ABSTRACT

Title of dissertation: AN EXPERIMENTAL APPROACH TO EXAMINING INDIVIDUAL DIFFERENCES IN EVALUATIVE CONCERNS AND RESPONSE TO FEEDBACK

Melanie F. Lipton, Doctor of Philosophy, 2018

Dissertation directed by: Associate Professor Andres De Los Reyes
Department of Psychology

Evaluative concerns feature prominently into the presentation of those experiencing Social Anxiety Disorder (SAD) and elevated social anxiety (SA) symptoms. The majority of work to date has focused on *fear of negative evaluation* (FNE). However, those with elevated SA may express general concerns with fears of evaluation, including a heightened *fear of positive evaluation* (FPE). Individual differences may exist in the relative salience of FNE and FPE. Yet, little is known about how these fears relate to real-world experiences of social-evaluative concerns (e.g., receiving feedback) or how to understand these differences in the context of physiological processes relevant to SAD, namely physiological flexibility as indexed by heart rate variability (HRV).

The purpose of this study was to investigate relations between subjective measures assessing FNE and FPE, subjective measures of arousal, and direct measures of physiological flexibility. This study aimed to (1) confirm the presence of the individual difference groups found in previous work, and (2) examine the relations between arousal, valence of evaluation presented, and individual's most endorsed concern. Participants completed self-report measures aimed to assess SA, FNE and FPE, as well as an Impromptu Speech task and subsequently received feedback (i.e. positive and negative) on their performance. In addition, participants completed all assessments while wearing heart rate monitors to measure their HRV.

Results confirmed that the evaluative concern groups previously found in a college student sample were also present in a community sample of adults. Further, individuals in these groups displayed significantly different levels of SA. When examining the relations among arousal, physiological flexibility, and evaluative concerns, we found mixed support for our hypotheses. Overall, individual's self-reported arousal was not highest following receipt of feedback that most matched their evaluative concern profile, however we did discover a buffer effect for certain individuals receiving positive feedback prior to negative feedback. When examining physiological flexibility, HRV was not lowest when feedback matched individuals' most endorsed concern. These findings hold important implications for the assessment, diagnosis, and treatment of SA, FNE, and FPE. We encourage future work to further examine these individual differences in other social contexts and clinical populations.

AN EXPERIMENTAL APPROACH TO EXAMINING INDIVIDUAL DIFFERENCES IN EVALUATIVE CONCERNS AND RESPONSE TO FEEDBACK

By

Melanie F. Lipton

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Advisory Committee:
Andres De Los Reyes, Ph.D., Chair
Andrea Chronis-Tuscano, Ph.D.
Lea R. Dougherty, Ph.D.
Julia Felton, Ph.D.
Brenda Jones Harden, Ph.D. (Dean's Representative)

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Chapter 1: Introduction

Social Anxiety Disorder (SAD) is one of the most prevalent internalizing disorders in the United States. Recent estimates suggest that SAD is the third most prevalent disorder, behind Specific Phobia and Major Depressive Disorder, with 13% lifetime and 7% 12-month prevalence rates, respectively (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). The onset of SAD typically occurs during adolescence, with a median age of onset of 13 years (Kessler et al., 2005). Additionally, prevalence estimates suggest that following the onset of SAD and if left untreated, the disorder remains heightened throughout adolescence and into adulthood (Kessler et al., 2005).

According to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), those with SAD experience long-standing and intense fears of social situations, especially when a person is exposed to people with whom they are unfamiliar (American Psychiatric Association, 2013). Most notably, these fears often involve performance-based situations with the possibility of scrutiny or evaluation by others (Bogels et al., 2010). As a consequence of these fears, those with SAD usually engage in various forms (e.g., both covert and overt) of avoidance, which typically results in functional impairments in a variety of life domains including occupational, academic, and social/romantic areas (Beidel, Rao, Scharfstein, Wong, & Alfano, 2010).

Much of the fear and avoidance experienced by those with SAD and elevated Social Anxiety (SA) is thought to result from how these individuals process information from their environment (Leary, Kowalski, & Campbell, 1988; Rapee & Heimberg, 1997). That is, when those with elevated SA receive information from their environment (e.g., from a social interaction), they may interpret this information in a different way than

someone without elevated SA. Specifically, those with elevated SA exhibit a number of maladaptive information processing strategies that heighten their fear and avoidance. Those experiencing elevated SA are more likely to adapt an observer perspective when viewing social situations (Coles, Turk, Heimberg, & Fresco, 2000). Given that those with elevated SA tend to view their own performance negatively, this perspective often fuels their belief that social events or situations are negative, even if those situations are ambiguous or positive (Stopa & Clark, 2000; Amin, Foa, & Coles, 1998). In addition, compared to healthy controls, those with SAD and elevated SA report a greater use of negative imagery when thinking about themselves within social situations (e.g., drenched in sweat; face red), further fueling their fear and avoidance of such situations (Hackmann, Surawy, & Clark, 1998). Thus, it appears that those with elevated SA exhibit a number of maladaptive information processing strategies that lead to their experience of distressing symptoms and subsequent avoidance of social situations.

In addition to these strategies, one particular salient set of cognitions linked to the maladaptive information processing patterns seen in those with elevated SA involves *fears of evaluation* (Weeks & Howell, 2012). These fears involve maladaptive beliefs that those with whom individuals are interacting evaluate their performance in a particular way (i.e., positively or negatively; Rapee & Heimberg, 1997). Traditionally, fears of evaluation have been described with regard to *fears of negative evaluation (*FNE; Watson & Friend, 1965; Clark & Wells, 1995; Weeks, Heimberg, Rodebaugh & Norton, 2008). That is, those experiencing FNE believe that the individuals who are evaluating them are doing so in a negative manner (i.e., criticism or ridicule). Additionally, this cognition involves the belief that those evaluating them hold extremely high standards. Given that

those with elevated SA doubt their ability to live up to these standards, FNE is associated with a significant amount of distress. Traditionally, the belief in others holding high standards is present even when there is an absence of evidence or support for these standards (i.e., these standards have not been expressed, merely implied).

Those with SAD and elevated SA may struggle not merely with FNE, but with fears of evaluations more generally. With this in mind, researchers recently proposed the *bivalent fear of evaluation (BFOE) model* (Weeks & Howell, 2012). This model suggests that individuals with SAD experience two distinct fears of evaluation, negative and positive, and that these distinctly valenced fears contribute uniquely to the fear and avoidance seen in SAD. The *fear of positive evaluation* (FPE) involves a fear that others will evaluate them, and that the evaluation is positive, such as praise (Heimberg, Brozovich, & Rapee, 2010; Weeks, Heimberg, & Rodebaugh, 2008).

Those experiencing FPE hold the belief that receiving a positive evaluation may lead to negative consequences in the future. Specifically, those who experience FPE believe that receiving a positive evaluation from someone may lead these evaluators to hold high or higher expectations of them in the future (Wallace & Alden, 1997; Weeks, et al., 2008; Weeks & Howell, 2012). However, those who experience FPE often do so in the context of experiences with high levels of SA, and individuals experiencing SA often doubt their social abilities (Weeks, et al. 2008). Thus, often accompanying an individual's experiences with FPE is the belief that they will be unable to live up to the heightened expectations. Consequently, those experiencing FPE often fear that they will experience negative consequences when they disappoint those who had previously given them a positive evaluation. In addition, FPE is thought to stem from an evolutionary fear.

That is, the receipt of praise is often a public event in which those giving and receiving praise often do so with third-party observers looking on (e.g., positive appraisal of job performance by boss to one subordinate in a weekly group meeting of subordinates). Thus, individuals experiencing FPE often believe that the mere experience of receiving praise draws negative attention to themselves, and may result in others viewing them as a social-dominant threat (Wallace & Alden, 1997; Weeks et al., 2010). These beliefs serve to heighten anxiety in response to experiencing FPE.

In addition, while conceptually, FNE and FPE share a significant amount of overlap (i.e., fear of failure), and scales measuring the two are often correlated, evidence points to distinct underlying features of each (Weeks et al., 2008; Weeks et al., 2012). For example, in the first investigation of the psychometric properties of the Fear of Positive Evaluation Scale (FPES; Weeks et al., 2008), the developers examined if FNE and FPE represented distinct constructs. In this study, a two-factor model representing distinct evaluative concern factors provided a superior fit (i.e., relative to a single-factor model). Additionally, the items of the FPES scale, which were designed to tap into several of the key theoretical domains of FPE (i.e., fear of attention when positive, social hierarchy dynamics) all strongly loaded onto the factor of FPE, whereas all items on a measure of FNE strongly loaded onto the factor representing FNE.

Evidence confirming FNE and FPE as distinct constructs also support the BFOE model described previously (Weeks & Howell, 2012). Specifically, FNE and FPE display different relations with associated features of SAD, with increased FPE (and not FNE) uniquely relating to increased fears of social reprisal, decreased trait positive affect, and decreased positive experiences. Thus, the literature provides sufficient evidence for the

BFOE model, highlighting that FNE and FPE represent distinct and important features of SAD and associated concerns.

Given the differences inherent in the fears of evaluation previously described, it follows that individual differences in the salience of perceived fears may exist. That is, some individuals may show heightened concerns with both FNE and FPE, whereas others may show more salient FPE, but relatively low FNE, and vice versa. A recent study from our team supports this idea of individual differences in fears of evaluation (i.e., differences in the saliency of evaluative concerns; Lipton, Weeks, & De Los Reyes, 2016). Specifically, in a large sample of undergraduate students, we identified four distinct groups who varied on their expression of evaluative concerns. These four groups represented individuals who were (a) low on FNE/FPE (LowFNE-LowFPE; 58.4% of total sample); (b) high on FNE, low on FPE (HighFNE-LowFPE; 14.4% of total sample); (c) low on FNE, high on FPE (LowFNE-HighFPE; 14.9% of total sample); and (d) high on FNE/FPE (HighFNE-HighFPE; 12.3% of total sample). In addition to supporting the presence of these four groups, this study found that these groups differed on their self-reported levels of SA symptoms, as well as internalizing concerns known to be associated with SA (i.e., depression, anxiety sensitivity, safety behaviors; Lipton et al., 2016). Specifically, those who reported being high on both FNE/FPE reported the greatest levels of both SA concerns and associated internalizing concerns relative to the other groups, suggesting that fears of evaluation have cumulative effects on displays of psychopathology. Thus, this study provided evidence to support not only individual differences in displays of evaluative concerns, but also that these individual differences relate uniquely to displays of psychopathology concerns that often co-occur with SA.

While Lipton and colleagues (2016) provided preliminary data on the presence of these FNE/FPE subtypes, a key limitation of this study was the exclusive reliance on self-report measures to classify fears of evaluation. While this provides some insight into displays of individual differences in fears of evaluation, to properly evaluate anxiety and anxiety related concerns, researchers ought to use a multi-method approach, including behavioral and performance-based measures (Silverman & Ollendick, 2005). Evidence-based assessment of anxiety should cover a wide range of associated behaviors of SA, such as anxiety cues and triggers, avoidance patterns, and physical symptoms or arousal (Barlow, 2005; Hunsely & Mash, 2005, Antony & Rowa, 2005). For example, for individuals in the four groups previously identified, it is clear that they may exhibit individual differences in subjective fears of evaluation. What remains unclear is how these fears manifest in the context of *in vivo* responses to actually receiving positive versus negative evaluation (e.g., receipt of positive vs. negative feedback on performance of a task). Would reactions to evaluative information depend, in part, on the relative weight a person places on fears of negative versus positive evaluation? If so, there may be individual differences in how much distress someone experiences during an actual social situation involving feedback, depending on whether the valence of the feedback they receive matches the kinds of evaluative feedback they tend to subjectively perceive as most distressing (e.g., actually receiving positive vs. negative feedback when the greatest subjective fears tend to revolve around receiving positive feedback).

Examining these individual differences in *in vivo* experiences with evaluative feedback is imperative to better help us understand individual differences in treatment response. Specifically, the majority of treatments for SAD involve a component of in

vivo exposures (Rapee & Heimberg, 1997; Hoffman, 2007). That is, most cognitive behavioral therapy (CBT)-focused treatments for SAD involve exposing the client to their feared stimuli and helping them learn to cope with the associated fear. Thus, examining individual differences in fears of evaluation using exposure-based state measures would provide us with information that can inform our understanding of how to "match" exposures in CBT treatments for SAD to meet patients' specific needs. Thus, using a multi-method approach to examining these psychological constructs has clear clinical implications for further refining evidence-based treatments for SAD.

The emotion regulation framework and associated widely used laboratory-based social stressor tasks provide a strong conceptual and methodological foundation for implementing a multi-method approach to examine links between individual differences in fear of evaluation and in vivo feedback-related distress. First, emotion regulation is defined as a set of processes and mechanisms through which individuals alter and modulate their emotions, both unconsciously and consciously, in response to environmental demands such as stress or exposure to novel stimuli or situations (Gross, 2015). Given emotional processing's presence in the development and maintenance of both internalizing and externalizing disorders, there has been a significant body of research devoted to understanding emotional processing as a mechanism underlying the development and maintenance of various mental health concerns (Aldao, Nolen-Hoeksema, & Schweizer, 2010, Aldao et al., 2012). Much of this work is informed by a processing model of emotion regulation, which posits that when individuals are placed in situations which they find distressing, they experience behavioral, emotional (e.g., manifestations of anxiety), and physiological responses (e.g., changes in heart rate in

response to stimuli) which they have difficulty regulating (Gross, 2012). Given that a key component of SAD is avoidance behavior, those with SAD and elevated SA tend to also display emotion regulation deficits, especially when placed in situations where behavioral avoidance is possible (e.g., social interactions at parties or public speaking; Jazaieri et al., 2015).

Second, to mimic real-life performance situations, researchers often employ social stressor tasks to evaluate behavioral and physiological responses. Most notably, impromptu speech tasks have been used for these purposes (Beidel et al., 1989). These tasks typically involve instructing participants to give a speech of at least three minutes' duration to a small audience, typically consisting of members of the research team conducting the study. Impromptu speech tasks have been found to be a reliable behavioral measure in SAD and have been used in a number of studies examining anxious responses in this population (Beidel et al., 1989; Turner, Beidel, & Townsley, 1992; Hofmann, Ehlers, Newman, & Roth, 1995; Herbert et al., 2005). Specifically, Impromptu Speech tasks tend to result in increased in self-reported arousal and anxiety, as well as physiological changes (e.g. decreased heart rate variability [HRV], increased cortisol reactivity) in both the general population, and those with elevated anxiety (Bouma, Riese, Ormel, Verhulst, & Oldehinkel, 2009).

Given that emotion dysregulation tends to produce changes in multiple domains, in addition to examining behavioral indicators, there is added utility in examining indices of peripheral psychophysiology to understand how individual differences in fears of evaluation would impact responses following receipt of feedback. In recent decades, there has been increased attention towards examining peripheral psychophysiological

measures, specifically heart rate variability (HRV). Indices of HRV, or the amount of fluctuation in heart rate, have been associated with physiological flexibility in response to emotional stimuli (Thayer et al., 2009; Porges 2007). Specifically, low HRV, as evidenced by consistently high or low heart rate, has been associated with a general inflexibility in adapting to one's environment, whereas high HRV has been associated with flexibility in adapting to one's stressful environment (Porges, 1995; Thayer & Lane, 2000). Given this, HRV has been frequently used as a physiological index of distress in the context of SAD and other related mental health concerns (Aldao & De Los Reyes, 2015; Aldao, Dixon-Gordon, & De Los Reyes, 2015; De Los Reyes & Aldao, 2015). As noted above, and in line with best practices in evidence-based assessment, utilizing HRV in addition to self-reported measures allows us to gather not only information about individuals' arousal (i.e., via self-report), but also their flexibility and ability to respond to a range of situations (i.e., via direct measures of HRV), allowing us to further examine situations they find more stressful versus less stressful.

Research has also supported the use of HRV and related metrics to measure the physiological component of emotion regulation, and an index of how well one can regulate their emotional responses to stressors in their environment. Specifically, given that HRV represents cardiac parasympathetic activity (i.e., how well our bodies, specifically our hearts, respond to stimuli), it is thought to be one of the most robust and consistent measures of emotion regulation (Thayer & Lane, 2000). HRV has also been found to be sensitive to emotion regulation in the context of CBT, with pre-to-post increases in HRV being found following successful treatment using CBT for Panic Disorder and Post Traumatic Stress Disorder (PTSD); two disorders that involve

significant difficulties with regulation of emotions (Craske et al., 2005; Davies, Niles, Pittig, Arch, & Caske, 2014). In addition, HRV has been shown to reliability reflect stress-related change during social stressor tasks, with changes in HRV accompanying changes in self-reported arousal (De Los Reyes et al., 2017).

Empirical work that explores the links between individual differences in fears of evaluation, or evaluative concerns and subsequent emotion dysregulation has important theoretical and clinical implications. First, as stated earlier, pilot work on individual differences revealed that the groups expressing the four different levels of evaluative concerns also showed varying levels of relations to other internalizing concerns (i.e., depressive mood, anxiety sensitivity, and safety behaviors; Lipton et al., 2016). Thus, those experiencing varying levels of concern with both FNE and FPE may be more likely to also experience heightened mental health concerns related to SA, relative to those experiencing only FNE or FPE (but not both) or those experiencing neither of these concerns. In addition, given that emotion dysregulation features prominently in the presentation of many mental health concerns, it is important to examine emotion regulation (i.e., behaviorally and physiologically) in response to both FNE and FPE.

From a clinical standpoint, further understanding individual differences in evaluative concerns and their relation to emotion dysregulation could have important implications for both the diagnosis and treatment of SAD. Nearly all treatment work to date has focused exclusively on FNE, especially work focused on the cognitive misattributions and avoidance in SAD (Clark & Wells, 1995; Rapee & Heimberg, 1997). Given this, it is possible that current treatments may be missing an important cognitive component that underlies much of the fear and avoidance for many individuals; namely

FPE. In a recent examination of the efficacy of CBT for SAD, researchers found that most treatment protocols only show a modest effect, despite targeting both cognitive features and avoidance (Hoffman, 2007). One possible explanation for these modest effects is that current CBT programs do not focus on FPE. Given that CBT usually targets maladaptive cognitions using exposure-based techniques, if the specific type of feared situation (i.e., receiving praise for someone relatively high in FPE but low in FNE) is not included in treatment, exposure based-CBT may not target patients' predominant fears, and thus may not show strong treatment effects.

Furthermore, the effectiveness of CBT has been shown to be influenced by the use of emotion regulation strategies, both adaptive and maladaptive (Aldao, Jazaieri, Goldin & Gross, 2014; Goldin et al., 2014). Given that people experience the most emotion dysregulation, and thus engage in emotion regulation strategies, following stimuli they find most distressing, understanding the mechanisms by which some individuals become dysregulated may have numerous implications for understanding the mechanisms and success of CBT. Thus, properly identifying individual differences in which social situations cause fear may improve the efficacy of current treatments for SAD.

The Current Study

Given the relative paucity of work on evaluative concerns and the important potential theoretical and clinical implications, the purpose of the current study is to further examine individual differences in fears of evaluation in the context of emotion regulation. Specifically, while preliminary work has confirmed the presence of self-reported individual differences in evaluative concerns, it remains unclear if these

individual differences extend to behavioral and physiological manifestations of fears. Therefore, this study addresses two aims regarding the relations between self-reported individual differences in fears of evaluation and subjective and physiological responses to receipt of positive versus negative evaluation:

Aim 1: To confirm the presence of the FNE/FPE groups found in our pilot work.

Hypothesis 1: We hypothesize that four groups (i.e., representing individuals low on FNE/FPE, high on FNE, low on FPE, low on FNE, high on FPE, and high on FNE/FPE) will emerge. In addition, these groups will be distinguishable on measures of SA used to characterize our sample.

Aim 2: Examine the relations between emotion dysregulation, valence of evaluation presented and individuals' most endorsed concern.

Hypothesis 2a. Self-reported arousal will increase throughout the speech task. However, self-reported arousal will increase the most following receipt of feedback that matches their concern (i.e., someone who at baseline reported relatively high levels of FPE and relatively low levels of FNE receives positive feedback).

Hypothesis 2b. Given that high HRV reflects positive coping and physiological flexibility, we predict that HRV will decrease following receipt of feedback that best matches their individual concern.

Chapter 2: Methods

Participants

The study included 89 adult participants recruited as part of a larger study examining SA concerns in adolescents. Specifically, parent/adolescent dyads were recruited from two different groups; one where the parents reported that one of their adolescents exhibits concerns with SA (Clinic Referred Group), and a second group recruited for a study examining parent/adolescent relations (Community Control Group). The families recruited for the Clinic Referred group were informed that upon completing the study, they would receive feedback on their adolescent's level of mood and SA concerns, and would receive referrals to locations in the community where they could seek further diagnostic testing. Prior work using this recruitment method indicates that relative to gender- and age-matched Community Control adolescents, Clinic Referred adolescents display greater levels of SA symptoms, and associated features of SA (De Los Reyes, Aldao et al., 2012; Deros et al., 2017; Thomas et al., 2012).

In light of prior work using this approach to recruit adolescents high in SA, we expected this approach to also result in an enriched sample of adults (i.e., parents of adolescents) that overall displayed large individual differences in levels of SA symptoms and evaluative concerns. Specifically, genetic heritability has been shown to be high in SA and SAD, and particularly with evaluative concerns, with some studies showing that additive genetic influences account for as much as 42% of the variance in measures of evaluative concerns (Stein, Jang, & Livesley, 2002). Given this strong genetic heritability, we expected a substantial proportion of this sample of adults to express significant concerns with SA, in that half of the sample was being recruited through a

clinical evaluation for adolescent SA. Further, by recruiting our sample of adults from within a study where their adolescent child (Clinic Referred group) or the family unit (Community Control group) was the primary recruitment target, we hoped to reduce social desirability among our adult participants, particularly among adults at risk of experiencing SA (i.e., Clinic Referred group). Given that avoidance is a core feature of SA, attempts to recruit a sample of adults who exhibited concerns with fears of evaluation might have resulted in a sample evidencing relatively fewer concerns with negative and/or positive evaluation. However, a key strength of the recruitment strategy is that we recruited adults with the primary purpose of either their adolescent receiving a clinical evaluation or the family as a whole receiving an evaluation. Thus, we expected this approach to decrease the likelihood that our population, especially those who exhibited heightened concerns with SA, would avoid participating in the study.

Of the 90 adults recruited for the study, 60 were recruited via the Community Control group, and 30 were recruited via the Clinic Referred group. Of the 60 participants recruited as part of the Community Control Group, we excluded one participant's data due to experimenter error in the administration of the assessment. This resulted in a final sample of 89 adults. In addition, due to experimenter and equipment error during the application of heart rate equipment, we excluded nine individual's HRV data. Thus, all analyses utilizing HRV used the 80 participants with complete data. Of the 89 participants included in the primary analyses, approximately 11-12% of them fell above the clinical cut-offs for well-validated measures of SA symptoms (Social Interaction Anxiety Scale [SIAS] and Social Phobia Scale [SPS]; Mattick & Clark, 1998). Given that the 12-month prevalence rate of SAD in the general population is around 7% (see Kessler

at al., 2012), our sampling approach yielded a final sample of those enriched in their SA symptoms, as compared to the general population.

The final sample of 89 adults had a mean age of 43.80 years (SD = 9.67). Sixteen of those individuals identified as male and 73 identified as female. Participants identified their racial/ethnic background as White, Caucasian, American or European (31%), Black or African American (61%), Asian American (3%), American Indian (3%), Hispanic or Latino/a (4%) and/or "Other" (4%). Of note, these percentages represent more than 100% because of participants' option to identify themselves using multiple racial/ethnic backgrounds. Participants in the study identified their marital status as cohabitating or married (N = 42, 47%), separated/divorced/widowed (N= 23, 26%) or never married (N=24, 27%).

Measures

Fear of Negative Evaluation. To assess FNE, the Brief Fear of Negative Evaluation Scale was used (BFNE; Leary, 1983). The BFNE is a 12-item self-report scale designed to assess FNE in an adult population. The BFNE asks subjects to rate how characteristic specific qualities are of them (Example item: "I am afraid people will find fault with me"), ranging from 1 (not at all characteristic of me) to 5 (extremely characteristic of me). In previous work, the BFNE has been shown to possess strong psychometric properties, including excellent internal consistency, and ability to reliably distinguish SAD patients from non-anxious controls (Rodebaugh et al., 2011). In addition, given that previous work has indicated that the straightforward scoring of the BFNE (i.e., only using the 8 straightforwardly worded items; Rodebaugh et al. 2011)

exhibits superior psychometric properties to the full measure, we scored the BFNE using the straight-forward scoring method, which had a possible range of 8-40. In the current sample, this measure exhibited an excellent level of internal consistency (α= .94).

Fear of Positive Evaluation. The Fear of Positive Evaluation Scale (FPES) was used in the current study to measure FPE (Weeks et al., 2008). The FPES is a 10-item Likert scale that asks subjects to rate how true statements are of them (Example item: "I generally feel uncomfortable when people give me compliments."), ranging from 0 (not at all true) to 9 (very true). The FPES was designed to tap into several of the key components of FPE, namely being the center of positive attention, and social dominance dynamics, (e.g. group settings and authority figures). Total scoring of the FPES does not include the two reverse-scored item, and thus the FPES total score is represented by the eight straightforwardly worded items, which has a possible range of 0-72. Scores on the FPES show relatively large, positive relations to scores on the BFNE and other measures of SA symptoms, and show relatively low relations to measures of non-SA symptomatology (Weeks et al., 2008). Thus, the FPES demonstrates adequate convergent and discriminant validity. In addition, the FPES has been shown to be sensitive to treatment among those diagnosed with SAD (Weeks et al., 2012). In the current sample, we observed a good level of internal consistency (α= .87).

Social Anxiety Symptoms. Social anxiety concerns were measured using two scales. Social interaction related anxiety was assessed using the Social Anxiety Interaction Scale (SIAS; Mattick & Clark, 1998). The SIAS is a 20-item measure designed to assess anxiety related to initiating and maintaining interactions with people across a range of social situations. General SA symptoms, such as anxiety related to

performing various tasks like writing, eating, or drinking while being observed, were assessed using the Social Phobia Scale (SPS; Mattick & Clark, 1998). Both the SIAS and SPS utilize a 5-point Likert-type scale, with responses ranging from 0 (not at all characteristic of me) to 4 (extremely characteristic of me). Prior work has indicated that these scales show extremely high levels of internal consistency as well as validity as evidenced by strong convergence with other SA measures and weaker relations to measures or agoraphobia and panic disorder (Mattick & Clark, 1998). Consistent with evidence suggesting the straightforward scoring of the SIAS shows strong psychometric qualities, and in line with our previous work, we utilized the straight-forward scoring in the present study. Given this, our total score was calculated using the 17 straightforwardly scored items. Thus, the range for the SIAS-Straightforward Scoring is 0-68 and the SPS is 0-80. In the current study, we observed high levels of internal consistency for both the SPS and SIAS (α=.92 and α= .94, respectively).

Behavioral Tasks

Impromptu Speech Task. Behavioral and physiological responses to social stress and evaluative concerns were assessed using a modified version of the Impromptu Speech Task originally designed by Beidel and colleagues (Beidel et al., 1989; Beidel et al., 2010). Participants were asked to deliver a five-minute impromptu speech using up to three standardized topics, which were provided by the experimenter. After an introduction to the task, participants were given three minutes to prepare a speech on the topics of their choice. Previous research using versions of the Impromptu Speech Task has shown the task to reliably elicit social stress both in the general population and those

with SAD (Beidel et al., 1989; 2010, Beidel Turner & Morris, 1999). In addition, the Groningen Social Stress Task, a behavioral task that utilizes an impromptu speech task, has been shown to elicit both behavioral and physiological (e.g., HRV) changes in these populations (Bouma et al., 2009). See Appendix A for the Speech Task used in the present study.

Self-Reported State Arousal. State arousal (i.e., ratings provided before, during, and after experimental tasks) was assessed at several time-points throughout the assessment. To measure state levels of arousal, we utilized the Self-Assessment Manikin (SAM; Bradley & Lang, 1994). The SAM is a self-assessment tool that uses pictorial representations designed to assess a variety of affective states, including arousal. The SAM has been commonly used as a subjective measure of state levels of arousal (Bouma, et al., 2009; Oldehinkel et al.; 2011; Bouma Riese, Ormel, Verhulst, & Oldehinkel, 2011). Participants completed the SAM prior to the speech task, immediately following the completion of the speech task, and immediately following each piece of feedback.

Heart Rate Variability. Heart rate variability was measured using heart rate monitors, specifically Polar model Electro RS8000CX wristwatch monitors. Physiology was measured during the baseline period and the entire duration of the Impromptu Speech Task and subsequent feedback. For the baseline and Speech task periods, we collected approximately five minutes of HRV data, as consistent with the length of the task, while receipt of feedback yielded approximately 1.5 minutes of HRV, with some variation for rate of speech of the staff delivering it. Consistent with previous work using this methodology, measurements from the watches focused on the distance between heartbeats to index HRV (Anderson & Hope, 2009; De Los Reyes et al., 2012; De Los

Reyes et al., 2015). In addition, we used previously established cleaning and scoring procedures for these data. Specifically, we exported the inter-beat interval (IBI series), which represents the distance in milliseconds (ms) elapsed between one heartbeat and the next, from the heart rate monitors. Following exportation and consistent with previous work (De Los Reyes et al., 2012), we performed a mean replacement of outliers (defined as an IBI value of 1200 or above, or 200 and below). Following outlier replacement, the clean IBI series was imported into specialized software, CmetX (Allen, Chambers & Towers, 2007; Hibbert, Weinberg, & Klonsky, 2012). Within this software we obtained estimates of high frequency HRV. Specifically, we calculated the natural log of the band-limited (.12–40 Hz) variance of the IBI time series (log respiratory sinus arrhythmia [RSA]), which takes into account the influence of respiration on HRV and constitutes a robust measure of vagal-mediated cardiac influence (Allen, Chambers & Towers, 2007).

Procedure

Participants expressing interest in the study completed a 15-20 minute phone screen assessing basic eligibility criteria for both their adolescent and themselves. Families meeting basic screening criteria were invited to attend a single three-hour laboratory visit at the Comprehensive Assessment and Intervention Program. All study procedures are outlined in Figure 1. Prior to engaging in any study tasks, participants signed a written consent form explaining all procedures. Following consent, participants were instructed on how to administer and properly wear heart rate monitors (i.e., Polar Electro RS800CX wristwatch monitors) that tracked their heart rate. Once research

personnel was able to ensure proper placement of the heart rate monitors, participants completed a five-minute resting baseline period prior to engagement in any study tasks.

Following the baseline period, participants completed computer-administered questionnaires assessing the constructs described previously (see **Measures**). After completion of the questionnaires, participants were led into a room where the Impromptu Speech Task was introduced to them. Prior to administering instructions for the task, research personnel asked participants to indicate their current level of arousal using the SAM scale described previously (See **Measures**). This rating served as the baseline measure of arousal for the speech and feedback task. Following this rating, instructions for the speech task were introduced to participants. Participants were informed that following a three-minute time period to prepare their speech, they would be asked to perform a five-minute speech. Participants were instructed to deliver the speech into a camera, and that two observers would be watching in a separate room in the laboratory space. Specifically, they were informed that one observer would watch the first half of their speech, and the other observer would watch the second half of their speech. The current study utilized deception, as in reality; there were no observers in the other room listening to the participant's speech.

Following delivery of their speech, participants were asked to rate their post-speech arousal using the SAM measure. Research staff then "retrieved" the feedback from the observers and delivered it to the participants. Each participant received two pieces of feedback, one positive feedback and the other negative. Valenced (positive vs. negative) feedback was presented in counterbalanced order. Research staff administering the feedback were trained to employ positive and negative facial and vocal tone cues that

match the valence of the feedback being given (i.e., positive facial cues when delivering positive feedback). Feedback was identical for all participants and research staff read off a scripted sheet designed to appear as if it were written by the "observers". Again, deception was utilized. A single member of the research staff read all feedback, and participants were led to believe that the feedback came from two separate observers. In reality, all participants received standardized feedback regardless of performance on the task. See Appendix B for the positive and negative feedback used in the present study.

Immediately following receipt of each piece of feedback, participants were asked to complete a SAM rating and asked to wait alone in a laboratory room for five minutes. Thus, participants waited alone for five minutes following the speech task, following receipt of feedback 1, and following receipt of feedback 2. Following receipt of both pieces of feedback, participants were informed that they would be giving their speech a second time, and that during that presentation, the observers would be in the room with the participants. Consistent with the initial speech, participants were given three minutes to prepare their speech. After the preparation period, participants completed a final SAM rating, before being told that the observers were unavailable to watch their speech, and that the second speech will not be occurring. While participants completed this as part of the overall task, data from this period was not used in the present study, and will not be discussed further.

Finally, participants were instructed on how to remove their heart rate monitors. Given the deception described earlier, all participants were fully debriefed on all procedures and given the opportunity to ask any questions. Lastly, all participants received $50 compensation for their time and transportation commitment.

Data Analytic Plan

In order to examine our first hypothesis, confirming groups of individual differences in fears of evaluation, we first classified individuals who presented as high versus low in each fear of evaluation (**Hypothesis 1**). Specifically, consistent with prior work (Lipton et al., 2016), we dichotomized participant's total scores on the BFNE and FPES (see **Measures**), using the top 25% of participant scores as a cut-off. As in our previous work, we considered examining these constructs continuously, but our measures of evaluative concerns displayed relatively high multicollinearity in the current study (r= .60). Given this, entering both constructs as independent variables in a model would have likely impacted our statistical power. Thus, we dichotomized our key variables (Cohen, Cohen, West, & Aiken, 2003). This resulted in a markedly reduced correlation between the dichotomized variables (r = .45, p <.001), thus reducing the multicollinearity and providing additional power for our analyses. Following dichotomization, we created two nominal variables using the cut-off (i.e., 0 – below top 25%, 1 = above top 25%). Next, we collapsed these two dichotomized variables into a single variable that represents the four distinct categories, namely, individuals who were: (a) low on FNE and low on FPE (LowFNE-LowFPE), (b) high on FNE and low on FPE (HighFNE-LowFPE), (c) low on FNE and high on FPE (LowFNE-HighFPE), and (d) high on FNE and high on FPE (HighFNE-HighFPE). Once the groups were created, we used a Spearman Rank Correlation to examine the rank-ordering of the groups defined as "0s" and "1s". This allowed us to examine whether the ranks of the BFNE and FPES differ from each other, with lower correlations indicating greater individual differences between participants' rank orderings of the two constructs.

In addition, we conducted a multivariate analysis of variance (MANOVA) to explore group differences on means and standard deviations of the SA measures used to characterize our sample. For the MANOVA, the nominal variable denoting FNE/FPE group was entered as the independent variable, with the SA symptoms (i.e., scores from the SPS and SIAS described previously) entered as dependent variables.

Tests of our second hypothesis involved examining self-reported arousal ratings and physiological changes when receiving both negative and positive feedback for each participant. Given that these data constitute non-independent observations, the data violated key assumptions underlying general linear modeling (GLM). Given this, we examined our main hypotheses using Generalized Estimating Equations (GEE); an extension of the GLM that allows for correlated data structures (Hanley, Negassa, & Forester, 2003)

For the first GEE model examining differences in self-reported arousal following feedback (**Hypothesis 2a**), we used an identity link function with an unstructured correlation matrix. An unstructured matrix was chosen given the small number of dependent variables and the expectation that the variables will be normally distributed. The identity link function was used to reflect the repeated-measure dependent variable in our model. Specifically, we modeled the dependent variable (SAM score) as a function of three independent variables ("Time," "Feedback Condition," and "Evaluative Concern"). We entered as an independent variable one within-subjects "Time" factor to account for the assessment time point of the SAM (in descending order of baseline, post speech task, post 1st piece of feedback – Feedback 1, post 2nd piece of feedback – Feedback 2). Next, we entered as a second independent variable a within-subjects factor, "Evaluative

Concerns" to account for participants completing two measures of evaluative concerns (i.e., FNE/FPE group). We entered as a third independent variable a between-subjects factor "Feedback Condition", to account for which condition participants are in (in ascending order of either negative feedback first or positive feedback first). Lastly, we entered interaction terms accounting for all possible two-way interactions between variables (Feedback Condition x Time, Feedback Condition x Evaluative Concern, Time x Evaluative Concern) as well as the three-way interaction between our independent variables (Time x Feedback Condition x Evaluative Concern).

For the second GEE model examining differences in HRV following feedback (**Hypothesis 2b**), we again used an identity link function with an unstructured correlation matrix. For this model, we modeled the dependent variable (HRV, specifically the RSA metric described previously) as a function of three independent variables ("Time," "Feedback Condition," and "Evaluative Concern"). We entered as an independent variable one within-subjects "Time" factor to account for the assessment time point of the RSA metric described previously. Next, we entered as a second independent variable a within-subjects factor, "Evaluative Concerns" to account for participants completing two measures of evaluative concerns (i.e., FNE/FPE group). We entered as a third independent variable a between-subjects factor "Feedback Condition", to account for which condition participants are in (in ascending order of either negative feedback first or positive feedback first). Lastly, we entered interaction terms accounting for all possible two-way interactions between variables (Feedback Condition x Time, Feedback Condition x Evaluative Concern, Time x Evaluative Concern) as well as the three-way

interaction between our independent variables (Time x Feedback Condition x Evaluative Concern).

Sample Size Considerations

We proposed to recruit 85 participants. Given the relative paucity of work using subjective and physiological measures to examine individual differences in fears of evaluation, we conducted a Monte Carlo simulation to determine whether 85 participants would offer sufficient power for the planned analyses. Specifically, we set up a Monte Carlo GEE model with the hypothesized predictors' main effects and two-way interaction effects each predicting 10% (medium effect) of variance. In both Monte Carlo models we also assumed control variables to predict 10% of variance in the dependent variable. Results of the analysis revealed that with a sample size of 85, our power was .83 to detect medium main effects. We also observed power of .86 to detect hypothesized medium two-way interaction effects. Further, above and beyond main effects and the two-way interaction effects, we examined the hypothesized three-way interaction predicting an additional 10% of variance, a medium-sized effect. A sample of 85 participants provided power of .89 to detect these medium three-way interaction effects. Thus, the sample of 85 was hypothesized to provide enough power for our analyses.

Chapter 3: Results

Preliminary Analyses

Skewness and Kurtosis

Preliminary analyses revealed that both of our measures of evaluative concerns and one of our measures of SA met the statistical assumptions for the proposed analytic plan. Specifically, these measures displayed acceptable ranges of skewness (≈ +/−1.0) and kurtosis (≈ +/−1.0). However, one of our variables measuring SA, the SPS, exhibited high levels of skewness and kurtosis, and thus we applied a square-root transformation to account for this deviation. The transformed score displayed an acceptable level of skewness and kurtosis. All analyses reported below utilized this transformed score. Table 1 displays the means and standard deviations for all SA survey measures, and Table 2 displays the means and standard deviations for the subject's self-reported state arousal and HRV throughout the speech and feedback task. In addition, Table 3 displays the bivariate correlations between our measures of evaluative concerns (i.e., BFNE and FPES), and our trait measures of anxiety, while Table 4 displays the bivariate correlations of our measures of evaluative concerns and state measures of arousal (i.e., SAM and HRV).

Presence and characteristics of FNE/FPE Groups

Following implementation of the FNE/FPE grouping approach used previously (Lipton et al., 2016; see **Data-Analytic Plan)**, our data resulted in the following frequencies of individual differences in evaluative concerns: (a) low on FNE/FPE (LowFNE-LowFPE; N=56, 62.9% of total sample); (b) high on FNE, low on FPE (HighFNE-LowFPE; N=10, 11.3% of total sample); (c) low on FNE, high on FPE

(LowFNE-HighFPE; N=9, 10.1% of total sample); and (d) high on FNE/FPE (HighFNE-HighFPE; N=14, 15.7% of total sample). We utilized a Spearman's Rank Correlation to further examine the differences between the two constructs (i.e., individuals being high vs. low in FNE and FPE). Results revealed that individual's self-reported evaluative fears of negative and positive evaluation displayed a medium-magnitude relation with one another ($r = .45$, $p < .001$). Thus, while our data revealed a significant relation between measures of FNE and FPE, it did not reveal complete overlap between measures of these two constructs. These findings indicated that individuals exhibited enough variation in their reports of FNE and FPE to support the data-analytic plan described previously.

Relations between FNE/FPE group and social anxiety symptoms

In order to examine the relations between the FNE/FPE groups and SA symptoms, we conducted a MANOVA (see **Data-Analytic Plan**). Results revealed a significant main effect of evaluative concern group on levels of the dependent variables (i.e., SA symptoms scores); $F(6) = 13.14$, $p<.001$, partial $\eta^2=.31$. We conducted post-hoc univariate analyses to examine these differences between FNE/FPE groups. These analyses revealed that overall, the LowFNE-LowFPE group displayed the lowest level of SA symptoms compared to the other groups, all p's $<.05$. Individuals in both the HighFNE-LowFPE and LowFNE-HighFPE exhibited significantly greater levels of SA symptoms relative to the LowFNE-LowFPE group, all p's $<.05$; however were not significantly different from each other in their expression of SA symptoms, all p's $>.05$. Finally, individuals in the HighFNE-HighFPE group exhibited significantly higher levels of SA symptoms compared to all three other groups, with all p's $<.05$ (**Figure 2**). These

results were consistent with previous research identifying distinct profiles of FNE/FPE and their relations to SA symptoms in a college student sample (Lipton et al., 2016).

Relations Between Self-reported Arousal and FNE/FPE Groups During Feedback

To examine the relations between self-reported arousal and feedback we conducted GEE modeling using the data-analytic plan described previously (see **Data-Analytic Plan** section for details). Importantly, prior to analysis, we examined the number of individuals in each Evaluative Concern Group and Feedback Condition. Table 5 displays the number of individuals in each cell representing Evaluative Concern group and Feedback Condition. Due to one cell, specifically individuals in the LowFNE-HighFPE group who received negative feedback first being represented by a single participant, this group was excluded from all subsequent analyses.[1] The primary analysis revealed a significant main effect for two of the three main factors including Time (Wald $X^2 = 115.73$; $p < .001$), and Evaluative Concerns (Wald $X^2 = 33.37$; $p < .001$). The model revealed a non-significant main effect of Feedback Condition (Wald $X^2 = 0.88$; $p = .39$). Importantly, the significant main effect of Time provided evidence that the newly designed speech and feedback tasks performed as expected based off of previous

[1] We also ran this analysis including the single participant described here (i.e., the individual in the LowFNE-HighFPE group who received negative feedback first. Consistent with the results presented above, we observed a significant main effect of Time (Wald $X^2 = 124.69$; $p < .001$), and Evaluative Concerns (Wald $X^2 = 22.93$; $p < .001$) and a non-significant main effect of Feedback Condition (Wald $X^2 = 1.45$; $p = .23$). We also observed significant interaction effects for all two-way interactions included in the model; a Time x Evaluative Concern interaction (Wald $X^2 = 26.47$; $p < .01$), Time x Feedback Condition interaction (Wald $X^2 = 42.39$; $p < .001$), and an Evaluative Concern x Feedback Condition interaction (Wald $X^2 = 34.21$; $p < .001$). Lastly, we observed a significant 3-way interaction of Time x Evaluative Concern x Feedback Condition (Wald $X^2 = 37.39$; $p < .001$).

literature. Specifically, for the Time factor, self-reported arousal was the lowest during Baseline, and highest during the Speech Task, and the effect size for this change was extremely large (Cohen's *d*= 1.56). Self-reported arousal significantly decreased following the receipt of Feedback 1 (i.e., the first piece of feedback presented), and significantly decreased again following the receipt of Feedback 2 (i.e., the second piece of feedback presented). Thus, individuals appeared to respond as expected to the social stressor (i.e., the speech task) and express increased arousal, but displayed different levels of arousal depending on the feedback condition, thus providing initial evidence for individual differences in the experience of feedback. However, given that Feedback 1 and Feedback 2 varied depending on which Feedback Condition individuals were in (i.e., whether Feedback 1 was positive vs. negative), these effects are best interpreted by the interactions discussed below.

Overall, these initial main effects were qualified by several significant two-way interactions within the model. The analyses revealed significant interaction effects for two of the proposed two-way interactions included in the model; a Time x Evaluative Concern interaction (Wald $X^2 = 22.57$; $p < .01$) and a Time x Feedback Condition interaction (Wald $X^2 = 22.51$; $p < .001$). We did not observe a significant effect for the Evaluative Concern x Feedback Condition interaction (Wald $X^2 = 1.77$; $p = .41$). These significant two-way interactions, however, were qualified by a significant 3-way interaction of Time x Evaluative Concern x Feedback Condition (Wald $X^2 = 20.02$; $p < .05$).

Post-hoc univariate analyses revealed different patterns for response to receipt of the Feedback 1 and Feedback 2 when they received positive feedback first, compared to

those individuals receiving negative feedback first (**Figure 3**). For those receiving positive feedback first, individuals in all FNE/FPE groups exhibited a significant increase in self-reported arousal from Baseline to Speech Task, as well as significant decrease from Baseline to Feedback 1 (i.e., positive feedback). However, self-reported arousal at Feedback 2 (i.e., negative feedback) differed by FNE/FPE group such that individuals in the LowFNE-LowFPE and HighFNE-LowFPE did not show any significant change from Feedback 1 to Feedback 2, while individuals in the HighFNE-HighFPE reported a significant increase in self-reported arousal from Feedback 1 to Feedback 2. In addition, while they did not exhibit a significant change, those in the LowFNE-HighFPE group also reported an increase in self-reported arousal from Feedback 1 to Feedback 2. Overall, these results suggest that for individuals who receive positive feedback first, self-reported arousal may be "buffered" for receipt of negative feedback, thus leading relatively low levels of self-reported arousal following negative feedback, compared to the heightened arousal during Speech. However, for individuals who express heightened concern with FPE, this positive feedback does not provide the same buffer, and individuals expressed an increase in arousal. Furthermore, we examined differences in the groups while receiving each piece of feedback (i.e., did individuals in the groups show different levels of self-reported arousal while receiving negative vs. positive feedback). For individuals who received positive feedback first, there were no significant differences between the FNE/FPE groups at Feedback 1 or Feedback 2.

We further examined differences between the FNE/FPE groups when individuals received negative feedback first. Analyses revealed that all groups experienced a significant increase in self-reported arousal from Baseline to Speech Task. The groups

also showed different patterns of change from Speech to Feedback 1(i.e., negative feedback). While individuals in the LowFNE-LowFPE and HighFNE-LowFPE group experienced a decrease in self-reported arousal from Speech to Feedback 1, that change was only significant in LowFNE-LowFPE group. Conversely, individuals in the HighFNE-HighFPE group experienced an increase in self-reported arousal from Speech to Feedback 1, but this change was not significant. Thus, it appears that expressing any evaluative concerns led to either heightened arousal from Speech to Feedback 1, or arousal that matched the level of that elicited during the speech task. Individuals in all groups experienced a decrease in arousal from Feedback 1(i.e., negative) to Feedback 2 (i.e., positive), with significant change in all groups except the HighFNE-LowFPE. This indicated that in our sample, individuals who endorsed higher fears with FNE reported similar levels of arousal when receiving positive feedback when preceded by negative feedback. As above, we examined whether the FNE/FPE groups differed at Feedback 1 and Feedback 2 when participants received negative feedback first. During receipt of negative feedback, the HighFNE-HighFPE group showed the greatest level of self-reported arousal relative to all three other groups, with no other group differences noted. This finding is consistent with previous evidence suggesting that individuals who express concerns with both fears of evaluation appear to display the highest levels of arousal and associated internalizing symptoms and impairment (Lipton et al., 2016). Thus, our hypothesis that self-reported arousal would be highest for the feedback that best matches individual's most endorsed concern was not supported.

Relations Between HRV and FNE/FPE Groups During Feedback

To examine the relations between emotion regulation, as measured by HRV, and feedback, we conducted a second GEE using the data-analytic plan described previously (see **Data-Analytic Plan**).[2] Consistent with the results for self-reported arousal, the analysis revealed a significant main effect for Time (Wald $X^2 = 11.19$; $p < .05$). The main effect of Time revealed important information about the task in general. Results revealed that overall; individuals exhibited a significant decrease in HRV (e.g. a representation of physiological flexibility and coping) from Baseline to Speech, thus representing difficulty with regulating emotions during this stress-induced task. Again, the effect size for this change was relatively large (Cohen's d= -1.41). However, contrary to our hypothesis and the results from self-reported arousal, overall, individuals did not differ significantly in their expressions of HRV during receipt of Feedback 1 and Feedback 2 (i.e., positive and negative feedback; see below for additional details).

Additionally, in contrast to our findings from self-reported arousal, we did not observe a significant main effect of Evaluative Concerns (Wald $X^2 = 4.17$; $p = .24$) or Feedback Condition (Wald $X^2 = 41.53$; $p = .21$). We did observe several significant two-way interactions; a Time x Evaluative Concern interaction (Wald $X^2 =17.82$; $p < .05$) and

[2] This GEE model also excluded the individual in the LowFNE-HighFPE group who received negative feedback first. Similar to our results above, we also ran this analysis including this individual. Results of this analysis revealed a significant main effect of Time (Wald $X^2 = 11.19$; $p < .05$) and Evaluative Concerns (Wald $X^2 = 58.95$; $p < .01$). In addition, there was a significant main effect for Feedback Condition (Wald $X^2 = 4.56$; $p < .05$). Results also revealed significant two interactions, specifically a Time x Evaluative Concern interaction (Wald $X^2 =31.81$; $p < .001$), Time x Feedback Condition interaction (Wald $X^2 = 23.45$; $p < .001$), and an Evaluative Concern x Feedback Condition interaction (Wald $X^2 = 46.61$; $p < .001$). Additionally, we observed a significant 3-way interaction of Time x Evaluative Concern x Feedback Condition (Wald $X^2 = 34.32$; $p < .001$).

Time x Feedback Condition interaction (Wald $X^2 = 16.62$; $p < .05$). We did not observe a significant Evaluative Concern x Feedback Condition interaction (Wald $X^2 = 1.06$; $p = .59$). Lastly, in contrast to our findings for self-reported arousal, we did not observe a significant 3-way interaction of Time x Evaluative Concern x Feedback Condition (Wald $X^2 = 8.36$; $p = .21$). Thus, our hypothesis that HRV would be lowest when individual's were presented feedback that best matched individuals' most endorsed concern was not supported.

Chapter 4: Discussion

Main Findings

We examined individual differences in evaluative concerns and response to feedback, highlighting both self-reported arousal and physiological flexibility as indexed by HRV. There were six main findings. First, we replicated our previous findings highlighting significant heterogeneity in endorsement of evaluative concerns in a community sample of adults enriched for displays of SA and evaluative concerns. Participants reported varying levels of evaluative concerns, consistent with our previous study of emerging adults (Lipton et al., 2016), representing individuals who were low in FNE/FPE, individuals high in FNE but low in FPE, those low in FNE but high in FPE, and a group of individuals who reported high levels of FNE/FPE. Second, also consistent with our previous research, individuals in these groups significantly differed in self-reported levels of SA fears. Individuals expressing low levels of both FNE/FPE displayed the lowest levels of symptoms, followed by individuals relatively high in either FNE or FPE, and those with high levels of both concerns expressing the highest levels of SA symptoms. Importantly, those expressing high levels of either FNE or FPE did not significantly differ from each other.

Third, we found evidence that we could elicit fears of evaluation in a laboratory task utilizing in-the-moment feedback. Specifically, we found both self-report and physiological evidence supporting the utility of this task in eliciting social stress for all individuals, with significant stress observed during the speech task, while eliciting different responses to positive vs. negative feedback. Fourth, we found mixed support that when examining self-reported arousal, individuals in the four groups identified above

showed varying levels of responses to positive and negative feedback. This effect, however, varied depending on whether individuals received positive or negative feedback first. Overall, contrary to our hypothesis, individuals did not display the highest level of arousal when receiving the feedback that best matched their endorse concerns. However, for individuals expressing relatively low concerns with FPE (i.e., LowFNE-LowFPE and HighFNE-LowFPE groups), and receiving positive evaluation first, their arousal was significantly lower during both valences of feedback, and they did not experience a significant increase in arousal while receiving negative feedback following positive feedback. In contrast, for those expressing concerns with FPE, they expressed heightened arousal during the negative feedback. This suggests that positive feedback may provide a buffer for receipt of negative feedback, but this effect is only present in individuals who do not show elevated FPE.

Fifth, we found mixed support for the efficacy of our task when examining emotion regulation as indexed by HRV. Overall, individuals displayed a decrease in HRV from Baseline to Speech task, highlighting a decrease in physiological flexibility and thus a decrease in emotion regulation, thus providing support for the first portion of our speech and feedback task. However, we did not find support for differences in expression by the groups of HRV for negative vs. positive feedback. Sixth, we did not find support that HRV was significantly lower (e.g., poor emotion regulation and coping) for those expressing FNE and receiving negative evaluation, or those expressing FPE and receiving positive evaluation. Thus, our hypothesis that emotion regulation, as indexed by HRV, would be significantly lower when receiving the feedback that matched individual's most endorsed concern was not supported.

There are several reasons we may have observed mixed support for some of our hypotheses. First, testing interaction effects proved difficult as this involved probing effects within subgroups in our sample with small N's (see Table 3). Specifically, individuals expressing elevation in either or both evaluative concern made up approximately 37% of our sample, again representing an enriched SA sample. However, these individuals were distributed amongst three of our four main groups, and were divided even further according to receipt of our experimental conditions. Consequently, for probing of one of our interaction effects, one level of this effect (i.e., those in the LowFNE-HighFPE group receiving negative feedback first) was represented by only one individual and was subsequently dropped for all analyses of our second aim. Thus, our relatively low sample of individuals expressing heightened concerns with FPE, in addition to unequal cell size, may have contributed to our lack of significant findings on individual differences in response to feedback.

Second, it is possible that the mixed evidence may be due to the fact that participants received both positive and negative feedback within a few moments of each other. That is, we found that for most individuals, arousal following negative feedback was higher than following positive feedback. Recent research examining both negative and positive cues in feedback situations has found evidence suggesting that overall, individuals higher in SA demonstrate a bias towards negative information, even when positive information is provided, and that overall, negative feedback may be more salient (Bautista & Hope, 2015). Thus, providing both valences of feedback within the same 10-minute time period may have impacted how participants experienced each piece of feedback, and may have contributed to the lack of predicted effects. To our knowledge,

this is the first study to employ live, face-to-face positive and negative feedback following a performance-based task in research on evaluative concerns. Future work should examine whether providing individual pieces of feedback (i.e. one valence at each of two independent testing sessions) would yield the predicted effects.

Another possible explanation for our mixed findings was our utilization of deception, in that individual observers were not actually present in the room with our participants. That is, the fear of social evaluation and social stress may have been reduced by the absence of individuals physically in the room. A meta-analysis of social-evaluative tasks and cortisol responses found the strongest effects of eliciting physiological arousal when individuals were physically present in the room, compared to videotaping the session (Dickerson & Kemeny, 2004). They also noted that studies where two forms of social evaluation were used (i.e., the speech was both videotaped and in front of a live audience) exhibited higher effect sizes than those utilizing one form of social evaluation. Given this, it is possible that the lack of a true live audience might have reduced the effect of our social stressor task. Yet, our data points to a relatively high effect size for both self-reported arousal and HRV with regard to change from Baseline to Speech task (Cohen's d = 1.56 and -1.41 respectively). Thus, it appears our task sufficiently elicited increased arousal and decreased emotion regulation during the speech task, a finding that rules out the possibility that our social stressor task did not effectively induce social stress. While it is clear that we elicited arousal, a key theoretical component of FPE involves the public nature of praise or positive evaluation (Weeks et al., 2008). Thus, while our elicitation of arousal was not impacted by the lack of live observers, it is possible that by not having live observers or other individuals present while feedback was

being presented, we may have failed to elicit a key component of one of our evaluative concerns, potentially leading to our lack of significant findings for FPE. In any event, the possibilities for the mixed support of some of our hypotheses point to a need for future research to replicate and extend our findings with a larger sample.

Theoretical and Clinical Implications

The findings of this study have significant important theoretical, research, and clinical implications. First, we were able to replicate the profiles of individual differences in evaluative concerns previously identified in an unselected, college student sample (Lipton et al., 2016). Importantly, these profiles represented individuals with heightened concern with FNE, but relatively low concerns with FPE, and vice versa, as well as individuals expressing heightened concern with both, in a sample of community adults. In addition, consistent with our previous findings, these individuals showed varying levels of SA symptoms, such that those with elevated concern with both FNE and FPE evidenced the highest levels of SA symptoms, thus suggesting a cumulative effect of evaluative concerns. While it will be important to further examine these profiles in a clinical population of individuals with SAD, these findings represent an important extension to our previous finding, and thus an important step towards understanding factors that may maintain SA and related concerns.

Second, validating these concerns in an additional population further highlights the important potential treatment and diagnostic implications for these findings. It has been previously documented that the majority of treatments currently available for SAD focus primarily on FNE (Rapee & Heimberg, 1997; Weeks et al., 2008). While this

makes practical sense given that the current diagnostic criteria focus exclusively on FNE as a key component of SAD (Bogels et al., 2010), our study's findings highlight the need to examine the role of FPE in treatments for SAD. Given that a significant portion of individuals expressed elevated concern with FPE, it is possible that current treatments might be inappropriate to meet their treatment needs. In fact, current research highlights that even evidence-based treatments for SAD (i.e., CBT) show modest effects at best (Hofmann, 2007). Thus, future research should examine the possible role that positive evaluation could have in treatments for SAD, and if this may yield any improvements in treatment efficacy.

Third, an additional and related clinical implication arose from our finding of a "buffer effect" of receiving positive evaluation first. That is, for individuals who received positive evaluation prior to negative evaluation, and did not express concerns with positive evaluation, they did not report an increase in arousal when receiving negative feedback, and some experienced a decrease in arousal, despite showing elevated FNE. Thus, it appears that for those who report primary concern with negative evaluation, receiving positive evaluation may provide a shield against subsequent exposure to negative evaluation. As stated above, the majority of current treatments for SAD focus on exposure or cognitive-based techniques to target these fears (Clark & Wells, 1995; Rapee & Heimberg, 1997). Our findings suggest a possible avenue to improve treatment is to incorporate this effect into treatment for FNE and associated concerns. Thus, we encourage further research on how this effect may be incorporated into treatment packages and possible response to current treatments for SAD and related concerns.

Limitations

Four limitations to the current study should be noted. First, although we employed a recruitment strategy that yielded a sample enriched in SA and related concerns, the majority of participants still endorsed relatively low levels of FNE, FPE, and associated SA concerns. Importantly, while this work represented an extension of our previous work in college students, as we were able to validate profiles of FNE and FPE in an adult community sample, further examination is needed utilizing a clinical sample of individuals with SAD. Additionally, as noted above, we observed significant variation in the cell sizes of our groups, with individuals low in both FNE and FPE representing the greatest number of individuals in our sample. Future work should seek to extend these findings utilizing a sample with less heterogeneity in group size. Additionally, due to our lack of a clinical sample, we were also limited in our ability to examine the potential role of FNE and FPE on clinical and functional impairment. Specifically, while we were able to test the relative weight of FNE/FPE on symptoms of SA, we did not assess for functional impairment within our sample. Thus, we were unable to draw conclusions on the relative impact of evaluative concerns on functional and clinical impairment. Again, use of a clinical sample of with elevated SA and SAD, who are more likely to exhibit these concerns could also provide additional insight into these findings.

Second, in line with best practices to properly evaluate anxiety and related concerns, we utilized a multi-method approach to assess stress and feedback (Silverman & Ollendick, 2005; Antony & Rowa, 2005). While this likely provided greater ecological validity than utilizing self-report concerns alone, assessing social stress using a speech

task only gets at a single social stressor. Public speaking or performing a speech has been consistently shown to be on the most salient concerns for those experiencing elevated SA (see Biedel et al., 1989; Turner et al., 1992; Botella, Hofmann, & Moscovitch, 2004), and several studies have found support that speech tasks are reliable and valid ways to assess both self-reported and physiological reactions to stress (Dickerson & Kemeny, 2004). However, speech tasks are not the only tasks that elicit social stress, and they comprise but a subset of social situations relevant to understanding SA. In fact, it is possible that individuals may receive and have reactions to positive or negative evaluation in a variety of contexts, including those where performance is not a factor (e.g., in group meetings, one-on-one meetings or evaluations, social gatherings). Future studies should employ a wider range of social interaction and stressor tasks to more fully examine fears of evaluation in various contexts.

Third, we utilized HRV as our metric for examining emotion regulation in relation to evaluative concerns. Overall, our findings did not reveal significant relations between emotion regulation and responses to feedback in the context of the evaluative concern groups, and it is possible that our decision to use HRV led to these non-significant findings. While there is significant evidence showing the utility of heart rate metrics, including HRV as valid physiological measures of emotion regulation (Thayer et al, 2012), they are not the only metrics that could be utilized. Specifically, research has also highlighted use of techniques such as Skin Conductance Response (Shepard & Wild, 2014; Gruber, Hay, & Gross, 2014) and startle and eye-blink response (White et al., 2014). Additionally, while HRV is thought to represent underlying brain function, specifically in the amygdala (see Thayer et al., 2012; Lane et al., 2009), research suggests

it might be more useful to examine brain-based mechanisms more directly (Etkin, Buchel, & Gross, 2015). Thus, an important direction for future work is to further examine the relation between emotion regulation and evaluative concerns utilizing various methods of psychophysiology and brain-based measures.

Last, in order to carry out or analyses, we dichotomized participants' scores on our measures of evaluative concerns. We chose this approach for several reasons. First, we wanted to remain consistent with our pilot work, in order to expand upon previous findings (Lipton et al., 2016). Second, given that FNE and FPE share considerable theoretical overlap and show strong correlations, we were concerned that entering them as independent variables would have reduced our statistical power, especially considering we were examining multiple complex interactions (Cohen et al., 2003). Indeed, when we entered both constructs into our model continuously, we were underpowered to detect the interaction effects needed to examine our aims. Thus, we encourage future work to utilize a larger sample and thus increased power to examine these aims using continuous scores of evaluative concerns.

Concluding Comments

Our findings extended previous work by confirming the presence of individual differences in evaluative concerns in an adult community sample. As seen in previous work, individuals who varied in their expression of FNE/FPE related uniquely to symptoms of SA. Additionally, we examined the relations between evaluative concern and responses to feedback as indexed by self-reported arousal and HRV. We found some evidence of individual differences in response to experience social stress and exposure to

evaluative concerns. Importantly, these responses varied based off of individual's most endorsed concern (i.e., FNE vs. FPE), and the order in which they received feedback (i.e., positive feedback vs. negative feedback first). We also noted that receiving positive feedback appeared to create a buffer effect for receipt of negative feedback, but only for those individuals who did not express concerns with FPE. These findings have important theoretical and clinical implications for the assessment and treatment of SA, FNE, and FPE. We encourage future work to further examine individual differences in FNE/FPE and response to feedback in a wider range of settings and contexts (e.g. other social situations) and populations (e.g., clinical samples of SAD).

Table 1
Means (M) and Standard Deviations (SD for Survey Reports

Variable	***M***	***SD***
SPS		
Raw Score	13.08	11.71
Square Root Transformed	3.27	1.55
SIAS – SF		
Raw Score	12.92	11.54
BFNE – SF		
Raw Score	16.53	7.54
FPES		
Raw Score	21.37	15.63

Note. **SPS** = Social Phobia Scale; **SIAS-SF** = Social Interaction Anxiety Scale – Straightforward Scoring; **BFNE-SF** = Brief Fear of Negative Evaluation Scale – Straightforward Scoring; **FPES** = Fear of Positive Evaluation Scale.

Table 2
Means (M) and Standard Deviations (SD) Estimates of Self-reported Arousal *(N=89) and HRV (N=80)*

Variable	***M***	***SD***
Baseline		
SAM Rating	1.47	0.64
HRV	7.89	1.15
During Speech		
SAM Rating	2.88	1.10
HRV	6.02	1.48
Feedback #1		
SAM Rating	2.08	1.09
HRV	6.23	1.83
Feedback #2		
SAM Rating	1.86	0.99
HRV	6.32	1.80

Note. **SAM** = Self-Assessment Manikin; **HRV**= Heart Rate Variability, as measured by the RSA metric.

Table 3
Correlations among Survey Measures of Evaluative Concerns and Trait Social Anxiety Symptoms

Variable	**1**	**2**	**3**	**4**
1. BFNE-SF		.60**	.73**	.68**
2. FPES			.68**	.62**
3. SIAS – SF				.68**
4. SPS				

Note. **BFNE-SF** = Brief Fear of Negative Evaluation Scale – Straightforward Scoring; **FPES** = Fear of Positive Evaluation Scale; **SIAS-SF** = Social Interaction Anxiety Scale – Straightforward Scoring; **SPS** = Social Phobia Scale – Square Root Transformed.

** $p<.01$.

Table 4
Correlations among Survey Measures of Evaluative Concerns and State Arousal

Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1. BFNE-SF		.60**	.24*	.27*	.39*	.25*	.24*	.10	.24*	.07
2. FPES			.23*	.33**	.31**	.32**	.03	-.06	.08	-.13
3. SAM Baseline				.37**	.42**	.39**	.11	.12	.23*	.07
4. SAM During Speech					.39**	.43**	.22*	.17	.23*	.14
5. SAM Feedback #1						.23*	.21*	.13	.18	.18
6. SAM Feedback #2							-.04	-.04	.02	-.03
7. HRV Baseline								.55*	.64**	.55*
8. HRV During Speech									.75**	.71**
9. HRV Feedback #1										.62**
10. HRV Feedback #2										

Note. **BFNE-SF** = Brief Fear of Negative Evaluation Scale – Straightforward Scoring; **FPES** = Fear of Positive Evaluation Scale; **SAM** = Self-Assessment Manikin; **HRV**= Heart Rate Variability, as measured by the RSA metric. $^{*}p<.05$; $^{**}p<.01$.

Table 5
Cell Size (N) of Participants Grouped by FNE/FPE Group and Feedback Received First

Evaluative Concern Group	Positive Feedback First	Negative Feedback First
LowFNE-LowFPE	28	28
HighFNE-LowFPE	6	4
LowFNE-HighFPE	8	1
HighFNE-HighFPE	8	6

Figure 1
Study Procedure

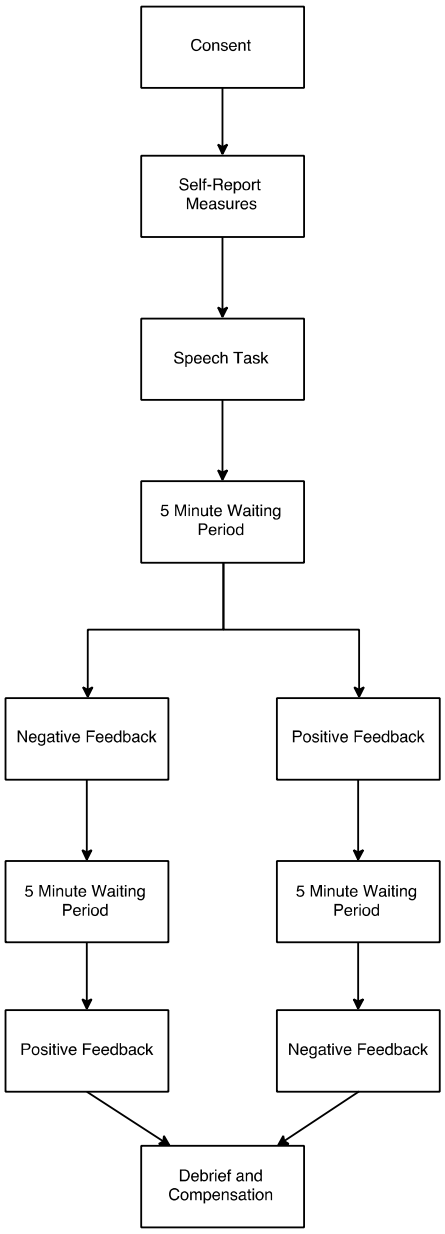


Figure 2

Graphical Depiction of Marginal Means of Trait Social Anxiety Symptoms by FNE/FPE Group.

Notes: SIAS = Social Interaction Anxiety Scale; SPS = Social Phobia Scale.

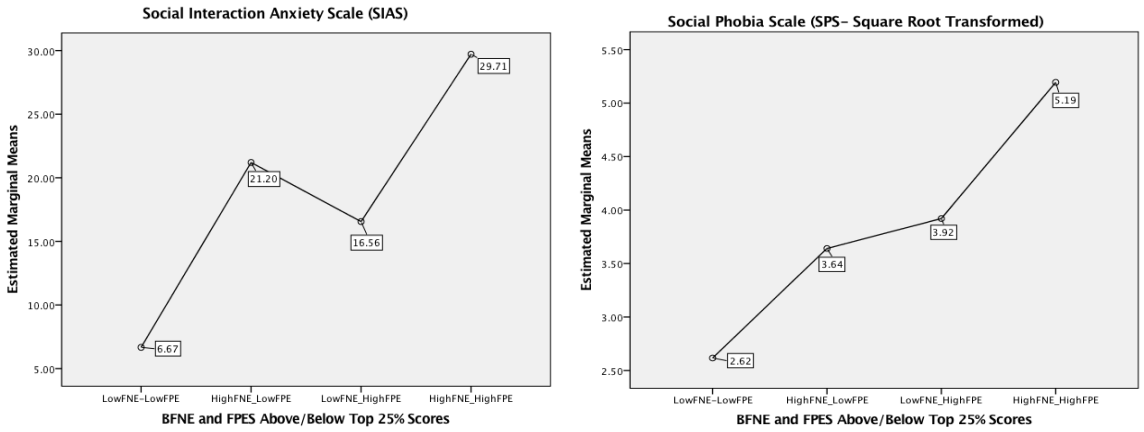
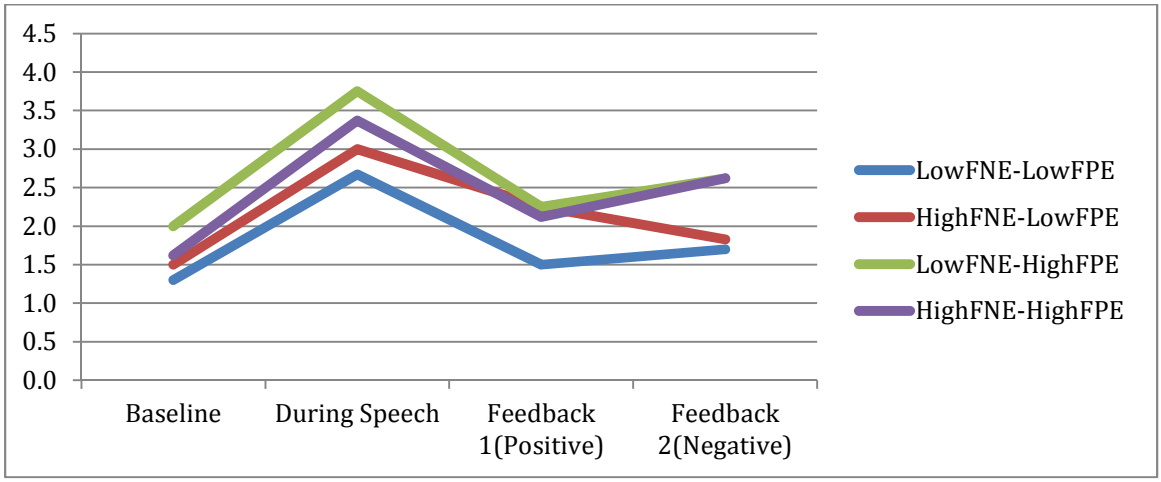
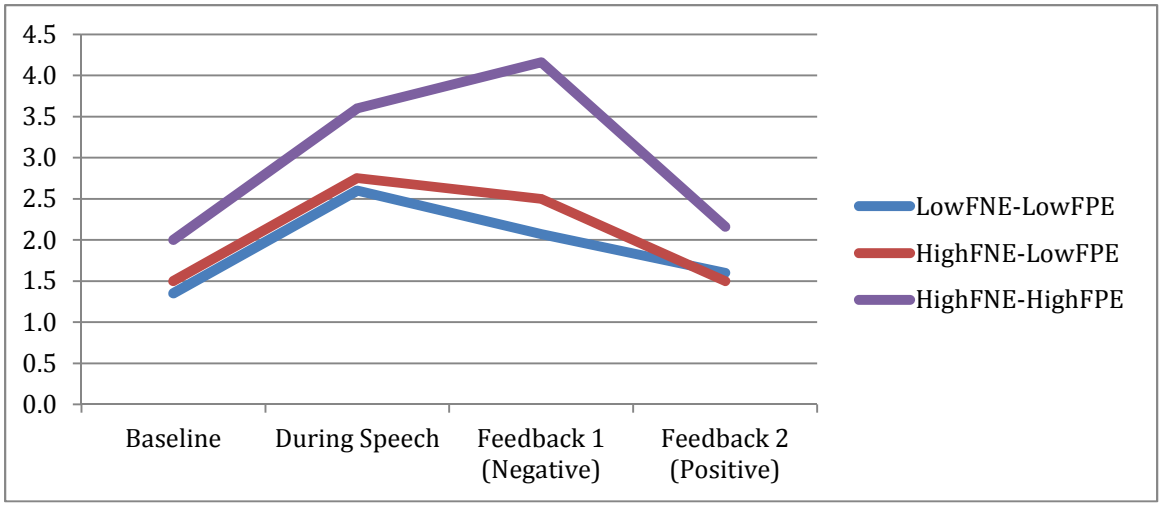


Figure 3

Graphical representation of the interaction between Time, Evaluative Concerns, and Feedback Condition for Self-Reported State Arousal





Appendix A: Speech Task

"In a few minutes, I am going to ask you to give a 5 minute speech in front a small audience that will be watching in the other room. I will ask you to face the camera and give your speech. Two observers will be watching your speech; one observer will watch the first half of your speech and the second observer will watch the second half of your speech. On the index card in front of you are 3 topics that you might use for the presentation. You will have 3 minutes to prepare the speech. There are paper and pen on the table that you can use to organize your thoughts. However, you will not be able to use your notes when you speak. I will tell you when three minutes are up. "

Topics:

What are the qualities of a good United States President?

Should all states adopt mandatory no smoking in public places laws?

What should be the legal drinking age and/or penalties for drunk driving?

Appendix B: Negative and Positive Feedback

Negative Feedback

You did not do a good job of discussing the topics provided.

You were very difficult to understand while presenting your speech.

You appeared very uncomfortable and fidgety during your speech.

Positive Feedback

You presented your points on the topics very well.

You did a great job of engaging the audience during your speech.

You appeared very calm and composed while presenting your speech.

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