increase in negative affect was evident from the beginning of the session (time 1, $M = 17.1$, $SD = 5.7$) to after the speech threat (time 2, $M = 21.4$, $SD = 7.2$), $t(56) = -7.11$, $p < .001$. For the non-anxious participants, there was a decreasing trend in their negative affect from after the speech threat (time 2, $M = 12.9$, $SD = 3.4$) to after the condition manipulation task (time 3, $M = 12.3$, $SD = 2.7$), $t(56) = 2.33$, $p = .023$.

Prediction of speech performance

Next we examined how individuals rated their performance in the upcoming speech task to test hypotheses 6-8. We predicted that socially anxious individuals in the PEP-Imagery condition would rate their performance in the upcoming speech more

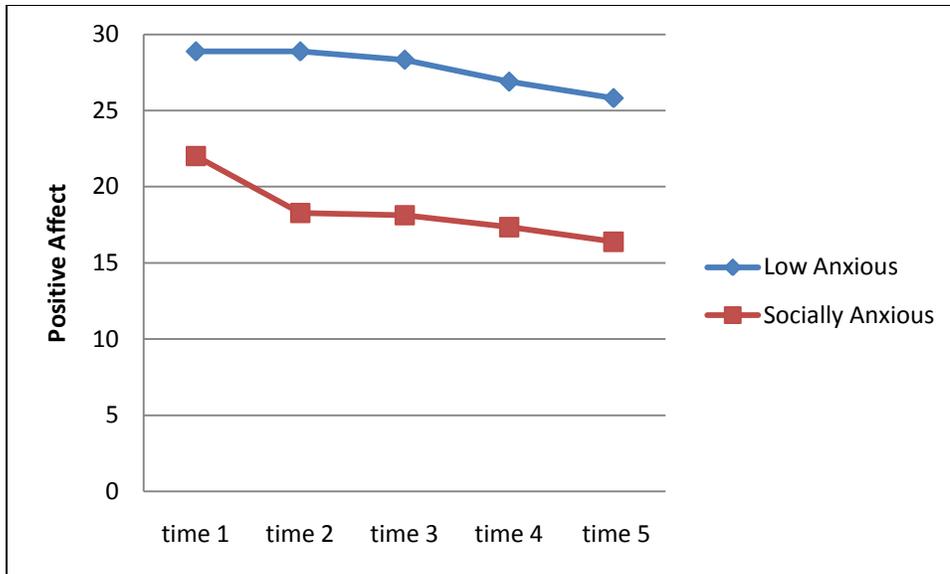


Figure 2. Positive Affect Scale scores throughout the session by group (a two-way interaction).

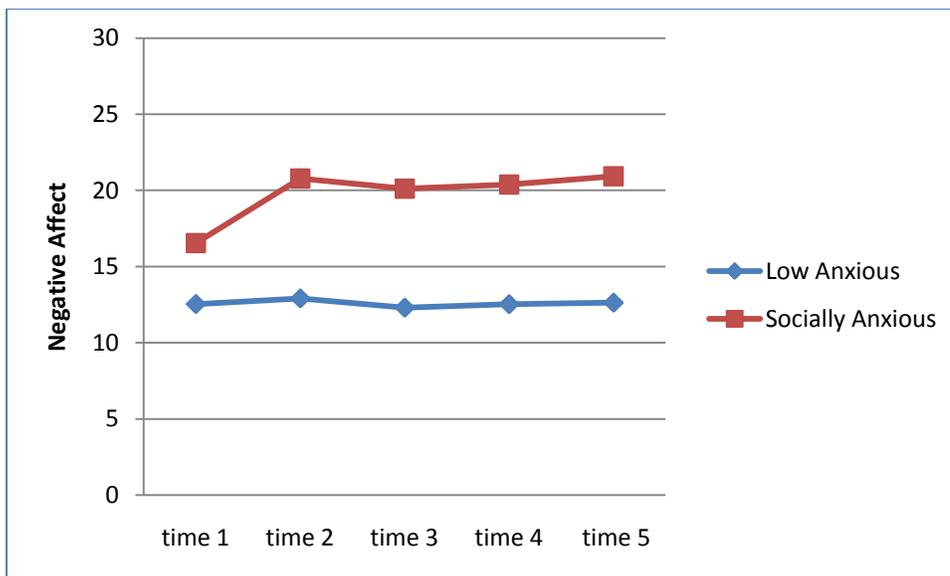


Figure 3. Negative Affect Scale scores throughout the session by group (a two-way interaction).

negatively than socially anxious participants in the other conditions as well as the control participants. A 2*3 ANOVA was conducted on the sum of the individuals' ratings of

their speech performance, with between-subjects factors of group (socially anxious or non-anxious) and condition (PEP-Imagery, PEP-Semantic, or Control). The analysis revealed a significant main effect of group, $F(1, 107) = 175.16, p < .001$, and a significant group x condition interaction $F(2, 107) = 5.83, p = .004$. See Figure 4. To further examine the significant interaction, we conducted an ANOVA on the socially anxious participants' responses alone. The analysis was not significant, $F(2, 55) = 2.24, p = .117$. An ANOVA of the non-anxious participants' responses highlighted a significant difference between conditions, $F(2, 56) = 4.12, p = .022$. Follow-up independent samples t -tests with a Bonferroni correction ($.05/3 = .017$) revealed a marginally significant difference between the PEP-Semantic ($M = 49.95, SD = 4.81$) and PEP-Imagery conditions ($M = 54.42, SD = 8.19$), $t(29.10) = -2.05, p = .049$. The means

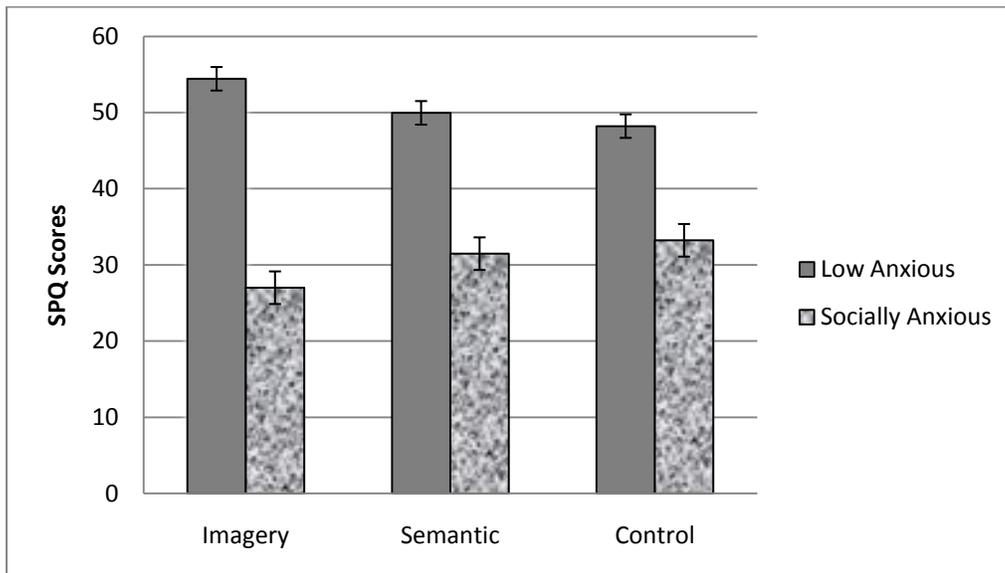


Figure 4. Prediction of Speech Performance scores for PEP-Imagery, PEP-Semantic, and Control conditions by group (a two-way interaction).

show a trend for the non-anxious individuals to predict they would perform better in the speech task if they had been in the PEP-Imagery condition compared to the PEP-Semantic condition. There was a marginally significant difference between non-anxious individuals' ratings of their future speech performance in the PEP-Imagery condition ($M = 54.42$, $SD = 8.94$) versus the Control condition ($M = 48.21$, $SD = 7.20$), $t(36) = 2.48$, $p = .018$. There was no significant difference between the non-anxious individuals' ratings in the PEP-Semantic condition versus the Control condition, $t(31.41) = 0.87$, $p = .39$.

We also examined the differences between the groups within each condition using independent samples t -tests and a Bonferroni correction ($.05/2 = .025$). The two groups significantly differed in the Semantic condition, $t(28.8) = 8.35$, $p < .001$, (socially anxious: $M = 31.47$, $SD = 8.4$; non-anxious: $M = 49.95$, $SD = 4.8$). The socially anxious individuals ($M = 27.00$, $SD = 9.6$) also differed from the non-anxious participants ($M = 54.42$, $SD = 8.2$) in their predictions of their performance in the Imagery condition, $t(36) = 9.49$, $p < .001$. And there was a significant difference between the groups in the Control condition, $t(35) = 5.32$, $p < .001$ (socially anxious: $M = 33.22$, $SD = 9.82$; non-anxious: $M = 48.21$, $SD = 7.2$). Therefore, the socially anxious and non-anxious individuals significantly differed in all of the conditions, with socially anxious individuals predicting overall worse performance than the non-anxious participants, most extremely so in the PEP-Imagery condition.

Disambiguating social and nonsocial scenarios

As described earlier, the Choose Your Own Ending Questionnaire asked individuals to rate how “like me” or “unlike me” a particular ending that had been

generated by participants with generalized SAD in a previous study (Hertel et al., 2008) was for the individual. All of the endings had been categorized as socially anxious, negative, positive, or neutral. We created summary scores of individuals' "like me/ not like me" ratings for each of the possible valenced endings for the social and nonsocial ambiguous scenarios, thus producing eight categories of ratings (i.e., sum of nonsocial scenarios with socially anxious endings, sum of social scenarios with socially anxious endings, sum of nonsocial scenarios with neutral endings, sum of social scenarios with neutral endings, etc.). We conducted four separate 2*3*2 ANOVAs on each of the valence categories of endings (i.e., socially anxious, negative, neutral, and positive) to test hypotheses 9-13. The hypotheses predicted that socially anxious participants in the PEP-Imagery condition would rate anxious or negative endings for the social scenarios more like themselves than for the nonsocial scenarios, more so than socially anxious individuals in the other conditions and the non-anxious participants. The between-subjects factors were group (socially anxious or non-anxious) and condition (PEP-Imagery, PEP-Semantic, or Control). The within-subjects factor was scenario type, defined as social or nonsocial. The analysis for the socially anxious endings revealed a significant main effect for type, $F(1, 108) = 33.71, p < .001$, and group, $F(1, 108) = 118.66, p < .001$. Moreover, there were significant interactions that qualified these main effects, including the type x group interaction, $F(1, 108) = 35.55, p < .001$, and the group x condition interaction, $F(2, 108) = 3.29, p = .041$. We conducted follow-up tests on both interactions to further understand these results.

To investigate the group x condition interaction, we collapsed across the nonsocial and social scenarios with socially anxious endings (see Figure 5). A one-way

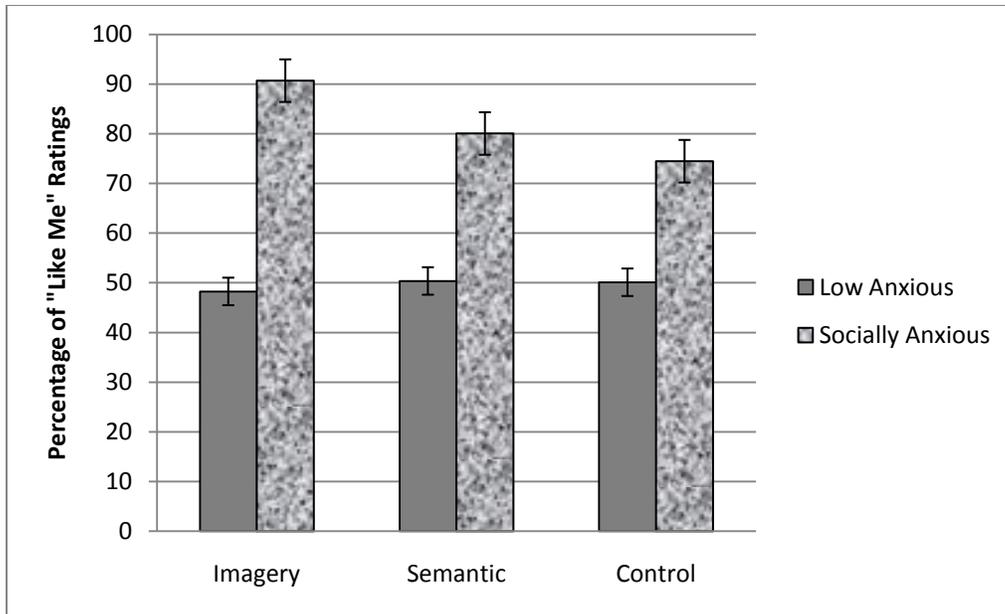


Figure 5. Percentage of “Like Me” ratings for socially anxious endings on the Choose Your Own Ending Questionnaire for PEP-Imagery, PEP-Semantic, and Control conditions by group (a two-way interaction).

ANOVA on the socially anxious participants’ socially anxious summary scores with condition (PEP-Semantic, PEP-Imagery, Control) as the between-subjects factor was significant, $F(2, 56) = 3.68, p = .032$. When following up with independent samples t -tests, using a Bonferroni correction ($.05/3 = .017$), we found a significant difference between the ratings of socially anxious individuals in the PEP-Imagery condition compared to the Control condition, $t(36) = 2.79, p = .008$. The means demonstrated that socially anxious individuals rated the socially anxious endings more extremely when they were in the PEP-Imagery condition ($M = 90.68, SD = 17.78$) compared to the ratings of socially anxious individuals in the Control condition ($M = 74.47, SD = 18.00$). The comparison between the socially anxious individuals’ ratings in the PEP-Semantic condition ($M = 80.05, SD = 20.23$) and those in the PEP-Imagery condition was not

significant, $t(36) = -1.72, p = .094$, nor was the comparison between the PEP-Semantic and Control conditions, $t(36) = 0.90, p = .38$. The same analysis was conducted on the summary “like me” ratings for the non-anxious participants’ responses for socially anxious endings, but there were no significant effects, all $ps > .84$.

To follow-up the significant type x group interaction we conducted paired samples t -tests with a Bonferroni correction ($.05/2 = .025$). When looking at the socially anxious individuals’ responses alone, there was a significant difference between the degree to which they rated socially anxious endings like themselves for social versus nonsocial scenarios ($M = 44.82, SD = 11.24, M = 36.91, SD = 9.65$, respectively), $t(56) = -8.013, p < .001$. This difference was not evident, however, for the non-anxious participants’ responses to socially anxious endings, $t(56) = 0.12, p = .91$.

We also analyzed how individuals rated how similar to themselves the negative endings to the social and nonsocial scenarios were using a $2*3*2$ ANOVA. The within-subjects factor was type (social, nonsocial scenarios), and the between-subjects factors were group (socially anxious, non-anxious) and condition (PEP-Semantic, PEP-Imagery, Control). The results yielded a significant main effect of type, $F(1, 108) = 8.35, p = .005$, and group, $F(1, 108) = 50.09, p < .001$. Additionally, there was a significant type x condition interaction, $F(2, 108) = 3.28, p = .041$, that was examined using a one-way ANOVA on the social and nonsocial scenarios separately. The analysis of individuals’ ratings for the negative endings for the nonsocial scenarios did not reveal a significant difference between the conditions, $F(2, 113) = 0.53, p = .59$, nor did the analysis for the social scenarios, $F(2, 113) = 0.90, p = .41$. Therefore, it is difficult to discuss this interaction in more detail. There was also a significant type x group interaction, $F(1, 108)$

= 27.28, $p < .001$. We conducted paired t -tests to examine the differences between the social and nonsocial scenarios within each group using a Bonferroni correction, $.05/2 = .025$. When looking at the socially anxious participants' ratings for negative endings, there was a significant difference between their ratings for the social scenarios ($M = 38.19$, $SD = 10.70$) versus nonsocial scenarios ($M = 32.58$, $SD = 9.45$), $t(56) = -5.35$, $p < .001$, demonstrating that they judged themselves more likely to generate a negative ending for a social scenario than a nonsocial scenario. This was not the case for the non-anxious participants, $t(56) = 1.71$, $p = .093$.

For the neutral endings, we once again conducted a $2*3*2$ ANOVA with the same within and between-subjects factors. The overall analysis uncovered a significant main effect of type, $F(1, 108) = 33.73$, $p < .001$, and group, $F(1, 108) = 40.22$, $p < .001$. These main effects were qualified by a significant interaction between type x group, $F(1, 108) = 30.60$, $p < .001$. To follow-up this interaction, we looked at each group separately and conducted paired sample t -tests using a Bonferroni correction, $.05/2 = .025$. The socially anxious participants' ratings of neutral endings were no different between the nonsocial and social scenarios, $t(56) = -0.18$, $p = .86$. The non-anxious individuals' ratings for the neutral endings were different depending on whether the scenario was social or nonsocial, $t(56) = -8.65$, $p < .001$. They were more likely to rate neutral endings like themselves for the social scenarios ($M = 53.25$, $SD = 5.61$) compared to the nonsocial scenarios ($M = 44.60$, $SD = 7.30$). There was also a marginally significant group x condition interaction, $F(2, 108) = 2.84$, $p = .063$.

The same $2*3*2$ ANOVA was conducted on the positive endings as well. Overall, there was a significant main effect of type, $F(1, 108) = 16.83$, $p < .001$, and group, $F(1,$

108) = 63.48, $p < .001$. There was also a significant interaction of type x group, $F(1, 108) = 26.46, p < .001$. When investigating this interaction further with paired samples t -tests using a Bonferroni correction, $.05/2 = .025$, there was a significant difference for the socially anxious individuals, $t(56) = 6.04, p < .001$. They rated the positive endings more like themselves for the nonsocial scenarios ($M = 44.56, SD = 7.94$) compared to the social scenarios ($M = 38.33, SD = 8.49$). The non-anxious participants' ratings did not show this pattern, $t(56) = -0.79, p = .432$. There was also a marginally significant type x condition interaction, $F(1, 108) = 26.46, p = .064$, and group x condition interaction, $F(2, 108) = 2.69, p = .072$; however, we did not follow-up due to lack of significance.

Interpretation Questionnaire

Similar to the Choose Your Own Ending Questionnaire, the Interpretation Questionnaire, provided individuals with social and nonsocial scenarios and three possible valenced endings, negative, positive, and neutral. In hypotheses 14-16 we predicted that socially anxious participants in the PEP-Imagery condition would be more inclined than socially anxious participants in the other conditions or the non-anxious participants to rate the negative endings for the social scenarios more like themselves than the neutral or positive endings. The participants were instructed to rank order the endings according to how much like them each one was (i.e. 1 = most like me, and 3 = least like me). We compiled the average of the ratings for the negative, positive, and neutral endings for the social and nonsocial scenarios. To examine the differences between individuals' ratings for the negative endings, we conducted a $2 \times 3 \times 2$ ANOVA. The between-subjects factors were group and condition. The within-subjects factor was

scenario type, defined as social or nonsocial. The analysis for the negative endings revealed two significant main effects, type of scenario, $F(1, 96) = 58.20, p < .001$, and group, $F(1, 96) = 12.46, p = .001$. These main effects were qualified by an interaction of type x group, $F(1, 96) = 12.61, p = .001$. To follow-up the significant interaction, we conducted paired sample t -tests within the socially anxious and non-anxious groups separately using a Bonferroni correction, $.05/2 = .025$. The socially anxious individuals' ratings for negative endings for the social scenarios ($M = 2.00, SD = 0.49$) were significantly different from those for the nonsocial scenarios ($M = 2.50, SD = 0.37$), $t(48) = -8.17, p < .001$. The socially anxious individuals rated the negative endings more similar to themselves for the social scenarios than for the nonsocial scenarios. The non-anxious participants showed a similar pattern, $t(52) = -2.50, p = .016$. They rated the negative endings more like their typical responses for the social scenarios ($M = 2.45, SD = 0.57$) compared to the nonsocial scenarios ($M = 2.62, SD = 0.44$).

In addition, there was also a significant interaction of type and condition, $F(2, 96) = 4.45, p = .014$. We followed up this significant interaction with independent samples t -tests using a Bonferroni correction, $.05/3 = .017$, to investigate differences between the conditions for social and nonsocial scenarios separately. Within the social scenarios, individuals in the PEP-Semantic versus the PEP-Imagery conditions differed with respect to their ratings of negative endings, $t(64) = 2.60, p = .001$, with individuals in the PEP-Imagery condition rating negative endings more like their typical response for social scenarios ($M = 2.0, SD = 0.56$) than individuals in the PEP-Semantic condition ($M = 2.36, SD = 0.55$). There was a trend for individuals' ratings for negative endings in the PEP-Imagery condition to differ from individuals' ratings in the Control condition, $t(65) = -$

2.30, $p = .025$. Individuals in the PEP-Imagery condition were more likely to rate the negative endings for social situations as similar to themselves than individuals in the Control condition ($M = 2.3$, $SD = 0.57$). There was no significant difference between individuals in the PEP-Semantic condition versus the Control condition, $p > .77$. When examining the individuals' ratings of negative endings for nonsocial scenarios, there were no significant differences between any of the three conditions, all p 's $> .62$.

We also conducted the same $2*3*2$ ANOVA on the mean ratings for positive endings. Similarly, there was a significant main effect of type, $F(1, 96) = 11.30$, $p = .001$, and group $F(1, 96) = 39.39$, $p < .001$. There was also a type x group interaction, $F(1, 96) = 7.70$, $p = .007$, which we followed up with paired samples t -tests with Bonferroni corrections, $.05/2 = .025$. When looking at the socially anxious participants separately, there was no difference between their ratings for social versus nonsocial scenarios, $t(48) = -0.53$, $p = .60$. The non-anxious participants' ratings for the social scenarios significantly differed from their ratings of the nonsocial scenarios, $t(52) = -4.05$, $p < .001$. They rated the positive endings for social scenarios more like themselves, ($M = 1.8$, $SD = 0.36$) than the positive endings for nonsocial scenarios ($M = 2.0$, $SD = 0.34$). There was also a marginally significant interaction of type x condition for the positive ratings, $F(2, 96) = 3.34$, $p = .04$.

Lastly, we conducted the $2*3*2$ ANOVA on the neutral ratings from the Interpretation Questionnaire. There was a main effect of type of scenario, $F(1, 96) = 138.51$, $p < .001$. Individuals tended to rate neutral endings more personally characteristic if the scenarios were nonsocial ($M = 1.3$, $SE = .026$) than social ($M = 1.7$, $SE = .036$). No other effects were significant.

CHAPTER 4 DISCUSSION

Impact of Imagery and Post-Event Processing

Given the abundance of research illustrating that mental imagery affects emotional processing (for a review, see Holmes & Mathews, 2010), we aimed to test the influence of imagery in post-event processing among socially anxious and non-anxious participants on their anxiety, mood, prediction of their performance, and interpretations of ambiguous scenarios. One of the central hypotheses of this study was that socially anxious individuals who were asked to vividly image social anxiety-evoking events in a ruminative fashion (PEP-Imagery) would display greater levels of anxiety and negative emotion, as well as generate more anxious and/or negative interpretations of social situations. We found support for this hypothesis in several areas throughout the study.

Foremost, the PEP-Imagery manipulation appeared to heighten socially anxious individuals' anxiety levels at certain time points during the experiment. Changes in anxiety levels were not apparent among the non-anxious participants. Socially anxious individuals in the PEP-Imagery condition exhibited greater elevations in anxiety after the PEP-Imagery task (time 3) than socially anxious individuals in the PEP-Semantic or Control conditions. Therefore, it appears that when socially anxious individuals engage in post-event processing involving vivid imagery, they experience greater anxiety than when processing the social information in a semantic manner (PEP-Semantic condition) or engaging in a distraction task (Control condition). This finding replicates those of several other studies showing that imagery evokes greater emotional response than semantic processing (Acosta & Vila, 1990; Holmes & Mathews, 2005; Holmes &

Mathews, 2010; Lang et al., 1983; Vrana et al., 1986). In our study, however, the pattern was specific to the socially anxious individuals in the sample.

Furthermore, the socially anxious individuals in the PEP-Imagery condition also reported having significantly greater levels of anxiety at the end of the session when they anticipated they would be delivering a speech (time 5) compared to the socially anxious individuals in the PEP-Semantic condition, and they appeared marginally more anxious than socially anxious participants in the Control condition. As previously mentioned, a social stressor in the laboratory, such as a speech, often brings emotions and cognitive biases “online,” as one would expect would happen in a natural setting (Mansell & Clark, 1999; Mansell et al., 1999, 2003). Since the participants were anticipating they would give a speech at the end of the session, it makes intuitive sense that all socially anxious individuals’ anxiety levels would be elevated at this time. It is particularly interesting, however, that the socially anxious participants who processed the past and future speeches using vivid imagery reported the highest elevations of anxiety at that time. This was the time when they assumed they would be giving a speech: thus, they were facing an exposure to one of their most feared situations. It appears that the PEP-Imagery condition had a particularly strong propensity to elicit anxiety among the socially anxious participants, both immediately after the induction as well as at the point when they anticipated the delivery of their speech.

We also found evidence that the imagery post-event processing condition influenced socially anxious individuals’ interpretations of ambiguous scenarios. For the Choose Your Own Ending Questionnaire, socially anxious participants in the PEP-Imagery condition rated socially anxious endings more similar to themselves than

socially anxious participants in the Control condition. Although it did not reach statistical significance, the pattern of the means showed that socially anxious individuals' ratings for socially anxious endings were greater for those in the PEP-Imagery condition compared to the PEP-Semantic condition. This finding provides support for the combined cognitive biases hypothesis discussed earlier (Hirsch et al., 2006). Specifically, the finding illustrates that vividly processing a social situation in a perseverative fashion (i.e. post-event processing) also affects socially anxious individuals' interpretation of other ambiguous situations. To date, research investigating imagery and its impact on cognitive biases has been limited and has provided mixed results (Holmes, Lang, & Shah, 2009; Stopa & Jenkins, 2007). Some studies have had difficulty demonstrating the connection between imagery and biased interpretation of ambiguous social stimuli (Holmes et al., 2009), whereas other studies have shown a relationship between imagery and biased autobiographical memory recall (e.g., Stopa & Jenkins, 2007). One reason why the imagery induction influenced interpretation biases in the present study may have been the threat of the speech at the end of the experimental session. Participants in the PEP-Imagery condition were asked to visually imagine their past speech as well as their upcoming speech and to describe these situations in words. They were also instructed to "describe these situations so the reader (could) imagine it as if he or she (were) there." It is likely that these instructions activated emotional responses as they stepped through the situation in a series of images. Describing individuals' mental images while going through the events may have increased socially anxious participants' anxiety levels and contributed to their biased interpretation of ambiguous scenarios.

Furthermore, all participants in the PEP-Imagery condition rated the negative endings for social situations on the Interpretation Questionnaire more like themselves than the participants in the PEP-Semantic or Control conditions. This is interesting given that both the non-anxious and socially anxious participants endorsed the negative ratings as being more ego-syntonic for the social scenarios but not the nonsocial scenarios. Once again it appears that the PEP-Imagery condition influenced how participants interpreted ambiguous social scenarios.

Regarding participants' predictions of their upcoming speech performance, we did not find direct support for our main hypothesis that socially anxious individuals in the PEP-Imagery condition would have the worst predictions in their performance; however, the pattern of the results reflected what we had anticipated among the groups. The socially anxious individuals had significantly more negative predictions of their performance compared to the non-anxious individuals in each of the three conditions. Interestingly, the significant interaction of group and condition in the analysis of Speech Performance Questionnaire scores was driven by the differences in reactions of the control participants. Non-anxious individuals who had vividly pictured their past and future performances in a speech (i.e., PEP-Imagery condition) anticipated they would perform significantly better in the speech task than non-anxious individuals who had been distracted for a period of time with working memory tasks (i.e., Control condition). Although it did not reach significance, it is important to note that the opposite pattern was true for the socially anxious participants: those in the PEP-Imagery condition rated their anticipated performance more poorly than those in the other conditions. Thus, individuals' imagery interacted with the valence of the material that they were thinking about during

the post-event processing task (i.e., their past and future speeches). It is likely that non-anxious participants vividly imagined positive past and anticipated public speaking experiences, thus influencing their predictions in a positive direction. On the other hand, socially anxious individuals were likely thinking about a negative past and future speech and thus tended to predict they would perform more poorly in the upcoming situation.

There is research showing that when socially anxious individuals hold a negative image of themselves in mind, it affects their actual performance in a speech task or social interaction compared to when they hold a neutral or positive image in mind (Hirsch, Clark, Mathews, & Williams, 2003; Hirsch, Mathews, Clark, Williams, & Morrison, 2006; Hirsch, Meynen, & Clark, 2004; Vassilopoulos, 2005). Our finding adds to this literature because it shows that vividly imagining past and future social events affects individuals' interpretation of their performance before the next event even occurs. It is possible that these interpretations create a self-fulfilling prophecy and contribute to either a better or worse future performance. It would be interesting to test this hypothesis in the future with a performance task in the laboratory. Although we did not find direct support for the hypothesis that imagery in post-event processing significantly affects predictions of speech performance among socially anxious individuals, we did find that imagery in post-event processing affects non-anxious participants' predictions of their performance in a positive direction.

One other piece of information to keep in mind while attempting to understand the PEP-Imagery findings is the potential influence of individuals' baseline levels of imagery for both the socially anxious and non-anxious participants. We found no notable differences between the groups in their daily usage of imagery (i.e., SUIS). We did find

differences, however, in how vivid socially anxious or non-anxious individuals' images were rated on the VVIQ. Recall that the VVIQ is a measure that examines the vividness of individuals' images for certain stimuli (e.g., contours of a face and body, a sunrise). Socially anxious individuals reported less vivid images than non-anxious individuals overall and particularly when they had their eyes open. The PEP-Imagery task instructions did not tell participants to imagine the past and future speeches with their eyes open or closed, just to describe the situations as vividly as possible. Because it was a writing task, it is safe to assume that most individuals had their eyes open most of the time; however, we did not ask participants to report the percentage of time they had their eyes open or closed during the task. Despite the fact that socially anxious participants reported having less vivid images at baseline, there still were striking group x condition interactions in the study. It appears that the PEP-Imagery induction had a significant impact on socially anxious individuals' levels of anxiety and interpretations of socially anxious endings to ambiguous scenarios. Even though these participants might not have as vivid images as their non-anxious counterparts in general, they still showed the emotional and cognitive impact of the PEP-Imagery induction, thus making these results even stronger.

Group Differences on Affect and Interpretation Measures

The two groups of participants also differed on their levels of positive and negative affect throughout the session. As one would predict, following the speech threat at the beginning of the session (i.e., between time 1 and time 2), socially anxious participants demonstrated increases in negative affect and decreases in positive affect.

The speech threat did not appear to significantly influence the positive or negative affect of the non-anxious participants. Socially anxious individuals also showed decreases in positive affect at the end of the session when they anticipated giving the speech (i.e., between times 4 and 5). The non-anxious participants showed a decrease in positive affect as the session went along, specifically from the point after the manipulation (time 3) until they prepared for the speech (time 4) and from time 4 to the end of the session (time 5). It is possible they were becoming bored during the experimental session and therefore showing decreases in positive affect. In addition, non-anxious participants displayed a decrease in negative affect from the point when they found out about the speech threat (time 2) to after the condition manipulations (time 3). However, the non-anxious participants had low levels of negative affect overall. Given that these individuals are not particularly threatened by a speech, it follows that the speech threat would not have much impact on their negative affect throughout the session.

Socially anxious and non-anxious participants also demonstrated differences in how they interpreted ambiguous scenarios. These differences arose on the Choose Your Own Ending Questionnaire interpretations of ambiguous social versus nonsocial situations. As we had predicted, socially anxious individuals rated the socially anxious and negative endings to the social scenarios more similar to their own predicted reactions compared to socially anxious or negative endings for the nonsocial scenarios. They also rated the positive endings more similar to how they would respond to the nonsocial scenarios compared to the social scenarios. The non-anxious participants did not show these differences. They did, however, report that the neutral endings were significantly more similar to how they would respond to social situations compared to the nonsocial

scenarios. The socially anxious participants did not illustrate any differences between social and nonsocial scenarios for the neutral endings.

The results from the Interpretation Questionnaire demonstrated a comparable pattern. Similar to the findings for the CYOE Questionnaire, socially anxious participants rated the negative endings more similar to their usual response for social situations, but not for nonsocial situations. Interestingly, the non-anxious participants also rated themselves more likely to generate a negative response for the social scenarios compared to the nonsocial scenarios. On the other hand, the non-anxious participants also rated the positive endings more similar to themselves for the social versus the nonsocial scenarios. Therefore, it appears the non-anxious individuals were at both extremes of the spectrum for socially ambiguous scenarios, rating themselves as more likely to produce positive or negative responses, whereas socially anxious participants endorsed only negative responses. Overall, the CYOE and IQ results provide evidence that socially anxious individuals interpreted socially ambiguous scenarios as anxiety-provoking and negative. If a situation was ambiguous and nonsocial, it appeared that socially anxious individuals interpreted things more positively. The non-anxious participants demonstrated more neutral or positive reactions to social situations, and occasionally negative responses, as evidenced by the IQ.

Limitations and Future Directions

The study was not without limitations. Like many of the studies examining imagery, the current study used an analogue sample. Our knowledge concerning imagery would be strengthened by the study of clinical samples. For example, the question

remains whether negative images are more vivid or salient for individuals with SAD than for undergraduates with high levels of social anxiety. Also, are the personal images of individuals with SAD more distorted than those personal images of individuals in an analogue sample? There are many unexplored questions about the nature of the images along the continuum of individuals with social anxiety symptoms and those with the disorder.

It would also be interesting to examine whether individuals' memories for their past speech were recurrent memories. As mentioned earlier, socially anxious individuals have reported experiencing spontaneous images that reference the time they first began struggling with social anxiety and that are negative, recurrent, and involve multiple sensory modalities (Hackmann et al., 1998, 2000; Hackmann & Holmes, 2004; Morgan, 2010). Evidence from Erwin, Heimberg, Marx, and Franklin, (2006) suggests that socially anxious individuals' reactions to salient memories resemble those of persons with PTSD. Therefore, if socially anxious individuals had a salient recurrent memory of a previous speech performance that they vividly imagined in the PEP-Imagery condition or semantically wrote about in the PEP-Semantic condition, the familiarity with the memory may have affected the degree to which they were able to engage in the induction and how activating the inductions were regarding their emotional responses and interpretation biases. Also, it is possible that socially anxious individuals' memories were more rehearsed than those of non-anxious participants, who might not have had as recurrent or intrusive memories of social situations. In addition, it would also be important to ask participants in future research the degree to which images were incorporated in their memory of the speech at baseline. If some individuals are experienced in recalling a

particular speech with imagery, they might have taken more easily to the PEP-Imagery induction, compared to others who might have experienced a greater cognitive load due to the relative novelty of the task. Additionally, it would be helpful to investigate the amount of negative or socially anxious content in the memory for the past speech and thoughts about the future speech and how the groups differed. This would provide us with clearer information about the valence of their ruminative thoughts before engaging in some of the interpretation tasks.

Furthermore, in the present study we asked individuals in the PEP-Imagery or PEP-Semantic conditions to recall their most anxiety-provoking memory involving a speech. Social anxiety involves fears of both performance and social interaction situations (APA, 2000). We recruited individuals based on their levels of speech anxiety using the PRCA and also included a speech threat in the study. Thus, focusing on a memory of a past speech fit the present study. There might, however, have been other, perhaps more self-defining memories that affected the onset of individuals' social anxiety, which could have been more meaningful for individuals to think about during the post-event processing inductions (Conway et al., 2004; Hackmann et al., 2000; Morgan, 2010). Conway and colleagues (2004) discuss self-defining memories as being vivid, affect laden, repetitively retrieved, congruent with other autobiographical memories and thoughts, and relating to a concern or unresolved conflict. It would be beneficial for future studies to investigate self-defining memories for both speech and social interaction situations to better assess the impact of post-event processing of salient memories via imagery or semantic processes. We would anticipate that imagery's impact on anxiety and cognitive biases would be even greater for memories that fit this description.

Last, we found that the socially anxious individuals in the PEP-imagery induction showed some differences in their interpretations of ambiguous scenarios. We implemented a new measure of interpretation bias, the Choose Your Own Ending questionnaire, developed by the author and adapted from previous empirically validated research of socially anxious individuals' interpretations (Hertel et al., 2008). There was some overlap with the results found with the Interpretation Questionnaire. It would be valuable in the future to investigate other interpretation measures using a variety of verbal and visual stimuli, such as a threat detection dot probe task, sentence completion, or a self-referential task. If mode of processing plays a role, one might find that imagery in post-event processing has an even greater influence on individuals' interpretations of facial stimuli or other visual stimuli. A task using faces for interpretations might also be more ecologically valid. Therefore, stimuli in the interpretation tasks should be carefully chosen based on the cognitive processing involved in post-event processing inductions.

Clinical Implications.

Many researchers and clinicians have been interested in integrating knowledge concerning imagery and post-event processing into cognitive-behavioral therapy (CBT) for social anxiety. In the early days of cognitive therapy, A.T. Beck (1976) discussed how distress could be experienced through words, phrases, or images, which he considered to be various forms of cognition. Many agree that CBT provides methods to cope with verbal cognitions; however, some argue that it has not examined visual cognitions as extensively (Hackmann & Holmes, 2004; Holmes, Arntz, & Smucker, 2007). Even though imagery was part of the early behavior therapies for anxiety (e.g., systematic desensitization; Wolpe, 1958) and more specifically for OCD (e.g., Foa & Wilson, 1991)

and PTSD (e.g., Foa & Rothbaum, 1989), it has taken a back seat to thought-based cognitions in practice.

More recently, cognitive rescripting techniques that originated to treat intrusive images in PTSD have been utilized for the treatment of socially anxious clients with distressing imagery as well. Wild, Hackmann, and Clark (2007, 2008) have investigated the effects of using imagery rescripting among socially anxious clients to alter some of the maladaptive beliefs or thoughts surrounding clients' negative imagery. Memory rescripting is comprised of three parts: a) visualizing and reliving the experience at the age clients were when the event occurred, b) imagining the experience again, but at their current age watching it and intervening in the memory, and c) reliving the event at the age they were when it occurred and visualizing their current older self in the image as well. The use of memory rescripting techniques was associated with changes in individuals' social anxiety scores and beliefs about the image immediately after the procedure as well as one week following the therapy session. The same group of authors also compared imagery rescripting to a control session in a within-subjects design (Wild et al., 2008). Participants' changes after the memory rescripting session were significant on all measures, including changes in beliefs about the memory, distress associated with the image, and social anxiety. In general, there were few changes resulting from the control session. This preliminary evidence illustrates that socially anxious clients, similar to clients with PTSD, could benefit from imagery rescripting techniques and that an imagery / memory rescripting procedure has somewhat better short-term effects than a control memory condition for socially anxious clients.

There is a need for further research on imagery rescripting and more rigorous studies that incorporate imagery into formal treatment paradigms. For example, there might be more subtle ways that imagery can be weaved into cognitive-behavioral treatments, and J.S. Beck (1995) discusses some of these. Perhaps one way would be to have clients classify an “automatic thought” as an image- or word-based thought. This would help therapists tap into recurrent images that seem to surface “online” during social situations. Clients also could describe how the image was formed and whether any significant events helped mold it. In addition, clients could begin noticing “cognitive errors” in their image, paying attention to any distortions that they are making. Later on in treatment, the imagery rescripting technique may be beneficially integrated with thought-based cognitive restructuring techniques. Also, during exposure work, the therapist and client could monitor and restructure images just as they restructure word-based automatic thoughts. Thus, there are options for bringing imagery into cognitive behavioral treatment so that it parallels the work that clients do for semantic thoughts.

Conclusions

We now know from the present study and several others reviewed earlier that imagery affects socially anxious individuals’ anxiety, interpretations, and predictions of their performance in a social situation. Our study was the first to investigate imagery within post-event processing and its impact on interpretations among socially anxious individuals. It provides evidence that imagery is indeed a particularly maladaptive factor in post-event processing. Additionally, the study illustrates that imagery, post-event processing, and interpretation processes interact with one another, providing support for

the combined cognitive biases hypothesis (Hirsch et al., 2006) and cognitive-behavioral models of SAD (Clark & Wells, 1995; Rapee & Heimberg, 1997). Preliminary evidence has shown that cognitive-behavioral interventions, such as memory rescripting, and image-based cognitive restructuring, appear to ameliorate the impact of imagery on social anxiety symptoms. Further research regarding treatment techniques targeting imagery within post-event processing is needed to improve our cognitive-behavioral interventions to treat social anxiety.

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