Examining Generalized Anxiety Disorder during social interactions: cardiac activity, and the influence of affect

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entitled

Examining Generalized Anxiety Disorder During Social Interactions: Cardiac Activity, and the Influence of Affect

By

Joanna I. Piedmont

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

Master of Arts Degree in

Psychology

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December, 2015
An Abstract of
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The current study is aimed at developing a multi-dimensional approach to understanding Generalized Anxiety Disorder (GAD). Within the United States there is a 2.9% prevalence rate of GAD over 12 months among adults, with a lifetime risk of 9.0% (American Psychiatric Association, 2013). This common disorder has been a significant area of study over the past several decades and various researchers have attempted to understand the factors that cause, maintain, and prevent GAD (Borkovec et al., 2004; Newman et al., 2011). The current study aimed to investigate infrequently assessed components (i.e., affect, heart rate variability, social abilities, and social perceptions) of GAD. A sample of 57 undergraduate participants completed measures of general anxiety, affect, and depression. They then entered a laboratory setting where they completed baseline measures of affect and worry, while ECG was recorded continuously throughout the duration of the study. Participants engaged in four subsequent phases: affect manipulation, two social interaction situations, and a recovery period. Some findings lend support to the Negative Contrast Avoidance Model, and results indicate that individuals with GAD present as being submissive, and are more likely to find others to be dominant, hostile, and less affectionate.
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List of Abbreviations

ANS…………….…..Autonomic Nervous System

BAI…………….…..Beck Anxiety Inventory
BDI…………….…..Beck Depression Inventory

CBT…………….…..Cognitive Behavioral Therapy

DFI…………….…..Desire for Future Interaction
DSM…………….…..Diagnostic and Statistical Manual

ECG…………….…..Electrocardiogram

GA…………….…..Generalized Anxiety
GAD…………….…..Generalized Anxiety Disorder
GAD-Q-IV……….…..Generalized Anxiety Disorder Questionnaire Fourth Edition

HR…………….…..Heart Rate
HRV…………….…..Heart Rate Variability

IMI…………….…..Impact Message Inventory

MDD…………….…..Major Depressive Disorder

PANAS…………….…..Positive and Negative Affect Schedule
PNS…………….…..Parasympathetic Nervous System
PSWQ…………….…..Penn State Worry Questionnaire
PTQ…………….…..Post Task Questionnaire

SNS…………….…..Sympathetic Nervous System
STAI…………….…..State-Trait Anxiety Inventory
Chapter One
The Problem

Generalized Anxiety Disorder (GAD) is a highly prevalent disorder (2.9% prevalence over 12 months, APA, 2013), that is frequently found to be comorbid with other psychological disorders and medical conditions. Despite its prevalence, GAD is still not fully understood. Its diagnostic criteria have been evolving since the DSM-III (3rd ed., rev.; DSM-III-R; American Psychiatric Association, 1987), and its conceptualization has changed significantly, as evidenced by evolving but insufficient understandings of this disorder. Despite limitations in understanding this disorder, it is known that GAD generally begins in childhood or adolescence and has a chronic course. GAD is highly resistant to both pharmacological and psychological treatments (Borkovec, Newman, Pincus, & Lytle, 2002; Sanderson & Wetzler, 1991; Zuelling & Newman, 1996) and has a high financial burden on both specialty mental health care and also primary care. Its symptoms overlap with other psychiatric and medical conditions, which is problematic in terms of differential diagnosis and prescribing treatments. Until this disorder is better understood, it will be difficult to prevent and treat. One way to improve our understanding and treatment of GAD is to get back to the bench and experimentally test the validity of theories that are influencing clinical work. The current study aimed to improve understanding of the physiological, affective, and social components of GAD.
A. Introduction

a. GAD and Worry

1. Generalized Anxiety Disorder. GAD is characterized by abnormally high levels of worry and anxiety. The Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5) lists the diagnostic criteria of GAD as (1) excessive levels of anxiety and worry occurring more often than not for at least 6 months, on a variety of topics; (2) the worry is difficult to control; (3) the anxiety and worry are associated with at least three symptoms (restlessness, fatigue, difficulty concentrating, irritability, muscle tension, and sleep disturbance); (4) the anxiety and worry must cause significant distress or impairment; and (5) the disturbance is not due to the effects of any substance or any other mental disorder (American Psychiatric Association, 2013). These criteria must all be met in order for the diagnosis of GAD to be applied to an individual.

Diagnostic criteria for GAD has evolved with editions of the DSM, beginning with its predecessors “anxiety reaction” and “anxiety neurosis”, in the DSM and DSM-II, respectively (American Psychiatric Association, 1952, 1968). The DSM-III created more distinctions among the anxiety disorders, and reflected a more advanced definition of GAD by isolating other anxiety disorders (e.g., panic disorder/agoraphobia, post-traumatic stress disorder, etc.), and specifying symptoms for GAD, none of which included worry (DSM-III; American Psychiatric Association, 1980). These criteria for the DSM-III were considered weak by the psychological community, as significant diagnostic overlap among anxiety disorders still existed. The validity of GAD was yet to be sufficiently supported with adequate empirical data, and the psychological construct was questioned because of these criteria (Mennin, Heimberg & Turk, 2004). Thus, in the
revision of the 3rd edition, worry was added as a cardinal feature of GAD which led to
greater acceptance of and perceived clinical validity for the disorder (3rd ed., rev.; DSM-
III-R; American Psychiatric Association, 1987). While worry is a common feature in
other disorders, it is unique to GAD in its uncontrollability and excessiveness. This
version of the DSM also included broad categories of symptoms including motor tension,
autonomic hyperactivity, vigilance, and scanning (Mennin, Heimberg & Turk, 2004).

In the fourth edition of the DSM, the criteria were further revised. The autonomic
symptoms listed in previous versions of the DSM were found to have low reliability,
leading to their removal in DSM-IV (4th ed.; DSM-IV; American Psychiatric Association,
1994; Mennin, Heimberg & Turk, 2004). Further, the worry criteria were specified in the
DSM-IV to include difficulty controlling worry, and the realistic-ness of the worry topics.
Having two or more domains of worry were removed as criteria for GAD from the third
dition (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000; Mennin,
Heimberg & Turk, 2004). These changes led to increased reliability in diagnosing this
disorder (Mennin, Heimberg & Turk, 2004).

Though there have been many developments in the current understanding of GAD,
there were no changes in its diagnostic criteria from the DSM-IV-TR to the current DSM-
V. The most current DSM specifies that there is a 2.9% prevalence rate of GAD over 12
months among adults (APA, 2013). This is a high percentage of individuals, which
creates more concern when adding in the high rates of comorbidity of GAD with other
psychiatric disorders and medical conditions.

Despite research to date and the high prevalence rates of GAD, it has been found to
be highly resistant to treatment (Borkovec, Newman, Pincus, & Lytle, 2002; Sanderson &
Wetzler, 1991; Zuelling & Newman, 1996). Cognitive Behavioral Therapy (CBT) is considered the most effective therapy for Generalized Anxiety Disorder, but is effective less than 50% of the time in follow up assessments (Borkovec & Ruscio, 2001; Borkovec & Whisman, 1996; Chambless & Gillis, 1993). This resistance highlights the importance of developing a stronger theoretical model of GAD to facilitate the creation of more evidence-based treatment approaches.

Beyond its high prevalence rate, GAD is also highly comorbid with other psychiatric disorders. GAD is so often comorbid that some studies suggest that approximately 60-90% of individuals with GAD also meet criteria for at least one other psychological disorder (Brawman-Mintzer et al., 1993; Brown, Barlow & Liebowitz, 1994; Sanderson & Barlow, 1990), while others estimate that 55% of those with GAD meet criteria for another anxiety disorder and 59% meet criteria for depression (Carter, Wittchen, Pfister, & Kessler, 2001). These disorders include major depressive disorder, substance use, post-traumatic stress disorder, social phobia, panic disorder, obsessive-compulsive disorder, dysthymic disorder, bipolar disorder, avoidant personality disorder and dependent personality disorder (Mennin, Heimberg & Turk, 2004). Consequently, researchers and clinicians often struggle to determine whether an individual is presenting with symptoms of GAD or another disorder. Because of difficulties in differential diagnosis, it is possible that the estimated prevalence rates of GAD may be different than the actual reported prevalence rate.

GAD has also been found to be associated with several medical conditions, such as immunosuppression and coronary heart disease (Sinha, Mohlman, & Gorman, 2004). Further, patients with GAD experience higher outpatient medical center utilization rates
Nearly 8% of individuals presenting to primary health care physicians meet a diagnosis of GAD (Wittchen & Hoyer, 2001). Roughly 10% of patients in clinic waiting rooms have reported symptoms of anxiety that have gone unrecognized and untreated (Fifer et al., 1994), suggesting that there are a significant amount of individuals who are treated for their somatic symptoms and not their underlying anxiety. Due to its relatively high pervasiveness, comorbidity with other psychological and physical disorders, and its resistance to treatment, there exists an urgent need to develop a stronger scientific understanding of GAD and its cardinal symptom, worry.

2. Worry. Worry is a crucial component of GAD, and thus it is imperative to have a working definition to initiate understanding of it. The Oxford English Dictionary defines worry as “a troubled state of mind arising from the frets and cares of life; harassing anxiety or solicitude” (2014). This formal definition may contribute to the lay understanding of worry as a common cognitive activity that may be viewed as a form of maladaptive problem solving.

Within the field of psychology, the definition and understanding of worry has been in development since Freud first wrote about “anxious expectation” (Mennin, Heimberg & Turk, 2004), and this cognitive activity is a prominent feature of most anxiety disorders as well as depression. Borkovec, Robinson, Pruzinsky and DePree (1983, p. 10) described worry as “a chain of thoughts and images, negatively affect-laden and relatively uncontrollable; it represents an attempt to engage in mental problem-solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes”. Critical to this understanding of worry is that it is mainly a verbal-linguistic thought activity, as opposed to an activity based in imagery (Borkovec, 1994). It is also
important to recognize that worry is distinct from similar constructs such as anxiety, obsessions, and rumination. Worry is distinct from rumination in that rumination tends to focus more on past events, while worry centers more on the future [for a full review of the differences between anxiety and its similar constructs see Mennin, Heimberg, & Turk (2004)]. For the remainder of this paper, the term “worry” will be used, with the understanding that this construct is synonymous with similar terminologies such as “worry behavior”.

A more applied understanding of worry is as a cognitive process that orients an individual to look to the future, which is necessary for survival. It can function as a thought process with the goal of anticipation, preparation, and ultimately avoidance of future possible dangers (Borkovec, Alcaine & Behar, 2004). Wells (2004) explains worry as having four main components. First, worry is a verbal pattern of thoughts that are primarily negative. While some maladaptive cognitions can occur in other forms (i.e., imagery), worry is distinct in its verbal-linguistic form. Second, worry is both a symptom of anxiety and a coping mechanism. Individuals who are anxious frequently worry as a result of their anxiety. Simultaneously, worry can be functional and used to alleviate anxiety. By worrying, individuals are sometimes able to gain a sense of control over their anxiety. Third, for some individuals worry can become excessive and uncontrollable. Thus, worry can become a trigger of anxiety and additional worry, which is negatively reinforced through its elimination of an aversive event (i.e., anxiety). This is especially true for individuals with clinical levels of anxiety. Fourth and finally, worry is distinct from similar types of negative thoughts, such as rumination, and obsessions.
Behaviorally, worry is conceptualized as a conditioned stimulus (UCS = threat, UCR = fear/anxiety; CS = worry, CR = threat anxiety) and, in instrumental terms, a behavioral response to fear/anxiety that is negatively reinforced, and thus continues to occur more frequently. Functionally, worry, at low levels, can be viewed as an adaptive response to anxiety or fear; however, chronic excessive worry leads to heightened allostatic load through prolonged physiological arousal. Further, an overreliance on worry as a way of coping also limits opportunity for learning and utilizing alternative coping strategies, leaving a person less flexible in their way of matching coping to situational contextual factors.

Taken together, this information demonstrates that worry is a functional process implicated in the stress-coping system and may also serve as an antecedent stimulus in the production and maintenance of anxiety. The physiological components of worry and anxiety have unique effects on the body, specifically the cardiovascular system.

3. **Physiological Components of GAD and Worry.** The physiological foundations of anxiety involve the cardiovascular system, which is controlled by the autonomic nervous system (ANS). The ANS has two branches – the sympathetic nervous system (SNS; excitatory) and the parasympathetic nervous system (PNS; inhibitory). Both of these branches work together to mobilize energy, meet environmental demands (fight, flight or freeze), as well as to conserve energy and appropriate internal resources to internal processes such as rest, digestion, and relaxation. Physiologically, anxiety is characterized by anxious arousal and/or anxious anticipation, each with distinguishable physiological characteristics.
Anxious arousal is associated with short lived, acute reactions of sympathetic activation (Watson et al., 1995). Anxiety disorders are commonly associated with this pattern of autonomic hyper-arousal, meaning they are often found with symptoms such as sweating, shortness of breath, rapid heart rate, dizziness, tightness in the chest and increased blood pressure (Brown et al., 1994, 1995; Marten et al. 1993; Fisher Granger, & Newman, 2009; Watson et al., 1995). Anxious apprehension, on the other hand, is associated with more chronic, slightly elevated parasympathetic and sympathetic pathways (Barlow, 1991), as evidenced by cardiovascular indices, such as a slight increase in heart rate and decreased heart rate variability, muscle tension, and irritability.

Unlike most other anxiety disorders, GAD is primarily associated with anxious apprehension with infrequent bouts of autonomic hyper-arousal, that is, absence of the large “peak-to-valley” stress responses seen in heart rate or galvanic skin response (Borkovec, Ray, Stober, 1998; Hoehn-Saric & McLeod, 1988). Said differently, GAD is associated with blunted reactions to stress, but more long-lasting slightly elevated levels of stress response which suggests decreased parasympathetic nervous system activity. GAD’s pattern of diminished physiological flexibility, or absence of the typical pattern of autonomic hyper-arousal found in other disorders (Hoehn-Saric & McLeod, 2000; Hoehn-Saric et al., 2004; Fisher, Granger & Newman, 2009), produces symptoms such as fatigue, muscle tension, concentration difficulties, and problems related to sleep, all of which implicate decreased parasympathetic nervous system activity, as it is associated with such inhibitory functions. This type of responding is maladaptive as it contributes to chronically anxious states (Hoehn-Saric & McLeod, 2000) and emotion regulation.
deficits (Porges, Doussard-Roosevelt, and Maili 1994). Thus, GAD is distinguishable from other anxiety disorders based on its unique physiological characteristics.

The purported underlying mechanism of GAD’s *rigid autonomic nervous system* is vagal modulation of the heart, which is estimated using metrics of heart rate variability (HRV). Generally, lower HRV is suggestive of less vagal nerve modulation of cardiac activity which may result in decreased HR reactivity and sensitivity to environmental stimuli (Thayer, Friedman, & Borkovec, 1996). An integral component of HRV is respiratory sinus arrhythmia (RSA), which is the influence of respiration on HR through the baroreceptor reflex (Maganin et al., 2010), and is highly correlated with HRV under normal conditions (Allen, Chambers, & Towers, 2007). RSA is commonly used as an estimate of parasympathetic activation, or more accurately, an estimate of vagal modulation of the heart.

The vagus nerve, a branch of the ANS located at the 10th cranial nerve, has a strong influence on heart rate activity (Saul, 1990) and is a crucial component of study when analyzing physiological reactivity. HRV is not an absolute measure of activation, but rather gives an estimate of the balance of the vagal tone. In addition to psychological and emotional risks, low HRV is associated with various medical issues such as sudden cardiac death, hypertension, ventricular fibrillation, and coronary atherosclerosis (Goldberger, 1992), again highlighting the potential risks of the physiological profile of GAD, and the importance of establishing a more robust understanding of it.

There appears to be compounding effects of psychopathology on heart rate variability. For example, researchers have found that individuals with both GAD and Major Depressive Disorder (MDD) had the lowest levels of HRV among healthy, un-
medicated adults, thus placing them at higher cardiovascular risk (Kemp, Quintana, Flemingham & Jelinek, 2012). Additionally, decreased HRV has been associated with emotion dysregulation (Di Simplicio, et al., 2012) and emotional avoidance, two key components in current theoretical models of GAD.

4. Models of Worry and GAD. Promulgated by its complexity and poor response to treatment, researchers returned to developing and testing theoretical models of GAD. Contemporary models of GAD include the Avoidance Theory of Worry (Borkovec et al., 2004), and The Negative Contrast Avoidance Model (Newman et al., 2011). The following section will provide a brief summary of these contemporary theories to describe the current working conceptualization of GAD as well as the role and function of worry.

The Avoidance Theory of Worry. Developed by Borkovec, Alcaine, and Behar (2002), this model of GAD posits that worry has two main functions: to prepare for or avoid possible future danger; and to suppress somatic activity. All humans, even those without GAD, worry. There is an adaptive significance to worry, in that it allows individuals to avoid future negative events. When used appropriately, worry can function to prepare an individual for the worst-case scenario, and in this way may reduce the likelihood or severity of future threats. Consider an individual who spent time worrying about a future event. If this event were to occur, and be less aversive than the individual feared, the use of worry would be reinforced. Alternatively, if the feared stimulus (the event being worried about) never occurred, worry is still reinforced (Wells, 2004). The process of negative reinforcement leads to worrying being seen as an effective tool that should be used more often.
This type of reinforcement is found in both clinical and non-clinical worriers. Those who spend a significant amount of time worrying also tend to use worry to cognitively escape from other negative cognitions and/or aversive internal states (Borkovec, 1979).

This model also holds that worry can function to avoid cognitions, emotions and somatic symptoms associated with past negative events, such as past traumas, previous life experiences and negative interpersonal relationships (Borkovec et al., 2004). Worry is used to both prepare for future negative events, as well as to escape from negative internal states.

The second posited function of worry in The Avoidance Theory of Worry is to act as a suppressor of somatic activity (Borkovec, Alcaine, & Behar, 2004). Empirical research supports that the process of worry suppresses sympathetic activation, which is important in fight or flight responses to feared stimuli (Borkovec, Alcaine, & Behar, 2004). Within the Avoidance Model of Worry, worry functions as a method to evade aversive internal stimuli, promote further worry, and stifle somatic activity.

*Negative Contrast Avoidance Model.* The most recent conceptualization of GAD is the Negative Contrast Avoidance model of worry (Newman & Llera, 2011). This novel theory builds its base from other empirically validated theories of GAD, such as Borkovec’s model of avoidance. For a complete review of the similarities and differences between this model and well established previous theories see Newman and Llera (2011).

The Negative Contrast Avoidance Model distinguishes between emotional avoidance (the lack of negative emotions despite a stressor being present) and emotional *processing* avoidance, or the lack of attending to and processing emotions (Newman & Llera, 2011).
It differs from previous theories by maintaining that individuals with GAD, when faced with negative emotions avoid the processing of emotions (Newman & Llera, 2011). This theory aligns with previous theories, for it concludes that individuals with GAD use worry as a type of avoidance coping mechanism. Individuals with GAD do not avoid emotions as hypothesized in previous theories, but rather, avoid processing them.

This theory furthers this idea by stating that individuals with GAD prefer feeling constantly worried and distressed as a mechanism of preparation for the worst possible outcome, as opposed to feeling momentarily contented with life and then dropping in emotion to a negative state (Newman & Llera, 2011). Put more simply, this theory holds that individuals with GAD prefer to worry constantly so that they are constantly in a state of negative affect. They use worry to avoid experiencing an emotional shift from positive states to negative, but stay at a constant negative affective state. If individuals with GAD were to not worry, they would potentially experience positive states of affect. When threatening events occur they would then experience a disheartening change in affect, from a positive to a negative one. Worry is used to avoid processing the emotional content, and as a mechanism to avoid negative contrast in emotions.

This theory holds that individuals with GAD find the experience of negative contrast to be more upsetting than do non-anxious individuals (Llera & Newman, 2010). Llera and Newman (2010) are suggesting that GAD is more complex than simply an attempt to avoid all aversive emotional content, or anxiety. Further research is needed to validate the explanatory power of this model. Specifically, little is known about how GAD interacts with important variables, such as affect or in social situations.
5. **Social Components of GAD.** Not much is known about how individuals with GAD perform in social situations. It is unknown how individuals with GAD perform in social situations, how others perceive them, how anxious they become during and after social interactions, or what their physiological responses are to social situations. Only one study has attempted to examine the social components of GAD. This laboratory based study compared the social performance of GAD analogues and non-anxious controls in two social situations with a confederate (Erikson & Newman, 2007). The first situation was a collaborative story telling task using the Thematic Apperception Test, which assesses how individuals perceive the world through stories made up about ambiguous pictures. In the second situation, the confederate and participant picked from a list of disclosure topics, and alternated discussion of these topics. The confederates all recited pre-written scripts. After each situation, measures were collected to examine the participant’s level of distress, their perceptions of the social interaction, as well as their desire for future interactions with the confederate. An independent rater also completed a measure of the pleasantness of the social situation, and desire for their future interactions with the participant.

Findings suggested that individuals with GAD, when compared to individuals without GAD, were more likely to misinterpret the relationship (overestimating or underestimating the negative impact) between themselves and the confederate (Erikson & Newman, 2007). This finding is important because it suggest that GAD may be associated with a cognitive bias in social situations, by which the “social reality” of GAD might be inconsistent with the reality of others. This outcome further points to the need to gain better understanding of what influences this misinterpretation of social relationships.
in GAD. Additionally, those in the GAD group were found to exhibit greater “sad” affect than controls, which suggests that there might be experiential differences in affective response between groups; in this case those with GAD reported social situations as more negative (Erikson & Newman, 2011). Finally, independent raters did not find those in the GAD group to be any less likeable than controls (Erikson & Newman, 2011), suggesting the that the negative effects of GAD do not “contaminate” the experiences others have when interacting with people diagnosed with GAD. However, it will be important to replicate this finding in future investigations.

Despite the importance of these findings, this study did not include physiological measures, which could have contributed towards a more robust understanding of GAD in terms of elucidating the physiological reactions of GAD in a social context. The current study aims to further these findings by making affect the primary independent variable and measuring physiological reactions during social interactions.

Though much research has been conducted on GAD, more still remains to be understood. For example, how do individuals with GAD relate to other people? How do others perceive those with GAD in social situations? How does affect influence people with GAD in general? How does affect influence GAD in social situations? What are the physiological associations with affect and social situations in GAD? Due to its high comorbidity rates and high levels of prevalence it is important to study key components of GAD in a broader context.

b. Affect

Affect plays a significant role in not only anxiety, but also depression, a disorder that is highly comorbid with GAD (Clark & Watson, 1991). Negative affect, in particular,
is considered to have a significant relationship with both disorders (Clark & Watson, 1991). Studies have found a higher-order factor of negative affect through structural equation modeling of GAD (Brown, Corpito, & Barlow, 1998). Current and previous models of GAD address the function of GAD to help avoid negative states of mind, or negative changes in affect, but have done little to define the exact relation between affect and GAD. The most recent working model of GAD, the Negative Contrast Avoidance Model, suggests that acute precipitous changes in affective and emotional content may serve as the ‘feared stimuli’ for individuals with GAD. This current study aims to build upon this theory, by examining the influence of affect on physiological response and social performance. Therefore, it is important to take a closer examination of affect, especially as it relates to GAD.

Affect, a seemingly simple term, can be difficult to completely define. Affect is defined as a “super ordinate category for various kinds of states that involve relatively quick good-bad discriminations” (Gross & Thompson, 2007; Scherer, 1984). The states that fall under this category involve response to stress, emotions (e.g., happiness, sadness), moods (e.g., depression), and impulses based on motivations (e.g., sex, pain) (Gross & Thompson, 2007). Affect can be differentiated from emotion, as it is more of an umbrella term under which emotion falls. Affect is also differentiated from moods, which are less intense, hold little cognitive content, are often not the focus of conscious processing, and have little content and structure (Forgas, 1992; Forgas, 2001a). It is important to be able to discriminate between these similar terminologies.

Affect is often given a bipolar structure, with high positivity at one end and high negativity at the opposite end of the spectrum (e.g., Russell, 1979; Russell & Carroll,
Most theories of affect agree on the existence of these poles, though traditional theories hold that these poles are reciprocal in nature (as one increases the other decreases), while more modern theories suggest that these poles can be separated (Ito & Cacioppo, 2001). Affect induction procedures used in this study will aim at eliciting either positive or negative affect. This complex idea of affect has significant interactions with a variety of factors such as sociability, physiology, anxiety, and depression, all salient contributors to GAD.

Affect has been found to be closely tied with the social aspects of the individual. Various types of affect can influence the way individual’s process social information. Positive affect is associated with more advantageous social processing, such as being more creative and open (Bless, 2000; Fielder, 2000), and is associated with schema-based, top-down processing styles when compared to negative affect, which uses more externally focused, bottom-up processing (Forgas, 2001a). Research has found that positive and negative affect can also influence how individuals process their environment. The mood-congruent processing theory has shown that individuals become sensitized to information that is congruent with their current emotional status (Bower & Forgas, 2001). To illustrate, if an individual were experiencing a negative affect, they would process information in a way that would continue their negative feelings. Instead of attributing a friend in a large crowd of people not waving to them to difficulty seeing them, the individual might perceive that their friend was purposefully ignoring them.

Numerous studies have found that affect can have significant impacts on cognition and interpersonal behaviors (Feshbach & Singer, 1957; Schachter, 1959; Griffit, 1970), but affect does not always have congruent effects on cognitive processes,
and mood-incongruent effects have been frequently found (Erber & Erber, 2001; Sedikides, 1994). The effect of affect on interpersonal behaviors and processing is related to the information-processing strategies being used by an individual at a certain time, and can lead to affect congruent or incongruent behavior and processing (Forgas, 2001b). It is important to recognize that affect, as well as processing strategies, can influence social behavior.

Affect has also been theorized to explain the link between anxiety and depression. The Tripartite Model posits that negative affect explains the relation and overlap between depression and anxiety (Clark & Watson, 1991). It posits the link between anxiety and depression is negative affectivity. As this model highlights, affect has a significant role in psychological well-being.

Physiology is also influenced by affective states. Psychological distress often brings about physical symptoms (Katon, 1984, Maddox, 196, Tessler & Mechanic, 1978) and vice versa. Self-reported health status is often found to be mood congruent, with sad individuals reporting more physical symptoms than happy individuals (Croyle and Uretsky, 1987). Affective states also influence health related levels of self-efficacy, outcome efficacy (Salovey & Birnbaum, 1989), and beliefs about vulnerability to future illnesses (Salovey, Detweiler, Steward & Bedell, 2001). Affective states may also influence health-relevant behavior, such as risk taking (Salovey and Birnbaum, 1989; Salovey et al., 2001). Affect can change an individual’s perception of their health and well-being.

Multiple studies have found that affective states, both positive and negative, are associated with poorer immune function than normal (Futterman, Kemeny, Shapiro, &
State negative affect in particular has been related to the development of more severe illnesses after exposure to respiratory viruses (Cohen et al., 1995). Thus, affect may have a direct influence on the development of diseases, and an overall significant effect on an individual’s physiology.

Affective states also have unique effects on HRV. Momentary positive affect has been found to be negatively correlated with HRV, while more neutral states are associated with higher vagal tones (Schwerdtfeger & Gerteis, 2014). Negative affect has been found to be inversely associated with HRV (Ingjaldsson, J., Laberg, J., & Thayer, J., 2003). Thus, higher affect is associated with higher levels of HRV.

This current study will use positive and negative affect induction procedures. Affect has significant interactions with a variety of factors such as sociability, physiology, anxiety, and depression, all salient contributors to GAD.

c. Affect and GAD

Though there is much existent literature on both GAD and affect individually, little research has delved into the interaction of the two. The Negative Contrast Avoidance Model, described above, is one of the few theories that have attempted to combine these two factors.

Despite the lack of concrete research on the intersection of affect and GAD, modern GAD researchers have found GAD to have significant overlap with affective disorders. Mennin, Heimberg, Fresco and Ritter (2008) called for anxiety and mood disorders to be diagnosed on three levels. The level would create a diagnosis of emotional disorders, as a combination of anxiety and mood disorders. The second would be diagnosing “positive or negative relationships with structural emotional characteristic
factors such as negative affectivity, positive affectivity,… and physiological hyper-
arousal” (Mennin et al., 2008, p. 297). This second level would reflect the important
influence of affect that is not covered in most theories of GAD and other anxiety
disorders. The third and final level would diagnose individuals through internalizing
factors, and would be a way to capture the overlap of anxiety and mood disorders.
Creating changes like this in the diagnostic understanding of GAD and similar disorders
could provide more accurate diagnoses of impactful disorders.

d. Current Study

As reviewed above, GAD is a complex disorder with a multitude of components
whose actions are not well understood. GAD appears to have a unique physiological
pattern and is highly comorbid with other psychiatric conditions. No one study to date
has simultaneously investigated the physiological, affective, cognitive, behavioral, and
social components of GAD in a controlled laboratory setting. This proposed study aims to
expand a biopsychosocial model of GAD by measuring the relationship between GAD
and affect on cognitive, physiological and behavioral outcomes during a social task. The
current study utilized several of the techniques in Erikson and Newman’s (2007)
previously discussed social GAD project and built upon it by manipulating affect,
including an additional social interaction situation, and the acquisition of heart rate
variability as a measure of vagal modulation of the heart. Specifically, there were four
broad research questions which this study aimed to answer: 1) Does GAD severity
predict affect change? 2) Does GAD severity predict individual’s perceptions of social
interactions? Relatedly, does GAD severity predict how others perceive those with GAD?
3) Do negative affect and general anxiety interact on individual’s perceptions of
themselves in social interactions? Does it influence how others perceive them? And 4) Is there a relationship between GAD severity and HRV, a biomarker of emotion regulation?

B. Hypotheses

**GAD and Affect Regulation**

*Hypothesis A:* It was expected that GAD severity would significantly predict self-reported affect, based on the Negative Contrast Avoidance Model (Newman et al. 2011). Specifically, higher GAD severity was expected to predict less affect change.

**GAD and Social Performance Task**

*Hypothesis B:* It was expected that GAD severity would predict participants’ self-reports of their social interactions. However, it was also predicted that GAD severity would not predict independent rater’s ratings of participants’ social interactions during story telling and interview tasks. This hypothesis was based on Erikson and Newman’s 2007 results.

**GAD, Affect, and Social Interactions**

*Hypothesis C:* Exploratory tests were conducted to examine the interaction of positive or negative affect condition and GAD severity (high vs. low) on social perception. Empirical research suggests that negative affect is related to negative self impressions and greater stress. Research on GAD highlights that there is an association between anxiety and affect (Clark & Watson, 1991). However, the Negative Contrast Avoidance Model (Newman et al. 2011) suggests that individuals with GAD may experience more stress when positive affect is induced because a shift from positive to negative affect might be a feared stimulus that is
avoided in people with GAD. This response is counter-intuitive, given research findings that show beneficial effects of positive affect and avoidance of negative affect in non-clinical and other clinical samples. It was unclear what the expected differences in affect conditions would be between those high and low on GAD.

**GAD, Social Performance Task and Heart Rate Variability (HRV)**

**Hypothesis D1:** It was anticipated that GAD severity would predict HRV across baseline, affect manipulation, collaborative story telling task, interview task, and recovery with higher GAD severity being related to lower HRV. This expectation was based off previous physiological studies of GAD (Brosschot, VanDijk, & Thayer, 2007; Borkovec, Ray, Stober, 1998; Hoehn-Saric & McLeod, 1988).

**Hypothesis D2:** It was expected that GAD severity would predict physiological recovery (i.e. HR recovery –area under the curve) during the recovery phase. It was expected that higher GAD status will predict return to physiological baseline (greater area under the curve) during the recovery phase. This hypothesis extrapolated from previous research on the physiology of GAD (Brosschot, VanDijk, & Thayer, 2007; Thayer, Friedman, & Borkovec, 1996) that provides evidence that GAD and worry are both associated with prolonged stress.

**Hypothesis D3:** Exploratory analyses were conducted to determine how affect manipulation (positive or negative) and GAD severity will interact with and influence HRV. Relevant studies (Borkovec, Ray, Stober, 1998; Hoehn-Saric & McLeod, 1988) suggest that negative affect may influence HRV in individuals with and without GAD. However, the Negative Contrast Avoidance Model
(Newman et al., 2011) posits that in GAD, positive affect may be a feared stimulus and thus may influence HRV.
Chapter Two

Current Study

A. Participants

Data were collected from 57 undergraduate students serving as representations of GAD analogues and normal controls at a large Midwestern University. This sample size is consistent with previous psychophysiology experiments (Peters et al., 1997; Friedman & Thayer, 1998; Matthews, Manuck, & Saab, 1986; Thayer et al., 2000). Analyses using G*Power were used to perform an a priori estimation of sample size using a medium effect size of Cohen’s D 0.50 (F = .25), 2x2 ANOVA gave 56 total participants. Within inherent difficulties with physiological data acquisition and dropout rates, we aimed to collect 14 individuals per group. Missing data were not found in the dataset. Participants were mainly female and between the ages of 16 – 55.

B. Measures

**Beck Anxiety Inventory (BAI; Beck & Steer, 1993).** The BAI is a 21-item self-report measure of anxiety. This was used in addition to the other measures of anxiety for demographic comparison. There have been no shown gender differences in this scale (Howitt & Norton, 1993). It has been shown to have strong internal consistency (coefficient α = .92), convergent validity, discriminant validity, and test-retest reliability (Howitt & Norton, 1993). This scale demonstrated high internal consistency (α = .90).

**Beck Depression Inventory (BDI-II; Beck, Steer & Brown, 1996).** This is a 21-item measure of depression symptoms, specifically those experienced within the past 2 weeks. This commonly used measure has high test-retest reliability (Beck, Steer & Brown, 1996), and construct validity (Dozois, Dobson, & Ahnberg, 1998). Within
college samples, it has demonstrated high internal consistency, $\alpha = .93$ (Beck, Steer, & Brown, 1996). This scale demonstrated high internal consistency ($\alpha = .91$).

**Demographic form.** Items collected in the demographic form included gender, age, marital status, race/ethnicity, sexual orientation, religious affiliations, level of schooling completed, and employment status.

**Desire for Future Interaction (DFI; Coyne, 1976).** This scale has eight items on a 5-point Likert-type scale, and measures how strongly the participant would like to engage in social activities in the future with another individual. This is a well-established scale and has high reliability (Boswell & Murray, 1981; Papsdorf & Alden, 1998; Voncken, Aldren, Bögels, & Roelofs, 2007; Voncken, Dijk, de Jong, & Roelofs, 2010; and Winer, Bonner, Blaney, & Murray, 1981), and good internal consistency (Voncken & Dijk, 2013), $\alpha = .97$ (Papsdorf and Alden, 1998). This scale was administered to determine the participant’s perceptions of the interactions in the social task, described below. This scale demonstrated high internal consistency ($\alpha = .93$) in the current study).

**Generalized Anxiety Disorder Questionnaire (GADQ-IV; Newman et al., 2002).** This self-report measured is composed of 9 items. It is designed to diagnose GAD based off the criteria for the DSM-IV, (a version based on the DSM-V is not yet available). However, detailed above, the criteria for GAD did not change between the DSM-IV and the DSM-V, so this measure should still be a valid measure for diagnosis. It was used to diagnose GAD analogues in this current study. This measure has demonstrated convergent and discriminant validity, test-retest reliability, and clinical validity (Newman et al., 2002), as well as good internal consistency, $\alpha = .83$ (Rodebagh,
Haloway, & Heimberg, 2008). This test was used to identify participants who will be used as GAD-analogues. This scale demonstrated high internal consistency ($\alpha = .88$).

**Impact Message Inventory- Octant Scale Version (IMI-C; Kiesler & Schmidt, 1993).** This measure assesses “interpersonal behaviors through the internal reactions and perceptions evoked in others” (Schmidt, Wagener, & Kiesler, 1999). The IMI-C is 28-question measure wherein participants rate each question on a range from 1 “not at all” to 4 “very much so”. It consists of eight scales (Dominant, Friendly-Dominant, Friendly, Friendly-Submissive, Submissive, Hostile-Submissive, Hostile, and Hostile Dominant) and 2 axes (Affiliation and Control), which are understood in a circular structure (Schmidt, Wagener, & Kiesler, 1999). This measure has acceptable levels of internal consistency and levels of reliability, alphas between .69 and .89 (Schmidt, Wagener, & Kiesler, 1999). The scales and axes of this measure will be used to determine how participants rate their social interaction with the confederate, and an independent rater’s ratings of the participants. Specifically, it was used to rate how highly the participant rated the confederate on each of the scales and axes after each social interaction, and vice versa. This scale demonstrated good internal consistency ($\alpha = .85$).

**Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988).** This measure is a 20-item self-report scale that measures both positive and negative affect in adult individuals. This commonly used scale of measurement has been found to have high reliability (Crawford & Henry, 2004). The PANAS has been found to be only modestly influenced by demographic variables (Crawford & Henry, 2004). This scale demonstrated good internal consistency ($\alpha = .84$).
State-Trait Anxiety Inventory (STAI; Spielberger, 1983). The STAI is a 20-item self-report measure that assesses anxiety at the moment of examination and general levels of anxiety. This measure has participants rank items, such as “I feel calm” and “I feel strained” on a 4-point Likert like scale, on a range from not at all to very much so. This measure has demonstrated high internal consistency (average $\alpha$ across various studies $> .89$) and high test-retest reliability (average $r = .88$) (Barnes, Harp, & Jung, 2002). The STAI also has good convergent and discriminant validity (Grös, Antony, Simms & McCabe, 2007). This scale demonstrated decent internal consistency ($\alpha = .603$).

a. Affect Manipulation

The International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) were used to manipulate participants’ affect. The IAPS is a large set of color photographs that induce a variety of different affects, both positive and negative. This system is found to have three main dimensions: pleasure, arousal, and dominance (Lang, Bradley, & Cuthbert, 2008). The scale as a whole has high internal consistency, and the valence and arousal dimensions of this scale’s split half coefficients are highly reliable ($p < .001$) (Bradley & Lang, 1994). To be consistent with the time frames needed for the physiological recordings, participants were shown five minutes of either positive or negative affect inducing photographs. The pictures used were chosen based off previous studies using the IAPS, were counterbalanced in each category (positive/negative affect) for arousal and dominance, and each picture was shown for 6 seconds, followed by 15 seconds of a blank screen (Lang, Bradley, & Cuthbert, 1990; Bradley & Lang, 2007;
Bradley, Hamby, Löw, & Lang, 2007). The pictures used in this study consist of an even amount of arousal and dominance.

b. Psychophysiology Measures

ECG (electrocardiograms) was recorded throughout the experiment. Two 3/8” Vermed disposable vinyl spot-electrodes were filled with Signa electrode gel (Parker Laboratories, Inc.) and attached to each participant’s upper left and right chest, and lower left rib cage (Lead II configuration). The ECG signal was amplified using a BioNomadix Acquisition Unit (Biopac Systems, Inc., Goleta, CA) and recorded beat-to-beat R-R intervals at a sampling rate of 1000 samples/sec.

Further power spectral analysis of R-R interval data utilized a fast-Fourier transformation using Heart Rate Variability Software (HRV; Department of Applied Physics, University of Kuopio). Given that participants levels of activation was within normal ranges, stationarity was assumed and FFT deemed appropriate. The FFT algorithm then calculated the frequency domains that characterize the high-frequency (HF) power spectrum (0.15Hz – 0.40Hz) and low-frequency (LF) power spectrum (0.04Hz – 0.15Hz). Detrending of the R-R series was conducted using “smooth priors” and “Eye” models and an Alpha value of 1000. From this analysis, high-frequency power spectrum was calculated across each phase and presented as normalized units of power (nu). HRV-HFnu represents a normalized unit of high frequency in proportion to low frequency HRV, and is a good estimation of vagal modulation of cardiac activity. LnHRV-HFms2 (log transformed HRV represented in milliseconds-squared) is also reported in the tables, as this is an absolute value which is useful for between study
comparison. It is an absolute value of the high frequency component of HRV. Both are reported per task force standards (Task Force, 1996).

**Data Cleaning**

There was a visual inspection of the raw ECG wave forms to identify instances of noise or artifact. Data that was compromised (e.g., due to movement artifact or interference noise) was manually corrected through visual inspection of the wave forms. If HRV was not normally distributed (based off kurtosis and skewness), data log transformations were conducted.

**C. Procedures**

**Experimental Design**

Participants were randomly assigned to an affect condition (positive or negative affect induction) in a 2 (affect induction) x 2 (high or low anxiety based off scores on the GAD-Q-IV) between subjects design.

Participants were recruited from the University of Toledo Undergraduate Research Pool. See Figure 1 for complete description of procedures. This study consisted of two parts. Part 1 took place online and all 57 participants engaged in it. They completed an online informed consent, and then filled out surveys (including the PANAS) that will took approximately 45 to 55 minutes. Participants were given ID numbers at the time of completion.

Some participants from Part 1 (N = 57) were then selected for Part 2 of the study, which took roughly 60 minutes to complete in the research laboratory. Data was examined from Part 1 of the study, using the ID numbers. Participants were excluded from Part 2 if they had any physiological difficulties (e.g. strokes, myocardial infarctions), or were taking any medications, which would interfere with the
cardiorespiratory recordings. They were selected for inclusion in the GAD group if they meet criteria for GAD using the GAD-Q-IV as a diagnostic tool, using a cut off score of 7.67 (Moore et al., 2014). Participants were excluded from the control group of Part 2 if they meet criteria for GAD. Participants were then contacted through e-mail by researchers, told that they are invited to participate in Part 2 of the study, and given a list of times that were open. If interested, participants were signed up for the study in SONA, and received a reminder e-mail the day before Part 2 is set to take place. Participants were randomly assigned, using a random number generator, to either the positive or negative condition.

Upon beginning Part 2 of the study, participants were familiarized with the laboratory equipment and their uses. They were then hooked up to the Biopac system, which continuously recorded their ECG. Participants were seated in a comfortable chair near a computer, and the research assistant stayed in the room for the majority of the study. The participants began by completing baseline measures (such as the PANAS), and collecting baseline measurement of their ECG for 5.5 minutes. Instructions for the baseline included “Now that the equipment is attached, I would like you to remain seated in your chair while at the same time trying to relax. Remember, just try to relax and let yourself be comfortable”. Participants were randomly assigned to be in either the positive or negative affect induction procedure. Participants were told “Now we will have you look at the computer screen for several minutes. You will see a variety of pictures for several seconds each. Once you have viewed all the pictures, we will give you more surveys to fill out. Let me know when the program tells you to get my attention.” Each affect condition took 5 minutes to complete. After the affect induction, participants self-
reported on their somatic symptoms (PTQ) and their negative and positive affect (PANAS).

All subjects then participated in two social interactions with the confederate. The confederates were research assistants. This social situation task is based off the Erickson and Newman (2011) study examining the social components of Generalized Anxiety Disorder. The confederate was presented to the participant as another participant who was connected to similar physiological equipment. This was explained to the participants by stating “Now we will have you work with another participant. We are interested in learning more about how people interact in different social situations. You may have noticed that they are sitting in the other room. They are already hooked up to the same equipment as you, and also completed the first part of the study. We will now bring the other participant in, and we will give you the task that you will both be working on together.” The confederate was brought in the room, and the participant and confederate were told they can talk while the experimenter gets ready for the next section. They were then given the following instructions “Because you are both hooked up to our system, we will begin our first task. This will be video recorded. The purpose of this portion of the study is to examine how students achieve agreement in a creative story construction task. You will work together for about five minutes to come up with the stories you agree are best for two pictures. Determine together the best story for this first picture. You may take notes if you like. You will work together to come up with the story you agree are best for this picture. Determine together the best story.” Following 10 minutes, the participants filled out measures rating the social interaction (DFI and IMI), and a self-report on their somatic symptoms.
Participants then engaged in the second social situation task, a structured interview with the confederate. Participants were told that the researchers randomly decided (i.e. coin toss), which participant will be the interviewer and which the interviewee; the confederates were always the interviewer, and participants were always answering the questions. After this social task which lasted no more than ten minutes, the participants again filled out the IMI, DFI, and PTQ. These interactions were recorded and reviewed by trained coders, who completed IMIs and DFIs for each participant per phase (Interview task, story-telling task).

After all three components were completed participants were given 5.5 minutes of sitting quietly in the lab to return to physiological baseline (i.e. recovery phase). The Biopac equipment was then removed from the participant. After this component was completed, the participants were debriefed. The social situations were reviewed by trained coders who watched each session and provided ratings on the participant and confederate’s social abilities using the IMI and DFI.

D. Analytic Plan

An initial set of preliminary analyses were conducted to test for group (GAD and non-GAD) demographic differences on the BDI and BAI. It was expected that there were differences between the GAD and non-GAD group on the BDI due to the high comorbidity between anxiety and depression and given differences on the BAI given the clinical nature of GAD. One of the aims of administering these measures was to obtain sample characteristics to test for the previously mentioned differences, but to also report for cross-comparison of samples among previous and future studies.
Primary Analyses

**GAD and Affect Regulation**

*Hypothesis A:* To test the hypothesis that GAD severity will significantly predict self-reported affect, two linear regressions were used. The first set of linear regressions entered GAD severity as a continuous independent variable and raw pre/post change scores on the PANAS negative scale as the continuous dependent variable. The second set of linear regressions entered GAD severity as a continuous independent variable and pre/post change scores on the PANAS positive scale as the dependent variable.

Hierarchical regressions were run to test for an interaction between GAD severity (IV – continuous) and affect condition (IV – categorical: positive or negative induction) on pre/post change scores on the dependent variable PANAS (negative and positive scales separately). For all regressions, GAD severity was centered and entered with affect condition in the first step. The interaction of centered GAD severity and affect condition was entered in step two.

**GAD and Social Performance Task**

*Hypothesis B:* To test the hypothesis that GAD severity will predict participants’ self-reports of their social interactions, and that GAD severity will not predict independent rater’s ratings of participants’ social interactions during the social tasks, multiple linear regressions were conducted. The first set of regressions entered GAD severity as a continuous independent variable and *participant* total scores for the DFI or IMI (two continues variables which will be run separately) as the dependent variables. The second set of linear regressions entered GAD severity as a continuous independent variable and *independent rater’s* ratings on the DFI and IMI (two continues variables
which were analyzed separately) as the dependent variables. Independent rater’s ratings were measured by the mean scores on the DFI and IMI completed by group of trained research assistants.

**GAD, Affect, and Social Interactions**

*Hypothesis C:* To examine the interaction of positive or negative affect condition and GAD severity (high vs. low) on social perception, multiple 2 (high vs. low on GAD-Q-IV) x 2 (positive or negative affect induction) ANOVAs were run. These tested for main effects and an interaction. In the first set of ANOVAs, GAD status and affect condition were the independent variables, and perception of social performance, as measured by the DFI, was the dependent variable. In the second set of ANOVAs, GAD status and affect condition were the independent variables, and perception of social performance, as measured by the IMI, was the dependent variable. To determine GAD status, a cut off score of 7.67 or higher on the GAD-Q-IV indicated “high” GAD, while lower scores indicated participants are “low” on GAD, as this cut off score provides an optimal balance of sensitivity and specificity (Moore, Barnes, Haigh & Fresco, 2014). GAD was run as a dichotomous variable, as opposed to a continuous one, because this is an exploratory test, and to be consistent with previous literature in the field.

**GAD, Social Performance Task and HRV**

*Hypothesis D1:* To examine if GAD severity (IV - continuous) predicts HRV (DV – continuous) across phases, a linear regression was run each for baseline, affect manipulation, story-telling task, interview task, and recovery, with HRV entered as the dependent variable for each regression. HRV was entered as HRV-HFnu.
Hypothesis D2: A linear regression was used to test whether GAD severity (IV – continuous) predicts HR recovery measured as area under the curve (DV – continuous) during the recovery phase.

Hypothesis D3: To explore whether the categorical independent variables, affect induction (positive or negative) and GAD severity (high vs. low), will interact with and influence HRV, the continuous dependent variable, multiple two-way ANOVA (2 group x 2 affect condition) were conducted, one for each phase. Anticipated results of this hypothesis are depicted in Figure 5.
Chapter Three

Results

A. Data Screening

A total of four people were excluded from the current sample for either having significant artifact in the raw ECG waveform, significant artifact due to technical malfunctions, presence of self-reported confounding cardiovascular diseases, or were unable to understand the directions.

B. Descriptive Statistics

Descriptive statistics were obtained in order to screen the data for normality, outliers, and missing values. Normality was assessed using skew and kurtosis (<2 and ≤7, respectively) guidelines specified by Curran, West, and Finch (1996). Only one variable was found to be non-normal (participant ratings of the hostile dominant subscale on the IMI), and this was transformed using appropriate computations (log transformation). The dataset was found to have no missing data.

In regards to participant demographics, participants were primarily female and had a mean age of 20.5. The majority of participants were Caucasian (Table 1 – compare to excluded participants in Table 2). Participants were randomly assigned to either the positive or negative affect conditions. Mean scores on related measures for all participants are presented in Table 3.

C. Linear and Hierarchical Regressions on GAD and Affect Regulation

Hypothesis A tested whether GAD severity predicted self-reported affect reactivity to the IAPS, using PANAS positive and negative change scores. Across all participants, the mean positive change score was -2.089 (SD = 4.29), and the mean negative change score was .500 (SD = 4.737). A correlated t-test was conducted to
examine changes in positive and negative affect across all participants. In the positive affect condition, there was a significant change in positive affect, $t (23) = 2.80, p < .01$. However, the mean change was in an unexpected direction: positive affect significantly declined in the positive affect group. In the negative affect group, there was a significant decrease in positive affect, $t (23) = 2.34, p = .03$, and a non-significant increase in negative affect.

The first analysis for this hypothesis regressed negative affect on GAD severity and failed to find a significant predictive relationship, $\beta = .025, SE = 4.779, t (52) = .187, p = ns$. The second analysis regressed positive affect on GAD severity. Again, no significant effect was found, $\beta = .058, SE = 4.323, t (52) = .426, p = ns$.

Despite the lack of significance in the main analyses, two hierarchical regressions were run to test for an interaction between GAD severity (IV – continuous) and affect condition (IV – categorical: positive or negative induction) on pre/post change scores on the dependent variable PANAS (negative and positive scales separately). The first hierarchical regression demonstrated that the main effect of anxiety severity $\beta = .246, t (52) = .046, p = ns$ did not predict negative affect change scores, but the main effect of affect condition approached marginal significance $\beta = .072, t (52) = 1.838, p = .072$, such that those in the negative condition had more increase in negative affect than did those in the positive condition. The interaction of GAD severity and affect condition was not able to predict negative affect change scores $\beta = .460, t (52) = .863, p = ns$. The second hierarchical regression demonstrated that neither the main effects nor the interaction of affect condition and GAD severity predicted positive affect change scores. Thus, the
negative condition caused all participants to experience a change in negative affect but the positive condition did not cause affect change.

D. Linear Regressions on GAD and Social Performance Task

Hypothesis B anticipated that GAD severity would predict participants’ desire for future interaction with the confederate, their perception of the confederate, but not independent rater’s ratings of the participant. The first linear regression revealed that GAD severity did not explain a significant portion of participant desire for future interaction as measured by the DFI, $\beta = -.103$, $t (53) = -.758$, $p = \text{ns}$.

The second series of analyses individually regressed all 8 subscales and 2 axes scores of the IMI on GAD status. GAD did not significantly predict participant ratings on the hostile dominant, submissive, friendly submissive, friendly dominant, or friendly subscales, or the dominant axis.

However, GAD status significantly predicted participants’ perceptions of the confederate on the dominant $\beta = .515$, $t (53) = 4.415$, $p < .001$, and hostile $\beta = .301$, $t (53) = 2.323$, $p = .024$ subscales of the IMI. Inspection of the beta weights indicated that higher GAD severity scores were associated with perceptions of the confederate as being dominant and hostile.

GAD marginally predicted participants’ ratings of the confederate on the hostile submissive subscale, $\beta = .254$, $t (53) = 1.927$, $p = .059$. Higher participant anxiety severity was related to higher ratings of the confederate as being hostile submissive.

GAD also marginally predicted a portion of participants’ ratings of the confederates on the affectionate axis, $\beta = -.226$, $t(53) = -1.707$, $p = \text{ns}$, indicating that higher GAD severity scores were related to lower ratings of the confederate as being affectionate.
The next set of regressions examined participant and confederate interactions which were recorded and analyzed by trained research assistants. All raters watched the first five interactions, and high internal reliability was displayed (α = .987). In examining the ratings for the 11 independent rater’s measures the effective reliabilities range from a low of .17 to a high of .97, with the average effective reliability being .79, and an internal consistency of .94 (Rosenthal & Rosnow, 1984).

The first of these analyses regressed desire for future interaction as measured by the DFI on GAD status, and a non-significant relationship was found β = -.090, t (53) = .667, p = ns.

The next set of linear regressions examined independent rater’s ratings of the interactions along the axes and subscales of the IMI. GAD status did not significantly predict independent rater’s ratings of the participant on the dominant, untransformed hostile dominant, hostile, hostile submissive, friendly submissive, friendly, or friendly-dominant subscales. It further did not explain a significant portion of the variance in the dominance or affectionate axes.

However, GAD was significantly related to independent rater’s ratings of the participants on the submissive subscale, β = 305, t (53) = 2.356, p = .022. Higher levels of participant GAD severity was associated with higher levels of independent rater’s ratings of the participant as submissive.

E. ANOVAs on General Anxiety, Affect, and Social Interactions

Hypothesis C examined the interaction of positive or negative affect condition and GAD status (GAD vs non GAD) on participant’s self-reported social interactions (as
measured by the DFI and IMI). Multiple 2 (high vs. low on GAD-Q-IV) x 2 (positive or negative affect induction) ANOVAs were run.

The first ANOVA examined group differences of GAD status and affect condition on participant desire for future interaction with the confederate. A main effect of GAD status was non-significant, $F(1, 52) = .080, p = ns$, as was the main effect of affect condition $F(1, 52) = .091, p = ns$. The interaction of these variables was non-significant as well ($p = .713$).

The next set of ANOVAs examined IMI subscales and axes as dependent variables. The first of these ANOVAs examined group differences of GAD status and affect condition on participant ratings on the dominant subscale. The main effect of GAD status was significant, $F(1, 52) = 19.250, p < .001$, such that participants with GAD status had significantly higher perceptions of the confederate as being dominant ($M = 1.405, SD = .358$) than did participants without GAD status ($M = 1.093, SD = .144$). The main effect of affect condition was not significant $F(1, 52) = .502, p = ns$, nor was their interaction.

The following ANOVA examined the effect of GAD status and affect condition on participant ratings of the hostile subscale. Neither the main effect of GAD status or affect condition was significant, but their interaction was significant $F(1, 52) = 6.508, p = .014$. Simple effects analyses revealed that in the negative affect condition, those with GAD found the confederate to be much more hostile than did those without GAD (Mean difference $= .491, SE = .168, p = .005$; Figure 2).

The next ANOVAs examined group differences of GAD status and affect condition on participant ratings of the hostile dominant subscale. Neither the main effect
of GAD status nor affect condition was significant, but their interaction was marginally significant for the non-transformed hostile dominant scale $F(1, 52) = 3.225, p = .078$. Simple effects analysis reveal that for those in the negative condition, those with GAD status (Mean = 1.38) rated the confederate higher on the hostile dominant subscale than those without GAD (Mean = 1.04) in the same affect condition (Mean Difference = .336, SE = .145, $p = .024$). There was no significant effects for the positive affect condition or GAD status.

The same relationship was found for the transformed hostile dominant scale, where neither the main effect of GAD status nor affect condition were significant, but their interaction was marginally significant $F(1, 52) = .541, p = .073$ (Figure 3). Simple effects analysis reveal that for those in the negative condition, those with GAD status (Mean = 1.16) rated the confederate higher on the transformed hostile dominant subscale than those without GAD (Mean = 1.02) in the same affect condition (Mean Difference = .141, SE = .06, $p = .02$). There were no significant effects for the positive affect condition or GAD status.

When predicting the hostile submissive subscale, neither the main effect of GAD status nor affect condition was significant ($ps > .05$), but their interaction approached marginal significance $F(1, 52) = 2.981, p = .090$, Figure 4. There were no significant effects for the positive affect condition or GAD status. However, simple effects analyses did reveal that for those in the negative condition, those with GAD status (Mean = 1.61) rated the confederate marginally higher on the hostile submissive subscale than those without GAD (Mean = 1.27) in the same affect condition (Mean Difference = .341, SE = .19, $p = .07$).
However, neither the main effects nor the interaction of GAD status or affect condition reached significance on the submissive, friendly submissive, friendly, or friendly dominant subscales, nor on the dominant or affectionate axes.

To further examine the relationship between affect condition, anxiety severity, and social interactions, ANOVAs were then conducted to examine the independent rater’s perceptions of the participants, using both the DFI and the IMI. However, neither the main effects nor the interaction of GAD status or affect condition reached significance on the confederate DFI, or the independent rater’s IMI subscales (dominant hostile dominant, hostile, hostile submissive, submissive, friendly submissive, friendly, friendly dominant) or axes (dominant or affectionate).

F. Linear Regressions and ANOVAs on General Anxiety Disorder, Social Performance Task, and HRV

For hypothesis D1, a series of linear regressions were conducted to determine if GAD severity predicts HRV across phases. HRV was measured using both HRV-HFnu and LnHRV-HFms2. HRV-HFnu represents a normalized unit of high frequency/low frequency and is a good estimation of balance between the SNS and PNS. LnHRV-HFms2 is an absolute value, which is useful for between subjects comparison. Leading theory conceptualizes the relationship between GAD and HRV as a condition of “vagal withdrawal” (with more vagal dominance in healthy controls), presupposing a balance with sympathetic modulators of cardiac activity. Thus this study focuses on normalized units, but consistent with reporting guidelines also tested and reports log-transformed absolute values of HF. Both metrics are reported in Table 4.

HRV was estimated across the phases using HRV-HFnu. The relationship between GAD severity and HRV-HFnu approached marginal significance during baseline
$R^2 = 0.059, \beta = 0.242, t(53) = 1.833, p = 0.072$, so that higher anxiety was associated with higher HRV. The relationship also approached marginal significance during recovery phase $R^2 = 0.060, \beta = 0.244, t(53) = 1.851, p = 0.070$, such that higher anxiety is correlated with higher HRV. However, GAD severity did not explain a significant portion of the variance in HRV-HFnu during the affect manipulation phase, story-telling task, or the interview task.

To examine Hypothesis D2, a linear regression was run to test whether GAD severity predicts HR recovery (area under the curve) during the recovery phase. Results indicate that GAD severity did not significantly predict area under the curve $R^2 = 0.024, F(1, 54) = 1.319, p = \text{ns}$.

Finally, Hypothesis D3 examined group differences among affect conditions, GAD severity and HRV. Multiple two (positive or negative affect group) x two (high vs. low GAD severity) ANOVAs were conducted, examining HRV across phases for each type of HRV estimates (HRV-HFnu and LnHRV-HFms2). The main influence of affect condition on LnHRV-HFms2 was marginally significant for the interview task $F(1, 52) = 3.726, p = 0.059$ and the rest phase $F(1, 52) = 3.560, p = 0.065$. For the interview task, those without GAD who were in the positive condition had marginally higher HRV than those in the negative condition ($p = 0.095$). Neither the main effects nor the interaction of GAD or affect condition reached significance ($p’s > 0.05$) on any of the other conditions as measured by both HRV-HFnu and LnHRV-HFms2. The results of this are depicted in Figure 6.
Chapter Four

Discussion

A. Overview

To summarize, the present study was aimed at increasing the current understanding of GAD, specifically purported physiological, affective, and social components. GAD is a very prevalent disorder (APA, 2013), which is often comorbid with other psychiatric disorders (Brawman-Mintzer et al., 1993; Carter, Wittchen, Pfister, & Kessler, 2001) and physical complications (Sinha, Mohlman, & Gorman, 2004; Katon et al., 1990; Wittchen & Hoyer, 2001). GAD is a complex disorder and is highly resistant to treatment (Borkovec, Newman, Pincus, & Lytle, 2002; Sanderson & Wetzler, 1991; Zuelling & Newman, 1996). Limited research has addressed the theoretical relationship between affect and GAD, with even less attention on social components of this disorder.

To address these limitations in our understanding of GAD, there were four broad research questions which this study aimed to answer: 1) Does GAD severity predict affect change? 2) Does GAD severity predict individual’s perceptions of social interactions? Relatedly, does GAD severity predict how others perceive those with GAD? 3) Do negative affect and general anxiety interact and influence social perceptions? And 4) Is there a relationship between GAD severity and HRV? These over-arching questions were broken down into specific hypotheses and addressed through the current study.

Participants completed a variety of questionnaires, and engaged in a laboratory component which manipulated positive and negative affect, and examined physiological responses and perceptions of social interactions with a confederate. Results of all analyses are summarized in Tables 5 and 6.
The first research question asked whether higher GAD severity would be associated with less affect change. This hypothesis (A) was not fully supported by the current data, as GAD was not associated with emotional rigidity, nor was the interaction of GAD and affect condition. This conflicts with the findings of the negative contrast avoidance model, as this theory would predict that individuals with GAD would likely show blunted affective reactions to affective stimuli (Newman et al., 2011). Said differently, those lower in general anxiety should evidence greater affect change in response to emotionally evocative stimuli, but again this was not observed. After exposing participants to either positive or negative affect inducing stimuli, the study next explored individual’s perceptions of social interactions to find answers for the second research question, which the next hypothesis addressed.

Based off results from a similar study (Erikson & Newman, 2007), hypothesis B predicted that GAD severity would predict participant’s self-report of their social interaction, and this was partially supported. Individuals with greater GAD severity reported that the confederates were significantly more dominant and hostile than did those low on GAD. Higher GAD severity marginally predicted confederates being more hostile submissive, and lower GAD severity was associated with higher ratings of confederates as being affectionate. GAD severity did not predict participant’s desire for future interaction with the confederate or their ratings of the confederate on other scales. These results suggest that individuals with GAD are more likely to perceive others more negatively, and see them as more hostile/ hostile-submissive and less affectionate than do those without GAD. Thus one additional negative consequence of GAD is that it may manifest itself in social situations, specifically taking the form of negative appraisals of
such situations. These appraisals might make socializing more challenging and aversive, and in effect cause and maintain avoidance of social situations.

This hypothesis further expected that GAD severity would not predict independent rater’s ratings of the participant, and results coincided with findings from previous studies (Erikson & Newman, 2007). GAD severity did predict higher independent rater’s ratings of the participant as being submissive, but did not influence independent rater’s desire for future interaction with the participant, or their rating of the participant on any other domain. Individuals with GAD likely have a negativity bias towards their own social performances, but despite how they may perceive themselves in social situations, others likely do not share similar negative perceptions.

To answer the third research question, whether negative affect and GAD interact on individual’s perceptions of themselves in social situations, Hypothesis C examined interactions between GAD severity and affect condition on social perceptions. This hypothesis confirmed hypothesis B’s conclusion that individuals who met criteria for GAD had significantly higher perceptions of the confederate as being dominant than did participants without GAD status. Additionally, there was a significant interaction between GAD disorder status and affect condition when predicting participant’s ratings of the confederate as being more hostile and hostile-dominant. Those with GAD in the negative affect condition had lower reports of the confederate as being hostile dominant. The interaction of GAD disorder status and affect condition also predicted participant ratings of the confederate as hostile submissive, so that for those in the negative condition, GAD led to lower reports of the confederate as being hostile-dominant. No other interactions or relationships were found between GAD status and affect condition.
on participant ratings of their perceptions of the confederates, or the independent rater’s ratings of the participants. Put together, these findings can be taken as partial support for the Negative Contrast Avoidance Model (Newman et al., 2011). This model likely would have predicted that individuals with GAD would have seen the confederates more negatively across both scales than what was found. The current study found that when individuals with GAD are placed in situations which cause negative affect, they are less likely to see the negative qualities in others. When placed in positive affect inducing situations, they may try to maintain their preferred negative affective state, and search for threatening qualities of others, such as dominance and hostility. It is possible that deficits associated with GAD may manifest as maladaptive perceptions of social situations and of others, which may have a detrimental effect on social performance. This idea should be further investigated in future studies.

Finally, the current study provided some clarity to the question of the relationship between GAD and HRV. Hypothesis D1 predicted that GAD would predict HRV across all phases of the experiment, per previous literature on the disorder (Kemp, Quintana, Flemingham & Jelinek, 2012). This was marginally supported for baseline and recovery, but not for any of the other phases. GAD severity was related to lower HRV only during periods of relaxation or recovery, not during stressful tasks. One possible explanation for this is the Negative Contrast Avoidance Model (Newman et al., 2011), which might suggest that when instructed to relax, a relatively positive instruction given in both baseline and recovery, individuals with GAD continue worrying in order to maintain their negative affect. This worrying behavior during relaxation may be causing the physiological change found in baseline and recovery. Another possible explanation for
this finding could be that anticipatory anxiety during the baseline condition is the underlying reason for this physiological change.

Hypothesis D2 predicted that GAD severity would predict physiological recovery, but this hypothesis was not supported. Individuals with and without GAD experienced similar stress-loads (measured by heart rate) during the recovery period. Last, Hypothesis D3 anticipated that there might be an interaction between affect and GAD across all phases, and exploratory analyses were conducted to better understand this relationship. There was only marginal significance for this interaction in the interview and recovery tasks. In the interview task, those in the positive affect condition without GAD had marginally higher HRV than those in the negative condition. This suggests that for individuals without anxiety disorder, positive mood may contribute to flexible autonomic responding (more physiologically reactive), allowing for more effective emotional and social expression and reception during socialization, as anticipated by previous literature (Kemp, Quintana, Flemingham & Jelinek, 2012). However, this response did not occur during the story telling task, and thus the interpretation of findings during the interview task should be taken with caution.

Put together, these results provide answers for the aforementioned research questions. The majority of the research hypotheses were not supported, and limited evidence was found in favor of current theories. Future work should aim to overcome the limitations of this present research, and further the current understanding of GAD.

B. Limitations

There are multiple limitations from this study which should be noted. First, this study was collected with a non-clinical, general undergraduate population. Delineation of
specific relationships and causal factors underlying GAD would be stronger if a clinical
sample was obtained through the usage of a validated structured interview, such as the
Anxiety Disorders Interview Schedule. This is not only a limitation of the current study,
but a more pervasive limitation in the extant literature (Fisher and Newman, 2013).

Second, the current study performed several exploratory analyses due to limitations in
theory and empirical literature to guide hypotheses, and due to limited power for
ANOVA. However, there was sufficient power for the majority of the tests used,
exploratory tests were determined a priori, and given that this was a psychophysiological
lab protocol the sample was similar in size to many studies alike.

Third, when examining affect the present study did not use a neutral condition which
could have provided further comparisons. A neutral condition would have provided
information on how individuals with GAD respond to stimuli that are not affectively
laden. Additionally, the affect manipulation used in the current study was not found to be
significant in the expected patterns. This is a weakness of this study, and researchers
should aim to use more effective affect manipulations, such as more emotionally
evocative film clips (Richards & Gross, 2000). This could possibly explain some of the
unexpected results presented, and future research should endeavor to overcome this
limitation, perhaps by using different types of affect manipulations.

Fourth, this study introduced a novel social task (the graded social interview). This
task is thus unstandardized and is a potential limitation of this study. This task was based
off a similar study (Erikson & Newman, 2011) but questions were placed in a more
particular order, becoming more personal as the task continued. Fifth, it should also be
noted that Body Mass Index (BMI) was not measured, and thus was not tested as a
covariate, common in studies examining cardiovascular activity. Additionally, the current study did not address type one error. This could be addressed in future studies by aiming to collect more participants. Additionally, given the number or statistical tests and the usage of 0.05 error probability, the current study type 1 error is a potential threat. This could be addressed in future studies by aiming to collect more participants, running fewer exploratory tests, and limiting the number of primary hypotheses.

Finally, the present study only has measures of “pure” sympathetic vagal modulation, with the exception of testing HR recovery, and did not test similar measures of sympathetic response. In terms of emotion regulation and stress reactivity, there would have been a more wholesome understanding of the autonomic nervous system if myocardial contractility indices or galvanic skin response to evocative emotional material were collected. However the vagus (HRV) is a transdiagnostic biomarker of emotion dysregulation in psychopathology (Beauchaine & Thayer, 2015), and was sufficient for the current studies aims and theoretical testing.

C. Clinical Implications

The results from this study have several interesting clinical implications. Clinicians working with individuals with GAD should note that their patients may hold more negative perceptions of others in social situations, particularly when their mood is more positive. This finding can be understood in the context of negative contrast avoidance, and thus is a direct application of theory into practice. As therapy can be a positive environment, individuals with GAD may make attempts to maintain negative affect and perceive others (including the therapists) as being hostile. This could be a potential barrier to rapport and treatment, and should be considered by the therapist throughout all
sessions. Since individuals in this study self-reported their perceptions, it is reasonable that therapists could assess for such perceptions (or related cognitions) while also monitoring mood.

Additionally, clinicians should recognize that attempting relaxation procedures with individuals who have GAD may be harder than anticipated. When told to relax for 5 minutes individuals with GAD in this study had the most change in HRV, albeit in a less favorable direction of decreases in HRV. If these instructions are seen as causing positive affect, individuals with GAD may attempt to maintain their negative affective states and this can have physiological, and likely psychological, results as well. Thus, being told to relax may cause individuals with GAD to use worry to maintain their negative affect and resist physiological and psychological relaxation.

D. Future Directions

Future work should be directed towards addressing the limitations found in this study. Researchers should also aim to capture pure measures of the SNS and PNS to have stronger understandings of exact physiological reactions with individuals who have GAD. Future research should also aim to use more standardized social procedures, and expand more on affective situations. Research could also examine the idea that the deficits associated with GAD may manifest as maladaptive perceptions of social situations, and in counterintuitive ways. Finally, research should aim to examine the physiological, affective, and social components of GAD in individuals with actual diagnoses of GAD, as opposed to undergraduate convenience samples.
References


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Ladouceur, R., Dugas, M. J., Freeston, M. H., Rhéaume, J., Blais, F., Boisvert, J. M.,


### Appendices

#### A. Tables

**Table 1: Sample characteristics for all participants.**

<table>
<thead>
<tr>
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<th>Percentages (N)</th>
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<tbody>
<tr>
<td>Female</td>
<td>83.9% (47)</td>
</tr>
<tr>
<td>Caucasian or White</td>
<td>71.4% (40)</td>
</tr>
<tr>
<td>African American or Black</td>
<td>14.3% (8)</td>
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<td>Asian</td>
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<tr>
<td>Multiple Races</td>
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</tr>
<tr>
<td>Positive Affect Condition</td>
<td>42.9% (24)</td>
</tr>
<tr>
<td>GAD Condition</td>
<td>44.6% (25)</td>
</tr>
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</table>

**Table 2: Sample characteristics for excluded participants.**

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<tbody>
<tr>
<td>Female</td>
<td>75.0% (3)</td>
</tr>
<tr>
<td>Caucasian or White</td>
<td>75.0% (3)</td>
</tr>
<tr>
<td>Asian</td>
<td>25% (1)</td>
</tr>
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<td>Positive Affect Condition</td>
<td>75% (3)</td>
</tr>
<tr>
<td>GAD Condition</td>
<td>75% (3)</td>
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Table 3: Means and standard deviations of participants across conditions and anxiety status.

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<tr>
<td>PSWQ</td>
<td>38.875 (11.105)</td>
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<tr>
<td>BDI</td>
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</tr>
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<td>BAI</td>
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<tr>
<td>STAI (Avg. lab component)</td>
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<td>PANAS Positive Post BL</td>
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<tr>
<td>PANAS Positive Post Affect</td>
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<td>PANAS Negative Post BL</td>
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<tr>
<td>PANAS Negative Change Score</td>
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</table>

<table>
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<tr>
<td>PSWQ</td>
<td>45.875 (9.357)</td>
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<td>BDI</td>
<td>24.375 (9.164)</td>
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<td>BAI</td>
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<tbody>
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<td>PSWQ</td>
<td>33.867 (6.300)</td>
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<td>BDI</td>
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<td>BAI</td>
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<td>PANAS Positive Post BL</td>
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<td>PANAS Positive Post Affect</td>
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<td>PANAS Negative Post Affect</td>
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<td>PSWQ</td>
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Table 4: Summary of Physiology Results

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<tr>
<th>Hypothesis</th>
<th>Statistics for HRV-HFnu</th>
<th>Significance</th>
<th>Statistics for HRV – LnHRV – HFms2</th>
<th>Significance</th>
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<tbody>
<tr>
<td>D1 – Baseline</td>
<td>$R^2 = .059, \beta = .242, t(53) = 1.833, p = .072$, Approached Marginal</td>
<td>$p &gt; .05$</td>
<td>Non</td>
<td></td>
</tr>
<tr>
<td>D1 – Recovery</td>
<td>$R^2 = .060, \beta = .244, t(53) = 1.851, p = .070$, Approached Marginal</td>
<td>$p &gt; .05$</td>
<td>Non</td>
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<tr>
<td>D1 – Affect Manipulation, Story Telling, Interview</td>
<td>$p &gt; .05$ Non</td>
<td>$p &gt; .05$ Non</td>
<td>Non</td>
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<tr>
<td>D3 – Interview</td>
<td>$p &gt; .05$ Non</td>
<td>$F(1, 52) = 3.726, p = .059$, Marginal</td>
<td>Non</td>
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<tr>
<td>D3 – Recovery</td>
<td>$p &gt; .05$ Non</td>
<td>$F(1, 52) = 3.560, p = .065$, Marginal</td>
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<td>D3 – Baseline, Affect Manipulation, Story Telling</td>
<td>$p &gt; .05$ Non</td>
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### Table 5: Summary of Significant Results

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<th>Hypothesis</th>
<th>Statistics</th>
<th>Supported Hypothesis</th>
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</thead>
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<tr>
<td>A – Main effect of affect condition in hierarchical regression of GAD severity and affect condition on PANAS negative change scores</td>
<td>$\beta = .072$, $t(52) = 1.838$, $p = .072$</td>
<td>Yes</td>
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<tr>
<td>B – Participant Ratings on IMI Dominant Subscale</td>
<td>$\beta = .515$, $t(53) = 4.415$, $p &lt; .001$</td>
<td>Yes</td>
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<tr>
<td>B – Participant Ratings on IMI Hostile Subscale</td>
<td>$\beta = .301$, $t(53) = 2.323$, $p = .024$</td>
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<tr>
<td>B – Participant Ratings on IMI Hostile Submissive Subscale</td>
<td>$R^2 = .064$, $\beta = .254$, $t(53) = 1.927$, $p = .059$</td>
<td>Yes</td>
</tr>
<tr>
<td>B – Participant Ratings on IMI Affectionate Axis</td>
<td>$R^2 = .051$, $\beta = -.226$, $t(53) = -1.707$, $p = .094$</td>
<td>Yes</td>
</tr>
<tr>
<td>B – Independent Rater’s Ratings On IMI Submissive Subscale</td>
<td>$F(1, 54) = 5.551$, $R^2 = .093$, $p = .022$</td>
<td>No</td>
</tr>
<tr>
<td>C – Main Effect of GAD on Participant IMI Dominant Subscale</td>
<td>$F (1,52) = 19.250$, $p &lt; .001$</td>
<td>N/A</td>
</tr>
<tr>
<td>C – Interaction of GAD and Affect Condition on Participant IMI Hostile Subscale</td>
<td>$F (1, 52) = 6.508$, $p = .014$</td>
<td>N/A</td>
</tr>
<tr>
<td>C – Interaction of GAD and Affect Condition on Participant IMI Non-Transformed Hostile Dominant Subscale</td>
<td>$F (1, 52) = .541$, $p = .078$</td>
<td>N/A</td>
</tr>
<tr>
<td>C – Interaction of General Anxiety and Affect Condition on Participant IMI Transformed Hostile Dominant Subscale</td>
<td>$F (1, 52) = .541$, $p = .073$</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Table 5: Summary of Significant Results (Cont.)

<table>
<thead>
<tr>
<th>Effect Description</th>
<th>Test Statistic</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>C – Interaction of General Anxiety and Affect Condition on Participant IMI Hostile Submissive Subscale</td>
<td>$F(1, 52) = 2.981, p = .090$</td>
<td>N/A</td>
</tr>
<tr>
<td>D1 – GAD Severity and HRV-HFnu During Baseline</td>
<td>$R^2 = .059$, $\beta = .242$, $t(53) = 1.833$, $p = .072$</td>
<td>Yes</td>
</tr>
<tr>
<td>D1 – GAD Severity and HRV-HFnu During Rest Phase</td>
<td>$R^2 = .060$, $\beta = .244$, $t(53) = 1.851$, $p = .070$</td>
<td>Yes</td>
</tr>
<tr>
<td>D3 – Main Effect of Affect Condition on HFms2 Log During Interview Task</td>
<td>$F(1, 52) = 3.726, p = .059$</td>
<td>N/A</td>
</tr>
<tr>
<td>D3 – Main Effect of Affect Condition on HFms2 Log During Rest Phase</td>
<td>$F(1, 52) = 3.560, p = .065$</td>
<td>N/A</td>
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<tr>
<td>Hyp</td>
<td>Research Question</td>
<td>Tested Through</td>
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<tr>
<td>A</td>
<td>GAD severity will significantly predict affect, such that higher GAD severity will predict less affect change.</td>
<td>Linear Regression – GAD severity and PANAS Negative Change Scores</td>
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<tr>
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<td></td>
<td>Linear Regression – GAD severity and PANAS Negative Change Scores</td>
</tr>
<tr>
<td>A</td>
<td>There will be an interaction between GA and affect condition on affect change.</td>
<td>Hierarchical regression – GAD severity and affect condition on PANAS Negative</td>
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<td>Hierarchical regression – GAD severity and affect condition on PANAS Positive</td>
</tr>
<tr>
<td>B</td>
<td>GAD severity will predict participant’s self-report of their social interactions on the DFI</td>
<td>Linear regression – GAD severity and participant DFI Total</td>
</tr>
<tr>
<td>B</td>
<td>GAD severity will predict participant’s self-report of their social interactions on the IMI</td>
<td>Linear regression – Dominant</td>
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<td>Linear regression – Friendly – Dominant</td>
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<td>Linear regression – Friendly</td>
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<td>Linear regression – Friendly – Submissive</td>
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<td>Linear regression – Submissive</td>
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<td>Linear regression – Hostile – Submissive</td>
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<td>Linear regression – Hostile</td>
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<td>Linear regression – Hostile - Dominant</td>
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<td>Linear regression – Dominant Axis</td>
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<td>Linear regression – Affectionate Axis</td>
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<tr>
<td></td>
<td>GAD severity will not predict independent rater’s ratings of the participant on the DFI</td>
<td>Linear regression – GAD severity and independent rater’s DFI Total</td>
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<tr>
<td>B</td>
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<td>Linear regression – Dominant</td>
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<td>Linear regression – Friendly – Dominant</td>
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<td>Linear regression – Friendly – Submissive</td>
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<td>Linear regression – Hostile – Submissive</td>
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<td>Linear regression – Hostile - Dominant</td>
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<td>Linear regression – Dominant Axis</td>
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<td></td>
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<td>Linear regression – Affectionate Axis</td>
</tr>
<tr>
<td>C</td>
<td>Interaction of affect condition and GAD severity on DFI – exploratory</td>
<td>ANOVA – affect condition, GA, and DFI</td>
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<td>ANOVA – Dominant</td>
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<td>ANOVA – Friendly – Dominant</td>
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<td>ANOVA – Hostile - Dominant</td>
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<td>ANOVA – Dominant Axis</td>
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<td>ANOVA – Affectionate Axis</td>
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<td></td>
<td>ANOVAs – Independent rater’s ratings on DFI and IMI Subscales</td>
<td>N/A – no effects</td>
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<tr>
<td><strong>D1</strong></td>
<td>GAD severity will predict HRV across phases</td>
<td>Linear regression – Baseline</td>
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<td>Linear regression – Affect Manipulation</td>
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<td>Linear regression – Story Telling Task</td>
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<td>Linear regression – Interview Task</td>
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<td>Linear regression – Recovery</td>
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<tr>
<td><strong>D2</strong></td>
<td>GAD severity will predict physiological recovery</td>
<td>Linear regression – GAD severity and area under the curve through recovery phase</td>
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<tr>
<td><strong>D3</strong></td>
<td>Interaction of affect manipulation and GAD severity across phases – exploratory</td>
<td>ANOVA – Baseline</td>
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<tr>
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<td></td>
<td>ANOVA – Affect Manipulation</td>
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<td>ANOVA – Story Telling Task</td>
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<td>ANOVA – Interview Task</td>
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<td>ANOVA – Recovery</td>
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</tbody>
</table>
Figure 1: Procedures for current study.
Figure 2: Interaction of GAD Severity and Affect Condition on Hostile Subscale

Figure 3: Interaction of GAD Severity and Affect Condition on Hostile Dominant Subscale
Figure 4: Interaction of GAD Severity and Affect Condition on Submissive Subscale

Figure 5: Visual representation of anticipated results for Hypothesis D1.
Figure 6: Visual representation of actual results for Hypothesis D1.
C. Demographic Form

1. What is your gender?
   a. Male
   b. Female
   c. Other

2. How old are you?

3. What is your marital status?
   a. Single
   b. Married
   c. Divorced, separated or widowed

4. What is the highest level or degree of schooling that you have completed?

5. What is your current employment status?
   a. Part Time
   b. Full Time
   c. Retired
   d. Unemployed
   e. Unemployed Student
   f. Full time student

6. What is your ethnicity?
   a. Caucasian/ White
   b. Hispanic/ Non-White
   c. African American/ Black
   d. Other
D. Cardiovascular Health Questionnaire

Please answer the following questions about your cardiovascular health, possible medications you are currently taking, and the history of cardiovascular health in your family, and your fitness level. You may circle all that apply. Remember, your responses will be kept confidential.

1. Do you have any of the following cardiovascular problems:
   a. Hypertension (high blood pressure)
   b. Coronary Artery Disease
   c. Atherosclerosis
   d. Stroke
   e. Myocardial Infarction (heart attack)
   f. Aortic stenosis
   g. Mitral regurgitate
   h. Any other cardiovascular disease not listed above (please, indicate the name of this disease)
      ____________________________________________________________
      ______
   i. I DO NOT HAVE ANY CARDIOVASCULAR PROBLEMS

2. Does your mother have any of the following cardiovascular problems:
   a. Hypertension (high blood pressure)
   b. Coronary Artery Disease
   c. Atherosclerosis
   d. Stroke
   e. Myocardial Infarction (heart attack)
   f. Aortic stenosis
   g. Mitral regurgitate
   h. Any other cardiovascular disease not listed above (please, indicate the name of this disease)
      ____________________________________________________________
      ______
i. **MY MOTHER **DOES NOT HAVE ANY CARDIOVASCULAR PROBLEMS

3. Does **your father** have any of the following cardiovascular problems:
   
a. Hypertension (high blood pressure)
   
b. Coronary Artery Disease
   
c. Atherosclerosis
   
d. Stroke
   
e. Myocardial Infarction (heart attack)
   
f. Aortic stenosis
   
g. Mitral regurgitate
   
h. Any other cardiovascular disease not listed above (please, indicate the name of this disease) __________________________
   
   
i. **MY FATHER **DOES NOT HAVE ANY CARDIOVASCULAR PROBLEMS

4. Does **anyone in your family** have any of the following cardiovascular problems (please, circle all that apply and write who this family member is, e.g., sister/brother/aunt/uncle, etc.):
   
a. Hypertension **(Family member: __________________________)**
   
b. Coronary Artery Disease **(Family member: __________________________)**
   
c. Atherosclerosis **(Family member: __________________________)**
   
d. Stroke **(Family member: __________________________)**
   
e. Myocardial Infarction (heart attack) **(Family member: __________________________)**
   
f. Aortic stenosis **(Family member: __________________________)**
   
g. Mitral regurgitate **(Family member: __________________________)**
   
h. Any other cardiovascular disease not listed above (please, indicate the name of this disease) __________________________ **(Family member: __________________________)**
   
   
i. NONE OF MY RELATIVES HAS ANY CARDIOVASCULAR PROBLEMS
5. Do you currently take any of the following medications in any form:
   a. Dexamethasone
   b. Steroids (e.g., prednisone, or inhaled steroids for asthma)
   c. Diet pills (please, indicate the name of the pill: ____________________________)
   d. Beta-blockers
   e. Histamines
   f. Decongestants
   g. Any other medications not listed above (please, write a name of this medication)________________________________________
   h. I DO NOT CURRENTLY TAKE ANY MEDICATIONS

6. Do you smoke?
   a. Yes
   b. no

7. If you smoke, how many cigarettes per day do you smoke per day? _______________________

8. How much caffeine/caffeinated beverages have you had TODAY?
   a. How many cups of coffee have you had today? _______________________
   b. What is the amount of coke have you had today? _______________________
   c. Please, list other caffeinated beverages/foods you have had today________________________________________

9. How much caffeine/caffeinated beverages do you USUALLY consume per day?
   a. How many cups of coffee do you have per day? _______________________
   b. What is the amount of coke you have per day? _______________________

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c. Please, list other caffeinated beverages/foods you may have during the day__________________________________________________________
   __________

10. How many times a week do you exercise:
   a. Less than once a week
   b. Once a week
   c. Twice a week
   d. Three times a week
   e. Four or more times a week

11. How vigorous is your exercise (the examples are taken from www.fitday.com):
   a. Very intense (such as fast jogging, weight lifting, etc.)
   b. Moderate (such as slow jogging, fast walk)
   c. Light (such as walking to school)
   d. If you are unsure on how to classify your exercise, please, provide its description below:

   Exercise:
   ____________________________________________________________________________________________
E. Desire for Future Interaction

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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td></td>
<td>Definitely</td>
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</table>

1. Would you like to meet this person again?
2. “Would you like to spend more time with her?”
3. “Would you like to work with this person?”
4. “Would you like to sit next to her on a 3 hour bus ride?”
5. “Would you invite this person to visit you?”
6. “Would you like to get to know this person better?”
7. “Would you ask this person for advice?”
8. “Would you consider having this person for a roommate?”
F. Generalized Anxiety Disorder Questionnaire

1. Do you experience excessive worry? Yes No
2. Is your worry excessive in intensity? Yes No
3. Do you find it difficult to control the worry (or stop worrying) once it starts? Yes No
4. Do you worry excessively or uncontrollably about minor things such as being late for an appointment, minor repairs, homework, etc.? Yes No
5. Please list the most frequent topics about which you worry excessively or uncontrollably:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

6. During the last six months, have you been bothered by excessive worries more days than not? Yes No
7. During the past six months, have you been bothered by any of the following symptoms?
   ○ restlessness or feeling keyed up or on edge
   ○ irritability
   ○ difficulty falling/staying asleep or
   ○ being easily fatigued
   ○ restless/unsatisfying sleep
   ○ difficulty concentrating or mind going blank
   ○ muscle tension
8. How much do worry and physical symptoms interfere with your life, work, social activities, family, etc.?
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   None Moderate Mild Severe Very Severe
9. How much are you bothered by worry and physical symptoms (how much distress does it cause you)?
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   None Moderate Mild Severe Very Severe
G. Impact Message Inventory

This inventory contains words, phrases and statements which people use to describe how they are emotionally engaged or impacted when interacting with another person.

You are to respond to this Inventory by indicating how accurately each of the items describes your reactions to the particular person under consideration. Respond to each item in terms of how precisely it describes the feelings this person arouses in you, the behaviors you want to direct toward him / her when he / she's around, and/or the descriptions of him / her that come to mind when you're with her. Indicate how each item describes your reactions using the following scale: 1-Not at all, 2-Somewhat, 3-Moderately so, 4-Very much so.

First, imagine you are in this person's presence, interacting with him/her. Focus on the immediate reactions you would be experiencing. Then read each of the items and fill in the number on the separate answer sheet which best describes how you would be feeling and/or would want to behave if you were, at this moment, in the person's presence. There are no right or wrong answers since different people react differently to the same person. At the top of each page is a statement which is to precede each of the items on that page. Read that statement with each item; it will aid you in imagining the presence of the person described. Be sure to make all your marks on the separate answer sheet.

1 - Not at all 3 - Moderately so
2 - Somewhat 4 - Very much so

When I am with this person he/ she makes me feel...
1. bossed around.
2. distant from him/ her.
3. important.
4. entertained.
5. like an intruder.
6. in charge.
7. appreciated by him/ her.
8. part of the group when he / she's around.
9. forced to shoulder all the responsibility.
10. complimented.
11. as if he’s/ she's the class clown.
12. uneasy.
13. dominant.
14. welcome with him/her.
15. as important to him/ her as others in the group.
16. annoyed.
17. taken charge of.
1 - Not at all  2 - Moderately so  3 - Somewhat  4 - Very much so

When I am with this person he/ she makes me feel that...
18. I want to tell him/ her to give someone else a chance to make a decision.
19. I want him/ her to disagree with me sometimes.
20. I could lean on him/ her for support.
21. I'm going to intrude.
22. I should tell him/ her to stand up for herself.
23. I can ask him/ her to carry her share of the load.
24. I could relax and he’d /she’d take charge.
25. I want to stay away from him/ her.
26. I could tell her anything and he/ she would agree.
27. I should tell her he’s/ she's often quite inconsiderate.
28. I should tell him/ her not to be so nervous around me.
29. I could ask him/ her to do anything.
30. I want to get away from him/ her.
31. I should do something to put him/ her at ease.
32. I want to point out her good qualities to him/ her.

When I am with this person it appears to me that....
33. he/ she wants to be the center of attention.
34. he/ she doesn't want to get involved with me.
35. he/ she is most comfortable withdrawing into the background when an issue arises.
H. Penn State Worry Questionnaire

Enter the number that best describes how typical or characteristic each item is of you, putting the number next to the item.

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<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Not at all Typical</td>
<td>Somewhat Typical</td>
<td>Very Typical</td>
<td></td>
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</table>

___ 1. If I don't have enough time to do everything I don't worry about it.
___ 2. My worries overwhelm me.
___ 3. I don't tend to worry about things.
___ 4. Many situations make me worry.
___ 5. I know I shouldn't worry about things, but I just can't help it.
___ 6. When I am under pressure I worry a lot.
___ 7. I am always worrying about something.
___ 8. I find it easy to dismiss worrisome thoughts.
___ 9. As soon as I finish one task, I start to worry about everything else I have to do.
___ 10. I never worry about anything.
___ 11. When there is nothing more I can do about a concern, I don't worry about it anymore.
___ 12. I've been a worrier all my life.
___ 13. I notice that I have been worrying about things.
___ 14. Once I start worrying, I can't stop.
___ 15. I worry all the time.
___ 16. I worry about projects until they are all done.
I. Positive and Negative Affect Schedule

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. **Indicate the extent you have felt this way over the past week** (circle the instructions you followed when taking this measure)

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<td>5</td>
</tr>
<tr>
<td>Not at all</td>
<td>A little</td>
<td>Moderately</td>
<td>Quite a Bit</td>
<td>Extremely</td>
</tr>
</tbody>
</table>

_________ 1. Interested _________ 11. Irritable
_________ 2. Distressed _________ 12. Alert
_________ 3. Excited _________ 13. Ashamed
_________ 5. Strong _________ 15. Nervous
_________ 7. Scared _________ 17. Attentive
_________ 8. Hostile _________ 18. Jittery
_________ 9. Enthusiastic _________ 19. Active
_________ 10. Proud _________ 20. Afraid
J. Post Task Questionnaire

Over the past few minutes, how much have you been worrying about future things?

1----------------2-----------------3-----------------4-----------------5-----------------6
None at all A little bit Moderate Quite a bit A lot Constantly worried

Over the past few minutes, how intense has your worrying been?

1----------------2-----------------3-----------------4-----------------5-----------------6-----------------7
Not at all Minimally Mildly Moderately Quite intense Very Extremely

Over the past few minutes, how distressing has your worrying been?

1-----------------2-----------------3-----------------4-----------------5-----------------6-----------------7
Not at all Minimally Mildly Moderately Quite Very Extremely

Over the past few minutes, how much have you been ruminating about past things?

1-----------------2-----------------3-----------------4-----------------5-----------------6
None at all A little bit Moderate Quite a bit A lot Constantly ruminating

Over the past few minutes, how intense has your ruminative thinking been?

1-----------------2-----------------3-----------------4-----------------5-----------------6-----------------7
Not at all Minimally Mildly Moderately Quite intense Very Extremely

Over the past few minutes, how distressing has your ruminative thinking been?

1-----------------2-----------------3-----------------4-----------------5-----------------6-----------------7
Not at all Minimally Mildly Moderately Quite Very Extremely

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<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
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<tbody>
<tr>
<td>How restless or “keyed up” do you feel right now?</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>How irritable are you right now?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>How fatigued are you right now?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>How much muscle tension do you feel right now?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>How is your concentration ability right now?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>How physically relaxed do you feel right now?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>How mentally relaxed do you feel right now?</td>
<td>1 2 3 4 5 6 7</td>
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</tbody>
</table>
K. Research Assistant Confederate Script

1) Prepare for Experiment
- Make sure you arrive AT LEAST 15 minutes prior to experiment start time to get everything situated. Help the other RA in preparing for the experiment.

Materials you will need:
- 7 sticky electrodes
- For Participant
  - PPG EDA device and belt
  - BN-EDA-LEAD2
  - RSP ECG device and belt
  - BN-EL45-LEAD3
- For Confederate
  - EEG EEG device, belt, and lead
  - EMG EMG device, belt, and lead
- BioPac key
- Two notebooks with writing utensils
- ECG Placement Picture
- TAT pictures
  - Sad boy looking at violin
  - Two told men whispering
- NEO-PI-R Instructions/Questions
- Participant Packet
  - Informed Consent
  - Interview Questions
  - Debrief
- Notes:
  - If running low on any materials, contact Joanna IMMEDIATELY! Many of the files are available on Dropbox if needed.
  - All BioPac equipment and notebooks are kept in the top left shelf in participant room
  - All paper equipment is kept in the filing cabinet in the main room
  - Confederate equipment should be kept in the confederate room
  - Extra electrodes are available in the shelf in the participant room, the second cubby from the right.
  - Log in information
    - Computer with BioPac
      - UH5280AP02\Biopac1
      - Biopac2014
    - Computer with MediaLab
      - UH5380AP01\Biopac1
      - Biopac2014

2) Hook yourself up to BioPac
- Take the EEG EEG BioNomadix device and turn it on
  - Insert the black end with three prongs into either of the EEG slots. It does not matter which one
  - Attach the long belt to the device, and place it around your waist
  - Put the three electrodes under your shirt, so it looks as if they are attached to your chest
    - If needed, you can tape them to your stomach with medical tape
- Take the EMG EMG BioNomadix device and turn it on
  - Insert the black end with three prongs into either of the EMG slots. It does not matter which one
  - Attach the short belt to the device, and place it around your non-dominant arm
  - Place two electrodes onto your non-dominant hand’s pointer and middle fingers
    - Place horizontally in the middle part of each finger
    - Attach the clippy parts to the electrodes
  - Keep the door half-open half closed so that the participant can see in

3) Sit in front of the computer and look like you are participating in the study. When the other RA comes to get you, enter the room with the participant.

4) Enter the participant room and sit down in the chair furthest from the door.
   - Allow the other RA to give the first set of instructions
   - Casually introduce yourself to the participant
     - “Hi, I’m NAME, how’s it going?”
   - When the RA gives the instructions, begin the story telling task.
     - Allow the participant to take the lead.
     - Ask questions such as
       - “What do you think?”
       - “Where do you think this could go next?”
       - “What do you think is going on here?”
       - “Do you think they look upset? Why do you think that is?”
       - “What do you imagine they are thinking about? Why?”
       - “How do you think they are feeling? Why?”
   - Do the same thing for part of the second picture
   - When told to do so by the other RA, leave the room and sit in the other lab room.

5) When the other RA comes to get you, follow them back to the room and sit down in the same seat as before.
   - Allow the other RA to give the first set of instructions
   - Take the set of interview questions from the other RA
   - Go through and ask each question of the participant
   - Write down brief answers, but don’t worry about getting everything down or writing things word for word.
   - When told to do so, leave the room and sit in front of the other computer.
- Once the participant leaves, help with closing procedures

6) Closing Matters
- Turn off recording device.
- Save video and BioPac
- Return BioNomadix devices to the shelf
  - If they are blinking yellow, charge them
- Turn off BioPac
- Safely remove BioPac key, and place on shelf
- Make sure that the lab is cleaned and ready for next set of participants
- Close MediaLab
L. Research Assistant Experimenter Script

1) Prepare for Experiment
Make sure you arrive AT LEAST 15 minutes prior to experiment start time to get everything situated.

Materials you will need:
- 7 sticky electrodes
- For Participant
  - PPG EDA device and belt
  - BN-EDA-LEAD2
  - RSP ECG device and belt
  - BN-EL45-LEAD3
- For Confederate
  - EEG EEG device, belt, and lead
  - EMG EMG device, belt, and lead
- BioPac key
- Two notebooks with writing utensils
- ECG Placement Picture
- TAT pictures
  - Sad boy looking at violin
  - Two told men whispering
- NEO-PI-R Instructions/Questions
- Participant Packet
  - Informed Consent
  - Interview Questions
  - NEO-PI-R
  - Debrief
- Notes:
  - If running low on any materials, contact Joanna IMMEDIATELY! Many of the files are available on Dropbox if needed.
  - All BioPac equipment and notebooks are kept in the top left shelf in participant room
  - All paper equipment is kept in the filing cabinet in the main room
  - Confederate equipment should be kept in the confederate room
  - Extra electrodes are available in the shelf in the participant room, the second cubby from the right.
  - If the participant pulls out their phone, water bottle, or any other distracter, ask them to put everything away until the end of the study.
  - If a participant asks, at any point, about confidentiality tell them that what they say will be kept confidential to a point
    - We are legally obligated to report any kind of abuse, especially towards children or the elderly
- We must also report if someone is a threat to themselves or others
- If you are in a situation that makes you uncomfortable, and you are not sure what to do contact Joanna, Jason, or Sam immediately.
  - If you know the participant and are the experimenter, this is okay. If you are the confederate, however, you need to switch roles with another RA.
- Log in information
  - **Computer with BioPac**
    - UH5280AP02Biopac1
    - Biopac2014
  - **Computer with MediaLab**
    - UH5280AP01Biopac1
    - Biopac2014

**Procedure:**
- Gather all materials
- Make sure lab looks presentable – no trash anywhere, etc.
- Turn on computers and make sure all monitors are active
- On confederate computer access Dropbox
  - Lab Folder → Studies → Social GAD Study → Social GAD Study Procedures → Master List
  - This will tell you the name of the participant, their ID number, what affect condition they will be in, etc.
  - Write in the date, time and RAs present
  - Save file
- BioPac
  - Insert BioPac key into your computer
  - Open BioPac Template labeled “Social GAD Template”
  - Turn on BioPac machine (button behind Module that says “MP150”)
  - Take participants’ Bionomadix devices and switch to “on”
  - Move BioPac onto the second screen so the participant cannot see the screen
  - The 3 clip cord goes with ECG
  - The 2 clip cord goes with EDA
- Open up a blank Microsoft Word Document on your computer
  - Use this to record anything unusual that happens during the experiment (e.g. a fire alarm going off)
  - Save in Participants Folder as “PID#”
    - For example, participant 1 would be saved as “P1”
- Set up Instructional Video
  - Open “Instructional Video” on participants computer and have it ready to play once the participant comes in
  - Turn the sound on using the speaker
- **Set up Webcam**
  - On your computer, click on “Logitech Webcam Software”
  - Select “Quick Capture”
  - Make sure you can see both the participant and confederate chairs.
  - Cover webcam

- **MediaLab**
  - Open MediaLab Experiment on participants computer
    - Click on Polar Bear icon “MediaLab v2014”
    - Run → Select and Run an experiment → “SocialGAD_MediaLab_Final” → Open
    - Enter appropriate Subject ID and condition
      - Remember condition 1 = positive affect, 2 = negative affect
    - Go to file labeled “SocialGAD_MediaLab_Final”
    - Do not press enter until participant is ready to begin!

- Make sure all papers have participant ID on top right corner

2) **Greet the Participant**
- “Hi, are you here for the Social Study?”
- “My name is __________ and I will be running the experiment today. Before we begin, if you need to use the restroom, now would be a great time to do so.”
  - Direct the participant to the location of the restroom if necessary
- “Right now, I want to give you a brief tour of the lab. In this first room you can see there is another participant who is currently working on the study. This room is the main room, where we hold lab meetings. Behind this door is our professor’s office.”
- “Here is the room which contains the computer and laboratory equipment which will be used to collect physiological measures. I will be behind this mirror for parts of this experiment, and in the room with you for most of it. Please take a seat over there. You may place your bag in this corner. Please turn your cell phone to silent and place it to the side.”
  - Point to the participant chair and seat yourself across from the participant.
- “Your consent is required before we begin the experiment. Here is a consent form similar to the one you completed on the online survey”
  - Hand participant the Informed Consent Form
- “Please take your time reading through this form. If you have any questions or comments about the form, please do not hesitate to ask me. When you are finished, your signature at the bottom of this form indicates that you are consenting to participate in this study. Do you have any questions at this time?”
  - Answer any questions.
  - Look at the form and make sure they signed it on the second page, and checked “Yes” on the first page.
o If the participant does not consent, collect the form and thank them for their participation.
  • “You indicated that you are not consenting to this study, is that correct?”

o Once the participant completes the consent form, collect the form.
o If the participant asks you questions about any surveys respond “Just try to answer to the best of your abilities”

3) Check Physiological Data Collection
- Show participant video on setting up electrodes
- Give participant picture of how to set up electrodes
- Explain that they will have several minutes to put on the electrodes, and that you will be outside the door to answer any questions they may have. Instruct them to knock on the door when they are finished
- Provide the participant with BN-EL45-LEAD3
  o There should be three “clippy parts”
- Give participants up to 3-5 minutes to attach electrodes
- They will knock once they have the electrodes attached
  o There should be a total of 3 electrodes – one on either side of their chest, and one on their lower left ribcage
  o If after 5 minutes the participant has not knocked, knock and ask if they have any questions
- Hook participant up to BioPac
  o There should be 1 hanging part coming off of the participants chest
  o Double check that they have placed them correctly
  o “Just to double check, the white string is connected to your right side, the black one on your top left side, and the red one on your bottom left side, with the flat part against the electrode. Correct?”
  o Take the RSP ECG BioNomadix Device
    • Make sure the belt is attached
    • Connect the belt around the participants waist
      • “Place this around your waist like a belt”
    • Connect the hanging part to the ECG slot on the BioNomadix
  o Take the PPG EDA BioNomadix Device
    • Insert the black end with three prongs into the EDA slot
    • “Are you left or right handed?”
    • Attach the short belt to the device, and place it around the participant’s non-dominant arm
    • Place two electrodes onto the participant’s non-dominant hand’s pointer and middle fingers
      • Place horizontally in the middle part of each finger
    • Attach the clippy parts to the electrodes
  o Turn off sound on participant’s computer
“During the entire experiment, it is very important that you remain seated in the back of your chair with your arms resting comfortably. It is critical that you remain still in your seat. Again, try to remain still at all times.”

- Press “Start” on the top left corner of BioPac
  - Pres OK, Calibrate, Continue as they appear
  - Save in Participants Folder as “PID#”
    - For example, participant 1 would be saved as “P1”
- Begin recording ECG to ensure a clean waveform, adjust the electrodes if necessary.
- Ask the participant to wiggle their hands and toes to make sure minimal noise does not interfere with the waveform.
- To see what this should look like, reference the picture on your desktop entitled “Ideal BioPac”
  - Press Display ➔ “Autoscale Waveforms” to make all the lines look better
    - To make a single row look neater, highlight that row and press Display ➔ “AutoScale Single Waveform”
  - Make sure that
    - ECG looks smooth
    - EDA line is curvilinear
      - If this drops off, it is okay
    - ECG an HR are showing up correctly (boxes)
    - C9 – Filter is showing up and looks neat as well
- After a clean waveform is found, delete all segments.
  - Press “Stop” in top left corner of BioPac
  - Press “Start” in top left corner of BioPac
  - When asked to overwrite existing data press “Yes”
  - Pres OK, Calibrate, Continue as they appear

4) Collect Baseline Data
- “Now that the equipment is attached, I would like you to remain seated in your chair while at the same time trying to relax. Remember, just try to relax and let yourself be comfortable and relaxed.”
- Start Collecting Baseline:
  A. Place a marker (F1) to indicate the start of baseline and denote “SB” in the text box
  B. After 5 minutes, place another marker (F2) to indicate end of baseline and denote “EB” in the text box
  C. Use the timer to measure 5.5 minutes

5) First set of Questions
- “This phase of the experiment is complete.”
  - Pull up MediaLab, make sure the correct information is entered, then press “Ok”
- Turn off volume on speakers
- Move computer so it is placed in front of participant

- “Please complete these measures on the computer carefully and accurately. Take your time. Let me know when the program tells you to stop answering questions.”
- Once the questionnaires are finished, the participants will be notified to tell you that they are complete.

6) Affect Manipulation Phase
- “Now we will have you look at the computer screen for several minutes. You will see a variety of pictures for several seconds each. Once you have viewed all the pictures, we will give you more surveys to fill out. Let me know when the program tells you to get my attention.”
- Collect EM Physiological Recordings:
  A. Place a marker (F3) to indicate the start of this phase and denote “SEM” in the text box
- Begin Affect Manipulation
  o Tell the participant to press “Okay” and continue with MediaLab
  o Have the participant continue using MediaLab- the pictures should happen automatically and will go for 5 minutes
  o Once the pictures are over, the participants will be notified to tell you that they are complete.
  o If you notice that the participant is not paying attention, nicely ask them to focus on the stimuli.
    - “Please try to focus your attention on the stimuli on the screen”
- “This phase of the experiment is complete. Please complete the next questions carefully and accurately. Take your time.”
  o Place marker (F4) in BioPac to indicate end of this phase and denote “EEM” in the text box
  o Once the questionnaires are finished, the participants will be notified to tell you that they are complete.
  o Move the computer back so that the participant can see the confederate

7) Story Telling Task
- “Now we will have you work with another participant. We are interested in learning more about how people interact in different social situations. You may have noticed that they are sitting in the other room. They are already hooked up to the same equipment as you, and also completed the first part of the study. We will now bring the other participant in, and we will give you the task that you will both be working on together.”
  o Bring in the “Second Participant” (SP). Give the following information to SP and participant as though they were a real participant.
• “During the entire experiment, it is very important that you remain seated in the back of your chair with your arms resting comfortably on the table. Small bodily movements, including your fingers and toes, could possibly disrupt the measurement. Therefore, it is critical that you remain still in your seat. Again, try to remain still at all times.”
  • Ask the participant and confederate to wiggle their hands and toes to make sure minimal noise does not interfere with the waveform.
• “You two can talk while I get ready for the next section.”

- Turn on web cam
  o Make sure that it is not covered and that both the confederate and participant can be seen.
  o Press the movie button to begin recording.
  o **Remember: If participant ID is an odd number, begin with the Violin Picture. If the participant ID is an even number, begin with the picture of the two men talking.**

- “Because you are both hooked up to our system, we will begin our first task. This will be video recorded. The purpose of this portion of the study is to examine how students achieve agreement in a creative story construction task. You will work together for about five minutes to come up with the stories you agree are best for two pictures. Determine together the best story for this first picture. You may take notes if you like.”
  o Provide participants with one picture from the TAT

- “You will work together to come up with the story you agree are best for this picture. Determine together the best story.”

- Collect SSTT Physiological Recordings:
  o Place a marker (F5) to indicate the start of this phase and denote “SSTT” in the text box once you have explained the instructions

- Provide participants with the second picture from the TAT

- “The time for this section has passed. We will now have both of you complete another set of questionnaires. [CONFEDERATE] you will fill out your questions in the other room.”
  o Move the computer in front of the participant
  o After completion of Story telling task, place another marker (F6) to indicate end of this phase and denote “ESTT” in the text box
  o Have participant fill out next set of questionnaires in MediaLab.
  o Once the questionnaires are finished, the participants will be notified to tell you that they are complete.
  o If the participants asks, they are filling out the questions about their interactions with others about the confederate.
  o Once finished questions, push the computer back again

- Bring confederate back into the room

---

8) **Interview Task and Questionnaire Packet 4**
- “You will now participate in a second social task. The purpose of this portion of the study is to examine how students disclose different levels of personal information. You will be participating in an interview situation. Based off a random coin flip, you (point to participant) will be the interviewee and you (gesture to confederate) will be the interviewer.”
- “Interviewer, here is the list of questions you will ask and write down brief responses to.”
  o Hand the SP the Interview Questions packet.

- Collect SIT Physiological Recordings:
  o Place a marker (F7) to indicate the start of this phase and denote “SIT” in the text box after you have given the instructions
  o Allow 15 minutes for the completion of this task.

- “Now that you have completed this task, I will again ask you to fill out questionnaires. [Confederate], please return to the other room to complete the measures.”
  o Place another marker (F8) to indicate end of this phase and denote “EIT” in the text box
  o Move computer in front of participant
  o Have participant fill out next set of questionnaires in MediaLab.
  o Once the questionnaires are finished, the participants will be notified to tell you that they are complete.

9) Rest Phase and Questionnaire Packet 5
- “This section of the experiment will allow you to return to your normal resting state. It will last five minutes. You will then be given your final questionnaires, and I will go over final information with you. For now, spend the next five minutes relaxing.”
- Collect SRP Physiological Recordings:
  o Place a marker (F9) to indicate the start of this phase and denote “SRP” in the text box
  o Use the timer to measure the 5 minutes
- Turn off webcam
  o Press red movie button
  o Double click on the movie file
  o Right click on the movie clip and press “go to file”
  o Open “Participant Files” folder on desktop
  o Move video to “Participant Files” folder and rename it to match the BioPac Name
    - E.g. “P1”
- After completion, place another marker (F1) to indicate end of this phase and denote “ERP” in the text box
- “You will now fill out the final questionnaires. Take your time and let me know when you have finished.”
  o Have participant fill out next set of questionnaires in MediaLab.
  o Once the questionnaires are finished, the participants will be notified to tell you that they are complete.
Hand the participant the NEO-PI-R Instructions and answer sheets
- “Write only on the answer sheet. Do NOT write on the sheet with the instructions and questions”.
- They will write on the answer sheet NOT the instruction/question packet. The instruction/question packet is reused with each participant.

10) **Debriefing**
- “You have now ended the experiment. You may now take off the electrodes”
  - Turn off BioPac by pressing “Stop” in the upper left hand corner of the screen
  - Assist the participant in taking off devices
  - Allow the participant to remove the electrodes as needed
- “Before you leave, we wish to discuss a few closing matters with you. Did you notice anything out of the ordinary about the participant you worked on the social tasks with?”
  - Record on Microsoft Word document
- “The participant you worked with was a confederate. This means that they are actually an experimenter in our lab, not an actual participant. They helped us to gain additional information about social tasks.”
  - Hand participant the debriefing form and review with them.
  - “We were interested in seeing how people with and without Generalized Anxiety Disorder differ in social situations. One of the cardinal features of Generalized Anxiety Disorder is worry, which can be adaptive and helpful, but when experienced excessively, worry can get in the way of one’s functioning. It is not well understood how worry influences people with Generalized Anxiety Disorder, especially in social situations. The point of this study was to increase our knowledge about worry and how it affects people at varying levels of frequency. We did this study in the lab so we could also gain a better understanding of the physiological effects of worry.”
- “Do you have any questions at this point?”
  - If yes, answer questions.
    - If they have questions that you do not have the answer to, give them my e-mail address and tell them they may contact me directly (Joanna.Piedmont@rockets.utoledo.edu)
  - If not,
    - “Remember to not discuss this study with any of your classmates or friends, as it could affect other data we are trying to collect. Do not mention to anyone that there was a confederate, someone who was pretending to be a participant, involved in the study. If someone does ask what the study was about, tell them it was looking at anxiety and physiology.”
11) Closing Matters
   - Close BioPac
     o Press the “X” in the top right corner, and press “Quit” when prompted
   - Return BioNomadix devices to the shelf
     o If they are blinking yellow, charge them
     o The charger is attached to the BioPac cart. It is the large black box in the power strip on the side of the cart.
   - Turn off BioPac by pressing the button on the back of the MP150 unit
   - Safely remove BioPac key, and place on shelf
   - Make sure that the lab is cleaned and ready for next set of participants
   - Close MediaLab
M. State-Trait Anxiety Inventory

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

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Somewhat so</td>
<td>Moderately</td>
<td>Very much so</td>
</tr>
</tbody>
</table>

1. I feel calm
   - 1 2 3 4

2. I feel secure
   - 1 2 3 4

3. I am tense
   - 1 2 3 4

4. I am regretful
   - 1 2 3 4

5. I feel at ease
   - 1 2 3 4

6. I feel upset
   - 1 2 3 4

7. I am presently worrying over possible misfortunes
   - 1 2 3 4

8. I feel rested
   - 1 2 3 4

9. I feel anxious
   - 1 2 3 4

10. I feel comfortable
    - 1 2 3 4

11. I feel self-confident
    - 1 2 3 4
<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>I feel nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>I am jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>I feel “high strung”</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>I am relaxed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>I feel content</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>I am worried</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18</td>
<td>I feel over-excited or rattled</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>I feel joyful</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>I feel pleasant</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>