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Facial Expressions in Generalized Anxiety Disorder

by

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Abstract

This study examines facial expressions during the viewing of emotion-eliciting videos (Rottenberg, Ray & Gross, 2007). Each participant watched negative emotion videos (fear and sadness) and a neutral video (Aldao, Mennin & McLaughlin, 2013). Facial expressivity was coded with the Emotional Expressive Behavior (EEB) Coding System (Gross & Levenson, 1993) to determine potential differences between individuals with GAD and healthy controls. I hypothesize that those with GAD will show more avoidance and thus less facial expressivity during emotion-eliciting films compared to controls. Findings suggest that greater displays of sad facial expressions and more body movement are associated with higher self-reported anxiety-related symptoms in those with GAD. In the control group, lower scores on rumination and worry scales was found to be associated with more facial expressions of fear during the fear video. No significant differences in facial expressivity between groups were found.

Keywords: emotionally expressive behavior, emotional suppression, anxiety, facial expressions, generalized anxiety disorder

Facial Expressions in generalized anxiety disorder

Generalized anxiety disorder (GAD) is defined by the Diagnostic and Statistical Manual, 4th edition (DSM-IV-TR; American Psychiatric Association, 2000) as excessive anxiety and worry on more days than not for a period of at least six months. The anxiety and worry cause distress and functional impairment, and are accompanied by at least three of the following symptoms: restlessness or feeling keyed up or on edge, fatigue, difficulty concentrating or mind going blank, irritability, muscle tension and disturbed sleep (difficulty falling or staying asleep, or unsatisfied sleep). In addition to these symptoms, the individual experiences difficulty trying to control their worry. GAD is also associated with heightened emotional intensity (frequently strong negative affect) and difficulties in emotion regulation, or the ability to control, experience and express one's own emotions (Gross, 1998; Mennin, Heimberg, Turk & Fresco, 2005). Emotional avoidance may also play an important role in GAD (Amstadter, 2008; Buhr & Dugas, 2012; Cooper, Miranda & Mennin, 2013).

Previous research has indicated that GAD is difficult to both understand and treat, but is also largely focused on cognitive behavioral treatment (CBT) studies where end-state functioning of anxious individuals is varied (Dugas & Ladouceur, 2000; Newman et al., 2013). Emotion regulation has been largely underemphasized in the treatment of GAD until more recently (Mennin, Fresco, Ritter & Heimberg, 2015). There are many indices of emotion dysregulation in GAD (Behar, DiMarco, Hekler, Mohlman, & Staples, 2009). Worry, for example, is a maladaptive coping mechanism used by those with GAD and become negatively reinforced through avoidance of perceived aversive stimuli (Behar et al., 2009; Borkovec, Alcaine & Behar, 2004; Newman, Llera, Erickson, Przeworski, & Castonguay, 2013). More broadly, the Emotion Dysregulation Model (EDM; Mennin & Fresco, 2013) suggests that

individuals with GAD struggle to regulate emotional conflict, and fail to engage in effective emotion regulation strategies. Mennin and colleagues (2005) found that those with GAD report greater deficits in understanding and experiencing their emotions, and greater negative reactivity to their emotions, compared to non-anxious controls. Both reappraisal (changing one's cognition about a situation; Gross, 2002) and suppression (decreasing expressive behavior; Gross, 2002) are also examples of emotion regulation strategies that differ among anxious and non-anxious individuals (Aldao & Mennin, 2012). Reappraisal and suppression have been shown to be effective strategies in reducing emotionally expressive behavior in non-anxious individuals with reappraisal correlating with lower subjective reports of negative emotions (Gross, 1998). The opposite is true for anxious individuals. For example, suppression can be conceptualized as an avoidance strategy utilized often by anxious individuals that has been shown to be accompanied by emotional distress, subjective anxiety and physiological arousal (Amstadter, 2008). GAD symptom severity and diagnoses have both been found to be associated with difficulties in emotion regulation strategies (Aldao & Mennin, 2012; Roemer, Lee, Salters-Pedneault, Erisman, Orsillo & Mennin, 2009). These deficits may be particularly heightened in GAD, compared to other anxiety disorders (Mennin, Heimberg, Turk & Fresco, 2002).

A number of studies have shown deficits in emotion and emotion dysregulation in those with GAD (McLaughlin, Mennin & Farach, 2007; Mennin et al., 2005; Turk, Heimberg, Luterek, Mennin & Fresco, 2005). This has been demonstrated utilizing subjective indices (e.g., self-report questionnaires; Aldao, Mennin & McLaughlin, 2013; Aldao & Mennin, 2012) but has also been demonstrated using physiological indices. Heart rate variability (HRV) is an example of a physiological measure that has been used to compare differences between anxious and non-anxious individuals (Aldao et al., 2013; Aldao & Mennin, 2012). HRV is defined as the

variation in the time interval between heartbeats (Khazan, 2013). Increases in HRV are reflective of greater flexibility in meeting situational demands, such as changes in emotional states (Appelhans & Lueken, 2006). Since people with GAD have more difficulty understanding and experiencing emotions than healthy controls and often engage in emotion suppression, their heart rate will likely increase, and HRV will likely decrease (Amstadter, 2008). Aldao and Mennin (2012) found that when instructed to engage in various emotion regulation strategies, people with GAD demonstrated reduced HRV compared to when they were not instructed to engage in these strategies. This index of difficulty implementing these strategies was found to contrast with control individuals whose HRV was lower when implementing these strategies than when not. Trait worry, more broadly defined within a specific diagnosis of GAD, has also been found to be associated with increased sympathetic nervous system activity (i.e. skin conductance, cardiac activity; Newman et al., 2013).

Non-verbal or behaviorally expressions of emotion are also important aspects of emotional responding (Gross & John, 1997) and dysregulation, but have been studied less within the context of GAD. Social anxiety has been found to be linked with lower emotional expressivity (Kashdan & Breen, 2008), and more rigidity and fidgeting (Gilboa-Schechtman & Shachar-Lavie, 2013) compared to non-socially anxious individuals. Higher self-reported emotional suppression and difficulty in emotional responding in social anxiety (Spokas, Luterek & Heimberg, 2009), which are also found in GAD, may be linked to behavioral suppression. Other research has posited that “environment scanning” behaviors, such as eyes shifting around the room (away from a stimulus), are indicators of anxiety (Perkins, Inchley-Mort, Pickering, Corr & Burgess, 2012). More recently, Cooper and colleagues (2013) found a link between high

levels of subjective worry and behavioral avoidance (e.g., disengagement from a stimulus) in those with GAD.

Less well examined in GAD and other anxiety and mood disorders are the role of facial expressivity as an indicator of emotion dysregulation. Facial expressions are another component of emotion, and a way to express our own emotions as well as interpret emotions from others (Adolphs, 2002; Ekman, 1999). In psychopathology, however, there may be deficits in understanding this type of emotional expression (Demenescu, Kortekaas, den Boer, & Aleman, 2010; Heuer, Lange, Isaac, Rinck, & Becker, 2010). Though research points to facial expressions being universally understood and generalizable across cultures (Ekman, 1999; Ekman, 1989; Ekman & Friesen, 1971), there may be differences between people with psychological disorders versus those without. Socially anxious children, for example, show reduced facial activity, and are better at expressing disgust, anxiety and sadness compared to non-anxious children (Melfsen, Osterlow, & Florin, 2000). Keltner et al (1995) also found that anxious-depressed adolescent boys displayed more fear expressions than their non-anxious peers.

Within adult populations, Cooper and colleagues (2013) found that individuals with GAD displayed fewer fearful facial expressions while viewing aversive stimuli when primed with an anxiety-eliciting video, compared to individuals with GAD primed with a neutral video. Those with GAD who were primed with an anxiety-eliciting video and showed behavioral avoidance when viewing an aversive stimulus (diminished facial expressivity or disengagement from the stimulus) reported greater worry than those who engaged in the aversive stimulus. Llera and Newman (2011) found that those with GAD report that coping with the emotional experience of viewing disgusting images is easier after being inducted to worry (compared to relaxing or

neutral inductions), such that being in a sustained negative emotional state is easier than experiencing a sharp neutral state to negative state change (Newman et al., 2013).

Taken together, these results suggest that those with GAD may be less facially expressive than healthy controls due to their heightened reliance on behavioral avoidance. They may hide or suppress their emotions (i.e. not show their true emotions on their faces). Emotional suppression may occur due to the tension and uncertainty in expressing emotions associated with anxiety broadly (Spokas et al., 2009). The opposite has been found to be true for participants who have no symptoms of psychopathology, as they demonstrate concordance between subjective reports of emotion and facial expressions (Ekman, Friesen & Ancoli, 1980; Rosenberg & Ekman, 1994).

One question that remains is whether facial expressiveness reflects an emotion regulation deficit such that it relates to other modalities of emotion including subjective (e.g., Mennin et al., 2005; Newman et al., 2013) and physiological indices (Aldao et al., 2013; Aldao & Mennin, 2012) that have been shown to be dysregulated in GAD. This congruence between components of the emotional cascade including subjective, expressive/behavioral, and physiological indices has been discussed as coherence. Past research presents the need to determine whether or not there is a relationship between trait- and state-level measures of emotion dysregulation and facial expressions. There is a particular need to establish if those with GAD accurately report their emotional expressions. Rosenberg and Ekman (1994) discovered a link between self-report of emotions and facial expressions, though their sample was lacking in terms of people with elevated levels of psychopathology. Those with GAD tend to have difficulty identifying and understanding their emotions, and therefore discrepancies may exist between what they report versus what is seen on their faces (McLaughlin, Mennin & Farach, 2007).

The current study aims to determine whether or not there is a difference in facial expressivity between individuals with GAD and non-anxious controls during the presentation of multiple emotional inductions as opposed to only disgust, which was the focus of Cooper et al. (2013). Also important is the extent to which diminished displays of facial expression in those with GAD reflect a regulatory deficit that is convergent with other subjective and physiological indices. As such, the first aim of this study is to demonstrate that individuals with GAD will be less facially expressive than non-anxious controls during target emotional films. The second aim is to determine whether or not there is a correlation between trait-level self-reports of anxiety and facial expressions. It is hypothesized that there will be a negative correlation between self-reported anxiety, depression, worry, and emotion regulation symptoms and expressivity in the GAD group. The third aim is to determine whether or not there is a correlation between state-level subjective measures and facial expressions. It is hypothesized that there will be a negative correlation between state-level subjective measures and facial expressions in the GAD group, such that higher scores on state-level subjective measures will be associated with lower facial expressions. Finally, the last aim is to examine concordance of facial expressivity with physiological responding (i.e., HRV), which is hypothesized to be positively correlated with facial expressions in the GAD group to a greater extent than healthy controls.

Method

Participants

Eligible participants were required to be between the ages of 18 and 65, and were required to have the ability to read and understand English. Participants in the GAD group (N = 26) were required to meet a primary diagnosis of GAD with or without other comorbid anxiety disorders and major depressive disorder (MDD) according to the Diagnostic and Statistical

Manual, 4th edition criteria (DSM-IV-TR; American Psychiatric Association, 2000). Participants in the control group (N = 22) had no history or current diagnosis of psychopathology.

Participants in both groups were also required to be free of current or past heart conditions or diabetes, current substance abuse, and were not permitted to be on medications that directly affect cardiac functioning (e.g., beta blockers). Participants in both groups were recruited via flyers in an urban community in the northeastern United States as part of a larger study.

Diagnostic procedures

Each participant completed the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders (SCID; First, Spitzer, Gibbon & Williams, 2002) with trained research staff to assess the presence of mood and anxiety disorders. Following the interview, a clinical severity rating (CSR) of zero to eight was assigned to each disorder for which participants met criteria (DiNardo, Brown, & Barlow, 1994). A CSR of four indicates that criteria are met for a clinical diagnosis of a given disorder, with higher scores indicating greater severity, based on number and frequency of symptoms and levels of distress and impairment. CSR ratings were assigned by the interviewer and confirmed by the principal investigator of the study.

Facial coding

Facial coding was measured using the Emotional Expressive Behavior (EEB) coding system (Gross & Levenson, 1993). This system measures eight emotions (anger, confusion, disgust, fear, happiness, interest, sadness, and surprise) and four movements (body movement, face movement, face touching, and mouth movement) on a zero to six scale. A zero on the scale is equal to no emotion, and each consecutive number has a combined intensity and duration value. Odd-numbered values denote a short occurrence (lasting less than five seconds, or

occurring on two or less occasions), and even-numbered values denote a long occurrence (lasting five seconds or more, or occurring on three or more occasions). Values 1 and 2 are considered slight, values 3 and 4 moderate, and 5 and 6 strong. Therefore, a code of “2” would denote a slight and long occurrence. Body, face, and mouth movements are also measured on a zero to six scale, indicating the same intensity and duration scaling above. Emotional valence is measured on a zero to four scale, where a 0 equals negative affect, a 2 is equal to a neutral affect, and a 4 is equal to very pleasant affect. Arousal is measured on a zero to six scale, where a 0 is equal to no emotionally expressive behavior and a 6 means the subject is extremely emotionally expressive. Frequency variables were also measured (number of yawns, smiles, obscuring vision, and blinks). Obscuring vision is defined as breaking one’s line of vision to the computer monitor by looking away, shutting his or her eyes for longer than a blink (more than one second), or using objects to cover one’s vision (Gross & Levenson, 1993). These measures were coded simply by counting the number of times the behavior occurred. In the current study, we used only negative target emotions for analysis (i.e. fear and sadness) as well as body movement (procedures described below).

Coders were two undergraduate students, receiving credit for independent study for their work in the lab. They trained extensively under the supervision of a senior research assistant (and former coder) and a graduate student. Coders were first assigned the Emotional Expressive Behavior (EEB) Coding System manual and the EEB Coding System Quick Reference readings (Gross & Levenson, 1993). Then, using the standard protocol, were assigned practice videos initially with supervision and then independently. Each week of training (8 weeks total) corresponded to a different set of practice videos. Each practice video assigned was discussed in weekly group meetings until coder agreement was reached (i.e. coders agreed between

themselves and one of the two trainers). Coders were provided with a link from Google forms (<https://docs.google.com/forms>) to an online input form where codes were recorded.

Trait-level self-report measures

The Penn State Worry Questionnaire (PSWQ). The PSWQ (Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item measure of trait worry. It assesses generality, excessiveness and uncontrollability of worry. Individuals who score a 65 or above are likely to show chronic and severe worry, similar to what would be characteristic of a diagnosis of GAD. The PSWQ has been shown to have strong reliability and validity and therefore often used to assess pathological worry in research studies (Brown, Antony, & Barlow, 1992).

Beck Depression Inventory – 2nd edition (BDI-II). The BDI-II (Beck, Steer & Brown, 1996) is a 21-item measure of the severity of depression in adolescents and adults. Scores are rated on a four-point scale for each item, ranging from 0 to 3. Severity of depression is indicated by higher overall scores. A total score of 0-13 is considered minimal severity, 14-19 is mild, 20-28 is moderate, and 29-63 is severe.

The Mood and Anxiety Symptom Questionnaire (MASQ). The MASQ (Watson & Clark, 1991), short form version, is a 64-item measure of anxious and depressive symptoms, consisting of four subscales. It is used to determine both shared and distinct symptoms experienced by anxious and depressed individuals, aiming to validate the three part model of anxiety and depression. It is a Likert-style scale requiring subjects to respond from 1 (“Not At All”) to 5 (“Extremely”). Higher scores indicate more severe symptoms. We used two subscales to measure general anxiety and depressive symptoms. The MASQ-GDA (General Distress Anxiety) subscale is an 11-item measure of general anxiety symptoms. The MASQ-GDD (General Distress Depression) subscale is a 12-item measure of general depressive symptoms.

Affect Intensity Measure (AIM). The AIM (Larsen, 1984) is a 40-item questionnaire designed to measure the characteristic strength or weakness with which one experiences emotion, using typical life events as examples. Participants are required to respond on a Likert-style six-point scale, with 1 being “Never,” to 6 being “Almost Always.” Higher scores on the AIM indicate stronger emotional responses. This study used the AIM negative intensity subscale as it is believed to be closely related to distress tolerance (Weinfurt, Bryant & Yarnold, 1994).

Difficulties in Emotion Regulation Scale (DERS). The DERS (Gratz & Roemer, 2004) is a 36-item self report questionnaire designed to assess emotion dysregulation. Items are rated on a five-point scale ranging from 1 (“Almost Never”) to 5 (“Almost Always”). A total score is obtained ranging from 36-180, as well as scores from six sub-scales. The six subscales include non-acceptance of emotional responses (Non-acceptance), difficulty engaging in goal-directed behavior (Goals), difficulty in impulse control (Impulse), lack of emotional awareness (Awareness), difficulty engaging in emotion regulation strategies (Strategies), and lack of emotional clarity (Clarity). Higher scores indicate greater difficulties in regulating emotion. The current study used the total DERS score, indicated as an overall measure of emotion dysregulation.

Emotion Regulation Questionnaire (ERQ). The ERQ (Gross & John, 2003) is a 10-item measure designed to assess individual differences in the use of two emotion regulation strategies: cognitive reappraisal (items 1, 3, 5, 7, 8 and 10) and expressive suppression (items 2, 4, 6 and 9). The ERQ uses a Likert-style seven-point scale that ranges from 1 “Strongly Disagree,” to 7 “Strongly Agree,” with a 4 being “Neutral.” Higher mean scores on each subscale indicate a greater ability to engage in the target strategy (i.e. greater ability to reappraise; increased likelihood to suppress).

State-level subjective and physiological measures

Rumination Visual Analogue Scale (RVAS). The RVAS (Wichelns, Renna & Mennin, in press) is a 0-100 scale that determines anchors of the degree of rumination in personal contexts for the participant. Rumination is operationally defined as extensively pondering things that have already happened. The RVAS includes an anchor sheet as well as score sheets. Anchor sheets allow the participant to describe five situations in which they experience rumination in real life situations. The anchors are 0, 25, 50, 75, and 100 where 0 indicates “no rumination at all” and 100 indicates “extreme rumination.” Under the anchor of “0” for example, the participant would describe a situation about which he or she would never ruminate. Score sheets then allow the participant to rate their current state feelings in comparison to their established anchors.

Worry Visual Analogue Scale (WVAS). The WVAS (Wichelns et al, in press) is a 0-100 scale that determines anchors of the degree of worry for certain personal topics. It is structurally identical to the RVAS (described above), only that worry replaces rumination. Worry is operationally defined as an extensive concern for future events. The anchors are 0, 25, 50, 75, and 100 where 0 indicates “no worry at all” and 100 indicates “extreme worry.”

Subjective rating of emotions. State-level subjective ratings of emotions were assessed prior to and after the emotion films using a modified Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988) that consisted of dimensional ratings of discrete emotions on a 9-point scale (0 = not at all; 8 = extremely). For each discrete emotion, participants rated three different words that were averaged into a composite score. For suspense, they rated anxiety, fear and nervousness; for sadness, they rated dejection, sadness and unhappiness; and for disgust, they rated aversion, disgust and repulsion. We were interested in

target subjective ratings of emotions (i.e. sadness and fear) in relation to our intensity emotion videos (sad and fear).

Physiological measures. Physiological measures were obtained in a subset of participants with Biopac ECG100C amplifier, part of the MP150 system (Biopac Systems Inc, Santa Barbara, CA, USA). We were interested specifically in HRV measures that were taken during target emotion videos. We used the mean absolute successive inter-beat interval difference (MSD) variable as a time-domain measure of HRV which reflects respiratory-linked changes in heart rate. MSD has been shown to be an indicator of parasympathetic nervous system influences on cardiac functioning (Allen, Chambers & Towers, 2007).

Procedures

Participants completed informed consent prior to engaging in the experiment. They were compensated \$30 upon completion of the study procedures. Prior to beginning the experimental session, participants completed a battery of trait-level self-report measures (described above). Following completion of the self-reports, participants were placed in front of a computer screen with two pre-gelled Ag-AgCl 1 cm disposable electrodes in a modified Lead II configuration for HRV measurement. This was assessed with the ECF100C amplifier (Biopac Systems Inc, Santa Barbara, CA, USA). Baseline measures were taken for five minutes prior to the first video, where nothing was displayed on the screen. Participants then watched a series of neutral and emotion eliciting film clips, all of which have been used in previous research (Rottenberg, Ray & Gross, 2007). At the start of the video task, participants were prompted to watch the film clips as they normally would, via on-screen instructions. Before each neutral or emotion-eliciting clip was presented, participants were provided with the following additional instruction: “Please watch this film carefully.” Films were selected based on past research in order to elicit distinct

emotional states: neutral (Color Bars; Rottenberg et al. 2007), fear (Silence of the Lambs), and sadness (Return to Me). The neutral clip was shown first, followed by emotion videos that were presented in a counterbalanced order using Superlab (Version 4.0.7, Cedrus, Inc. San Pedro, CA, USA). After the baseline recording, in addition to after each film clip, participants completed a small battery of state-level subjective measures. These procedures were approved by the Institutional Review Board at the corresponding university where the study took place.

Results

Demographic Information

The mean age of controls was 27.3 (SD = 6.93) and the mean age of the GAD group was 33.3 (SD = 12.7). The control group consisted of 54.5% female ($n = 12$), and 45.5% male ($n = 10$). 71.4% of participants in the control group were identified as white/non-Hispanic ($n = 15$), 9.5% black ($n = 2$), 4.7% American Indian ($n=1$), 9.5% Asian/Pacific Islander ($n = 2$), and 4.7% other ($n = 1$). The GAD group consisted of 84.6% female ($n = 22$) and 15.4% male ($n = 4$). Self-reported race was 69.2% white/non-Hispanic ($n = 18$), 7.7% black ($n = 2$), 15.4% Asian/Pacific Islander ($n = 4$), and 7.7% other ($n = 2$). Chi-square analyses revealed there was a significant difference in gender $\chi^2(1, N = 48) = 5.215, p = .022$, but no significant differences in race $\chi^2(4, N = 47) = 1.761, p = .78$ or ethnicity $\chi^2(1, N = 48) = .015, p = .904$ between the two groups. An independent samples t-test revealed no significant differences in age between the two groups $t(36.74) = -2.00, p = .052, d = -.66$.

Inter-rater Agreement

Percentage of agreement was calculated between raters for target emotions (74% for sadness, and 74% for fear.) We were interested in the percentage of codes between raters that were in 100% agreement as a stringent measurement of concordance between the two coders.

Both coders coded the same amount of videos, but coder 1 was considered the primary coder, as coder 2 was used exclusively as a reliability check for calculating percentage of agreement.

Percentages of agreement for non-target emotions are presented in Table 1.

Group differences

An independent samples t-test was run to determine if there were differences in target facial expressions and body movement between groups. No significant differences were found. Results are shown in Table 2.

An independent samples t-test was run to determine if there were differences between groups during baseline measurements. Significant differences were found between groups for state-level subjective reports of fear ($t(22)=-2.35, p = .028$), WVAS ($t(29)=-3.23, p = .003$), AIM ($t(23.15)=-3.42, p = .002$), BDI-II ($t(40.11)=-7.86, p < .001$), DERS ($t(23.01)=-3.09, p = .005$), MASQ-GDA ($t(23.07)=-3.39, p = .003$), MASQ-GDD ($t(23.13)=-3.19, p = .004$), PSWQ ($t(41)=-6.06, p < .001$), ERQ-Reappraisal ($t(23.53)=-2.28, p = .032$), and ERQ-Suppression ($t(28.91)=-2.85, p = .008$). There were trending differences found between GADs and controls for the RVAS ($t(28.89)=1.80, p = .082$), and for the subjective state-level reports of sadness ($t(18)=-1.93, p = .069$). Baseline t-tests between groups are presented in Table 3.

Relationship between trait-level self-reports and facial expressions

Bivariate correlations were computed to assess the relationship between trait self-report measures of anxiety and depression, emotion dysregulation, and negative affect and facial expressions. In the GAD group, the MASQ-GDA, MASQ-GDD, AIM Neg Int, DERS, and ERQ-SUPP were significantly associated with sad facial expressions and body movement. The BDI-II was found to be trending with fearful facial expressions ($p = .075$), disgust facial expressions ($p = .070$) and sad facial expressions ($p = .058$). The ERQ-REAP was found to be

trending with body movement ($p = .060$). There were no significant correlations between trait-level self-report measures and facial expressions of emotion in the control group. A test of independent correlations was used to assess whether or not there were significant differences in correlations between groups by converting Pearson's r to Fisher's z . Significant independent correlations were found between groups for DERS and sad facial expressions ($z = 2.05, p = .04$), ERQ-SUPP and sad facial expressions ($z = 2.44, p = .01$), ERQ-SUPP and body movement ($z = 2.15, p = .03$), and BDI-II and disgust facial expressions ($z = -2.22, p = .03$). Correlations for self reports are presented in Table 4. Scatter plots demonstrate the relationship between MASQ-GDD scores and sad facial expressions in both the GAD and control group (see: Figures 1 and 2). In the GAD group, as scores on the depression subscale of the MASQ get higher, so do expressions of sad facial expressions. In the control group, there is no significant correlation between the two.

Relationship between state-level subjective and physiological measures and facial expressions

Partial correlations were run to assess the relationship between state-level subjective measures and physiological measures and target facial expressions by video type, controlling for baseline ratings. State-level subjective measures and physiological measures were taken during a five-minute resting period during which no emotional stimuli were shown, which served as the baseline period. These measurements were also taken after the emotion videos. In the GAD group, no significant results were found between target facial expressions of emotion and HRV, nor target facial expressions of emotion and state-level subjective ratings of emotion. In the control group, fearful facial expressions were significantly correlated with the RVAS ($r = -.688, p = .028, z = .829$) and the WVAS ($r = -.678, p = .031, z = .811$) during the fear video. Scatter

plots demonstrate correlations between the RVAS and fearful facial expressions for both groups (see: Figures 3 and 4). A test of independent correlations revealed significance between group effects for the WVAS and sad facial expressions during the sad video ($z = 2.67, p = .01$), the RVAS and fearful facial expressions during the fear video ($z = 2.86, p = .004$), the WVAS and fearful facial expressions during the fear video ($z = 2.26, p = .04$). Correlations between state-level subjective measures and the target expressions of sadness and fear are presented in Tables 5 and 6, respectively.

Discussion

The current study examined differences in facial expressions during the viewing of emotion-eliciting film clips between individuals with GAD and non-anxious controls. We first hypothesized that during target films (i.e. fear and sadness), those with GAD would be less facially expressive than non-anxious controls. We also hypothesized that in the GAD group there would be negative correlations between trait-level self-reports of anxiety and depression with facial expressivity; negative correlations between subjective state-level measures and facial expressivity; and positive correlations between heart rate variability and facial expressivity. Our first hypothesis was not supported. Individuals diagnosed with GAD did not show less facial expressivity than controls during target films. Our second hypothesis was also not supported. In the GAD group, we found a positive (rather than negative) correlation between trait-level self reports of anxiety and behavioral expressivity (facial expressions and body movement). Our third hypothesis was not supported. In the GAD group, there were no significant correlations between state-level subjective measures and facial expressivity. There were, however, significant negative correlations between the RVAS and WVAS and fearful facial expressions in

the control group. Finally, our last hypothesis was not supported. We found no significant correlations between HRV and facial expressivity in either group.

An interesting finding from our study is the positive correlation found between trait-level self-report measures and body movement. Body movement is defined by Gross (1996) as overall body movement, including the head, hands, and shoulders - but most strongly recorded by movement of the torso. A body movement that is coded as being “strongly intense” based off of our coding criteria would include adjusting one’s position, or moving one’s torso quickly in any direction. “Fidgeting” is also defined in this way, characterized by increased movement due to high arousal, and has been shown to be correlated with high trait anxiety (Harrigan, Wilson & Rosenthal, 2004; Mehrabian & Friedman, 1986). We found body movement to be positively correlated with emotion dysregulation, trait anxiety, trait depression, and negative affect in the GAD group, but not in the control group. Interestingly in the GAD group, the same self-report measures that were correlated with body movement (mentioned above) were also positively correlated with sad facial expressions. Though we had anticipated that higher self-reports of anxiety-related symptoms would be associated with *less* facial expressivity, we found that they were associated with *more* instances of negative facial expressivity. One reason this might have been is that those with GAD may be better at expressing negative emotions (versus positive or neutral emotions), compared to non-anxious individuals (Mennin, Heimberg, Turk & Fresco, 2005). Negative affect biases have been found in probe detection tasks, where emotionally-eliciting or neutral stimuli are presented for a number of seconds, and then replaced with a probe (e.g., a dot). Participants then have to indicate where the target stimulus was. During a probe detection task, those with high-trait anxiety or a number of anxiety diagnoses including GAD are faster at detecting probes that replace “threat” stimuli (i.e. an angry face; or a threat word

“worthless”) compared to neutral stimuli (Waechter & Stolz, 2015; Mogg & Bradley, 1999; McLeod, Mathews & Tata, 1986; Roberts, Hart & Eastwood, 2010). For those with GAD, this may reflect the desire for the maintenance of negative affect and emotional states (Newman et al., 2013). Another interpretation of these findings is that GAD symptom severity is related to heightened negative emotional reactivity (Mennin et al., 2005; Sloan, 2004). Those in the GAD group scored significantly higher on all anxiety-related symptom questionnaires compared to the control group (see: Table 3). Sad facial expressions and body movement may be behavioral expressions of emotional reactivity due to higher symptom severity.

In the control group, lower scores on both the RVAS and WVAS indicated more facial expressions of fear during the fear video. Congruent with Borkovec’s avoidance theory, (Borkovec et al., 2004) those who worry less are more likely to show facial expressivity, thus this finding is not that surprising. Compared to those with GAD, non-anxious individuals are better able to understand and regulate their emotions (Aldao & Mennin, 2012; Borkovec et al., 2004) and are likely to show more facial expressivity (Cooper et al., 2013).

Interestingly, we found no differences between groups in target facial expressions during films. We suspected that individuals with GAD might engage more in emotional suppression and thus be less facially expressive than non-anxious controls (Amstadter, 2008; Cooper et al., 2013). In other studies like this one, researchers found that those with GAD displayed less facial expressivity (while viewing aversive stimuli) when primed with an anxiety-eliciting video compared to a neutral video (Cooper et al., 2013). In the current study each participant viewed a neutral video prior to subsequent emotion videos, which may have yielded similar results (i.e. no diminished facial expressivity after a neutral prime). Since target emotions and expressions were the focus, we only examined negative emotional films.

This study had several limitations. It was primarily limited by its small sample size, which may have impacted statistical power and the ability to determine effects. The sample was also largely homogenous with very little racial and ethnic diversity, which may not be generalizable or representative of the population. Relatedly, there was an unequal distribution of men and women in the GAD group in the current study. Although this is likely due to a higher rate of GAD diagnosis among women compared to men (Newman et al., 2013), future research should attempt to replicate these findings in groups that are more equally gender distributed. In terms of study methodology, blink rates were not included in our data collection, though research has linked higher blink rates with anxiety and emotional suppression (Gross & Levenson, 1993; Weiner & Concepcion, 1975). Blink rates may be an important marker of heightened anxiety and emotional suppression, and should be further researched. Finally, the coders for this study were lab members, and although blind to the hypotheses of the current study and ideally, completely naïve to experimental conditions, this may not have always been the case. Coders were involved in other projects of the lab, and could have gained information about the study. This may have resulted in a potential degree of bias in their coding of facial expressions, and future research should aim to control for this potential bias. Our study may have benefited from using coders not affiliated with the lab.

Future research related to this study should explore nonverbal emotional expressivity in clinical (treatment-seeking) samples of GAD as this group may differ in terms of symptom severity (Newman et al., 2013). Possible gender differences in emotional expressivity in GAD should also be explored, as women may be more facially expressive than men (Buck, Baron & Barrette, 1982). Higher self-reported anxiety-related symptoms may be associated with

increased negative facial expressions (compared to positive or neutral facial expressions), but further studies are needed to explore this.

Though this study has a few limitations, the implications of our findings are important to the study of concordance in GAD. Concordance is the coordination of three components of the anxiety response: subjective, behavioral and physiological (Calvo & Miguel-Tobal, 1998). Trait-level self-report measures of emotion dysregulation (anxiety, depression, emotion regulation difficulties and negative affect) were shown to be correlated with facial expressions of emotion in anxious individuals, which may have been due to higher levels of GAD symptom severity. Past research of comparisons between self-reported measures of emotion dysregulation and emotional expressivity is lacking. The emotion regulation approach may be important for future treatment of GAD, and more specifically for treatment-resistant individuals. CBT studies have shown differing results for treatment outcomes involving anxious individuals (Newman et al., 2013). CBT does not focus specifically on emotions, emotion regulation difficulties or heightened negative emotional responding, which are highly representative of GAD compared to other mood and anxiety disorders (Mennin & Fresco, 2013). Further research should be done not only on facial expressions but other forms of behavioral expressivity that may be associated with emotional avoidance in GAD (e.g. blinking, fidgeting, looking away from the stimulus). The current findings present preliminary associations between self-reported measures of emotion dysregulation and emotional expressivity.

References

- Aldao, A., Mennin, D. S., & McLaughlin, K. A. (2013). Differentiation worry and rumination: Evidence from heart rate variability during spontaneous regulation. *Cognitive Therapy and Research, 37*(3), 613-619.
- Aldao, A. & Mennin, D. S. (2012). Paradoxical cardiovascular effects of implementing adaptive emotion regulation strategies in generalized anxiety disorder. *Behaviour Research and Therapy, 50*, 122-130.
- Allen, J. J. B., Chambers, A. S. & Towers, D. N. (2007). The many metrics of cardiac chronotropy: A pragmatic primer and a brief comparison of metrics. *Biological Psychology, 74*, 243-262.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., ext rev.). Washington, DC: American Psychiatric Publishing.
- Amstadter, A. (2008). Emotion regulation and anxiety disorders. *Journal of Anxiety Disorders, 22*(2), 211-221.
- Appelhans, B. M. & Luecken, L. J. (2006). Heart rate variability as an index of regulated emotional responding. *Review of General Psychology, 10*(3), 229-240.
- Barrett, L. F. (1998). Discrete emotions or dimensions? The role of valence focus and arousal focus. *Cognition and Emotion, 12*(4), 579-599.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory-II. San Antonio.
- Behar, E., DiMarco, I. D., Hekler, E. B., Mohlman, J. & Staples, A. M. (2009). Current theoretical models of generalized anxiety disorder (GAD): Conceptual review and treatment implications. *Journal of Anxiety Disorders, 23*, 1011-1023.

- Buck, R., Baron, R., & Barrette, D. (1982). Temporal organization of spontaneous emotional expression: A segmentation analysis. *Journal of Personality and Social Psychology*, 42(3), 506-517.
- Buhr, K. & Dugas, M. J. (2012). Fear of emotions, experiential avoidance, and intolerance of uncertainty in worry and generalized anxiety disorder. *International Journal of Cognitive Therapy*, 5(1), 1-17.
- Calvo, M. G. & Miguel-Tobal, J. J. (1998). The anxiety response: Concordance among components. *Motivation and Emotion*, 22(3), 211-230.
- Cooper, S. E., Miranda, R. & Mennin, D. S. (2013). Behavioral indicators of avoidance and subsequent worry in generalized anxiety disorder and depression. *Journal of Experimental Psychopathology*, (), 1-18.
- Demenescu, L. R., Kortekaas, R., den Boer, J. A., & Aleman, A. (2010). Impaired attribution of emotion to facial expressions in anxiety and major depression. *PLoS ONE* 5(12): e15058. doi:10.1371/journal.pone.0015058.
- Dugas, M. J. & Ladouceur, R. (2000). Treatment of GAD: Targeting intolerance of uncertainty in two types of worry. *Behavior Modification*, 24(5), 635-657.
- Ekman, P. (1999). Facial expressions. In Dalglish, T. & Power, M. (Eds). *Handbook of Cognition and Emotion* (pp. 301-320). New York: John Wiley & Sons Ltd.
- Ekman, P. (1989). The argument and evidence about universals in facial expressions of emotion. In Wagner, H. & Manstead, A. (Eds.) *Handbook of Social Psychophysiology* (pp. 143-164). New York: John Wiley & Sons, Ltd.
- Ekman, P. & Friesen, W. V. (1971). Constants across cultures in the face and emotion. *Journal of Personality and Social Psychology*, 17(2), 124-129.

- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (2002). Structured clinical interview for DSM-IV TR Axis I disorders, research version, patient edition with psychotic screen. New York: Biometrics Research, New York State Psychiatric Institute.
- Gilboa-Schechtman, E. & Shachar-Lavie, I. (2013). More than a face: A unified theoretical perspective on nonverbal social cue processing in social anxiety. *Frontiers in Human Neuroscience*, 7, 904.
- Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, 74(1), 224-237.
- Gross, J. J. & John, O. P. (1997). Revealing feelings: Facets of emotional expressivity in self reports, peer ratings, and behavior. *Journal of Personality and Social Psychology*, 72(2), 435-448.
- Gross, J. J. & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition and Emotion*, 9(1), 87-108.
- Gross, J. J. & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, 64(6), 970-986.
- Harrigan, J. A., Wilson, K., & Rosenthal, R. (2004). Detecting state and trait anxiety from auditory and visual cues: A meta-analysis. *Personality and Social Psychology Bulletin*, 30(1), 56-66.

- Heimberg, R. G., Turk, C. L., & Mennin, D. S. (2004). *Generalized anxiety disorder: Advances in research and practice*. New York: The Guilford Press.
- Heuer, K., Lange, W., Isaac, L., Rinck, M., & Becker, E. S. (2010). Morphed emotional faces: Emotion detection and misinterpretation in social anxiety. *Journal of Behavior Therapy and Experimental Psychiatry*, *41*(4), 418-425.
- Kashdan, T. B., & Breen, W. E. (2008). Social anxiety and positive emotions: A prospective examination of a self-regulatory model with tendencies to suppress or express emotions as a moderating variable. *Behavior Therapy*, *39*, 1-12.
- Khazan, I. Z. (2013). Heart rate variability. In Khazan, I. Z. (Ed.), *The Clinical Handbook of Biofeedback: A Step-by-Step Guide for Training and Practice with Mindfulness*. (pp. 97-117). Massachusetts: John Wiley & Sons, Ltd.
- Keltner, D., Moffitt, T. E., & Stouthamer-Loeber, M. (1995). Facial expressions of emotion and psychopathology in adolescents. *Journal of Abnormal Psychology*, *104*(4), 644-652.
- Kensinger, E. A. (2004). Remembering emotional experiences: The contribution of valence and arousal. *Reviews in Neurosciences*, *15*(4), 241-251.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2005). *International Affective Picture System (IAPS): Affective ratings of pictures and instruction manual* (Technical Report No. A-6). Gainesville: University of Florida.
- Llera, S. J. & Newman, M. G. (2011). An experimental examination of emotional avoidance in generalized anxiety disorder: Data supporting a new theory of emotional contrast

- avoidance. Paper presented at *119th Annual Convention of the American Psychological Association*, Washington, DC.
- MacLeod, C., Mathews, A. & Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology*, *95*(1), 15-20.
- McLaughlin, K. A., Mennin, D. S., & Farach, F. J. (2007). The contributory role of worry in emotion generation and dysregulation in generalized anxiety disorder. *Behaviour Research and Therapy*, *45*, 1735-1752.
- Mehrabian, A., & Friedman, S. L. (1986). An analysis of fidgeting and associated individual differences. *Journal of Personality*, *54*(2), 406-429.
- Melfsen, S., Osterlow, J., & Florin, I. (2000). Deliberate emotional expressions of socially anxious children and their mothers. *Journal of Anxiety Disorders*, *14*(3), 249-261.
- Mennin, D. S., Fresco, D. M., Ritter, M. & Heimberg, R. G. (2015). An open trial of emotion regulation therapy for generalized anxiety disorder and cooccurring depression. *Depression and Anxiety*, *32*, 614-623.
- Mennin, D. S. & Fresco, D. M. (2013). What, me worry and ruminate about DSM-5 and RDoC? The importance of targeting negative self-referential processing. *Clinical Psychology Science and Practice*, *20*(3), 258-267.
- Mennin, D. S. & Fresco, D. M. (2013). Emotion regulation therapy. In Gross, J. J. (Ed.) *Handbook of Emotion Regulation* (pp. 469-487). New York: Guilford Press.
- Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2005). Preliminary evidence for

- an emotion dysregulation model of generalized anxiety disorder. *Behaviour Research and Therapy*, 43, 1281-1310.
- Mennin, D. S., Heimberg, R. G., Turk, C. L., & Fresco, D. M. (2002). Applying an emotion regulation framework to integrative approaches to generalized anxiety disorder. *Clinical Psychology Science and Practice*, 9(1), 85-90.
- Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, 28, 487-495. doi:10.1016/0005-7967(90)90135-6.
- Mogg, K. & Bradley, B. P. (1999). Some methodological issues in assessing attentional biases for threatening faces in anxiety: A replication study using a modified version of the probe detection task. *Behaviour Research and Therapy*, 37(6), 595-604.
- Newman, M. G., Llera, S. J., Erickson, T. M., Przeworski, A. & Castonguay, L. G. (2013). Worry and generalized anxiety disorder: A review and theoretical synthesis of evidence on nature, etiology, mechanisms, and treatment. *Annual Review of Clinical Psychology*, 9, 275-297.
- Roberts, K. E., Hart, T. A., & Eastwood, J. D. (2010). Attentional biases to social and health threat words in individuals with and without high social anxiety or depression. *Cognitive Therapy and Research*, 34(4),388-399.
- Roemer, L., Lee, J. K., Salters-Pedneault, K., Erisman, S. M., Orsillo, S. M., & Mennin, D. S. (2009). Mindfulness and emotion regulation difficulties in generalized anxiety disorder: Preliminary evidence for independent and overlapping contributions. *Behavior Therapy*, 40(2), 142-154.

- Rosenberg, E. L. (2005). The study of spontaneous facial expressions in psychology. In Ekman, P. Rosenberg, E. L. (Eds), *What the face reveals: Basic and applied studies of spontaneous expression using the Facial Action Coding System (FACS), second edition* (pp. 13-17). New York: Oxford University Press.
- Rottenberg, J., Ray, R. R., & Gross, J. J. (2007). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *The handbook of emotion elicitation and assessment*. London: Oxford University Press.
- Sloan, D. M. (2004). Emotion regulation in action: Emotional reactivity in experiential avoidance. *Behaviour Research and Therapy*, *42*, 1257-1270.
- Spokas, M., Luterek, J. A., & Heimberg, R. G. (2009). Social anxiety and emotional suppression: The mediating role of beliefs. *Journal of Behavior Therapy and Experimental Psychiatry*, *40*, 283-291.
- Watson, D. & Clark, L. A. (1991). Tripartite model of anxiety and depression: Psychometric evidence and taxonomic implications. *Journal of Abnormal Psychology*, *100*(3), 316-336.
- Waechter, S. & Stolz, J. A. (2015). Trait anxiety, state anxiety, and attentional bias to threat: Assessing the psychometric properties of response time measures. *Cognitive Therapy and Research*, *39*, 441-458.
- Weiner, E. A. & Concepcion, P. (1975). Effects of affective stimuli mode on eye-blink rate and anxiety. *Journal of Clinical Psychology*, *31*(2), 256-259.
- Wichelns, G. A., Renna, M. E., & Mennin, D. S. (in press). Preliminary validation of subjective

anchor scales for worry and rumination.

Table 1.*Percentage of agreement between raters on target and non-target emotions by video type.*

Emotion Expression	<i>Fear Video</i>	<i>Sad Video</i>	<i>Neutral Video</i>
Anger	0.90	0.91	0.96
Disgust	0.79	0.87	0.93
Fear	0.74	0.82	0.83
Sadness	0.85	0.74	0.82
Body Movement	0.48	0.51	0.53

Note. Bold numbers indicate target facial expressions.

Table 2.*Summary of independent t-tests for target facial expressions and body movement by group.*

Measure	Group				<i>t</i>	<i>df</i>	95% C.I. Lower	95% C.I. Upper
	Control		GAD					
	M	SD	M	SD				
<i>Target facial expressions.</i>								
Sadness	.31	.84	.45	1.09	-.91	182	-.42	.16
Fear	.29	.89	.21	.67	.68	183	-.15	.30
<i>Body movement.</i>								
Body mov. during sad video	1.02	1.22	1.21	1.55	-.89	182.81	-.58	.22
Body mov. during fear video	1.07	1.29	.99	1.38	.41	183	-.31	.47

Note. M = mean, SD = standard deviation, C.I. = confidence interval.

* $p \leq .05$

Table 3.
Summary of independent t-tests at Baseline by group.

Measure	Group				<i>t</i>	<i>df</i>	95% C.I. Lower	95% C.I. Upper
	Control		GAD					
	M	SD	M	SD				
<i>Trait-level self report measures.</i>								
AIM Neg Int	2.67	0.79	13.44**	15.38	-3.42	23.15	-17.26	-4.26
BDI-II	3.37	4.83	17.79**	7.16	-7.86	40.11	-18.13	-10.72
DERS	1.69	0.42	28.23**	42.09	-3.09	23.01	-44.31	-8.76
ERQ-REAP	5.14	0.99	10.02*	10.43	-2.28	23.53	-9.31	-.46
ERQ-SUPP	2.89	1.05	4.90*	3.24	-2.85	28.91	-3.44	-.57
MASQ-GDA	1.57	0.46	10.73*	3.22	-3.39	23.07	-14.74	-3.57
MASQ-GDD	1.70	0.75	11.85**	15.59	-3.19	23.13	-16.74	-3.56
PSWQ	34.42	17.12	62.33**	13.11	-6.06	41	-37.22	-18.61
<i>State-level subjective measures.</i>								
RVAS	15.00	18.84	31.75	32.90	-1.80	28.89	-35.76	2.26
WVAS	13.64	18.52	43.25**	27.06	-3.23	29	-48.39	-10.84
State subj. fear	.09	.30	.85*	1.39	-2.35	22.10	-1.43	-.09
State subj. sadness	.00	.00	.74	1.66	-1.93	18	-1.54	.06
HRV	29.27	18.31	26.26	15.29	.45	24	-10.72	16.72

Note. M = mean, SD = standard deviation, C.I. = confidence interval, AIM Neg Int = Affect Intensity Measure- Negative Intensity subscale, BDI-II = Beck Depression Inventory-II, DERS = Difficulties in Emotion Regulation total score, ERQ-REAP = Emotion Regulation Questionnaire reappraisal subscale, ERQ-SUPP = Emotion Regulation Questionnaire suppression subscale, MASQ-GDA = The Mood and Anxiety Symptom Questionnaire- General Distress Anxiety subscale, MASQ-GDD = The Mood and Anxiety Symptom Questionnaire- General Distress Depression subscale, PSWQ = Penn State Worry Questionnaire, RVAS = Rumination Visual Analogue Scale, WVAS = Worry Visual Analogue Scale, HRV = Heart Rate Variability.
 * $p \leq .05$, ** $p \leq .01$

Table 4.

Bivariate correlations for trait-level self-report measures, sad, anger, fear and disgust facial expressions and body movement by group.

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1. AIM Neg Int	—	.27	.98	.88	.69	.97	.95	.11	.47*	.01	.01	-.33	.46*
2. BDI-II	.44	—	.28	.13	.33	.28	.36	.01	.39	.04	.37	-.38	.24
3. DERS	.49	.57	—	.84	.72	.94	.97	.13	.52*	.02	.04	-.33	.44*
4. ERQ-REAP	-.48	-.28	-.41	—	.40	.91	.80	.01	.23	.05	-.09	-.30	.39
5. ERQ-SUPP	-.39	.09	.30	-.15	—	.63	.72	.14	.41*	.10	-.01	-.23	.59*
6. MASQ-GDA	.73	.62	.43	-.17	-.31	—	.94	.09	.49*	.13	.01	-.32	.51*
7. MASQ-GDD	.69	.77	.58	-.32	-.30	.80	—	.20	.60*	.11	.06	-.31	.48*
8. PSWQ	.59	.63	.47	-.28	-.26	.70	.85	—	.08	.04	-.04	.04	.12
9. Sad facial exp.	.17	.13	-.06	.01	-.31	.06	.29	.24	—	—	—	—	-.11
10. Angry facial exp.	-.15	-.05	-.25	.04	-.02	-.08	-.04	.08	—	—	—	—	.22
11. Fearful facial exp.	.05	-.14	-.15	.01	-.12	-.17	-.14	-.16	—	—	—	—	.23
12. Disgust facial exp.	.04	.28	-.11	-.05	-.05	.08	.12	.03	—	—	—	—	-.26
13. Body movement	.04	-.31	.04	-.05	.01	-.12	-.26	-.38	-.11	.13	.42	.23	—

Note. Correlations for GAD participants (n=26) are presented above the diagonal, and correlations for control participants (n=22) are presented below the diagonal. A test of independent correlations was computed by converting Pearson’s r to Fisher’s z and examining the difference between controls and GADs. AIM Neg Int = Affect Intensity Measure- Negative Intensity subscale, BDI-II = Beck Depression Inventory-II, DERS = Difficulties in Emotion Regulation total score, ERQ-REAP = Emotion Regulation Questionnaire reappraisal subscale, ERQ-SUPP = Emotion Regulation Questionnaire suppression subscale, MASQ-GDA = The Mood and Anxiety Symptom Questionnaire- General Distress Anxiety subscale, MASQ-GDD = The Mood and Anxiety Symptom Questionnaire- General Distress Depression subscale, PSWQ = Penn State Worry Questionnaire

* $p \leq .05$

Table 5.

Partial correlations between state-level subjective and physiological ratings and sad facial expressions as a Function of group during the Sad Video.

Measure	1	2	3	4	5	M	SD
1. Sad facial exp.	—	.00	-.30	.00	.04	.42	.75
2. State subj. sad	.17	—	—	—	—	3.61	2.33
3. RVAS	—	-.53	—	—	—	24.95	25.96
4. WVAS	—	-.68	—	—	—	32.63	30.25
5. HRV	—	-.33	—	—	—	29.99	20.77
M	3.18	.34	23.91	20.64	31.57		
SD	2.32	.70	30.32	28.19	18.50		

Note. Correlations for GAD participants (n=26) are presented above the diagonal, and correlations for control participants (n=22) are presented below the diagonal. Means and standard deviations for GAD participants are presented in the vertical columns, and means and standard deviations for control participants are presented in the horizontal rows. A test of independent correlations was computed by converting Pearson’s r to Fisher’s z and examining the difference between controls and GADs. M = mean, SD = standard deviation, RVAS = Rumination Visual Analogue Scale, WVAS = Worry Visual Analogue Scale, HRV = Heart Rate Variability

* $p \leq .05$

Table 6.

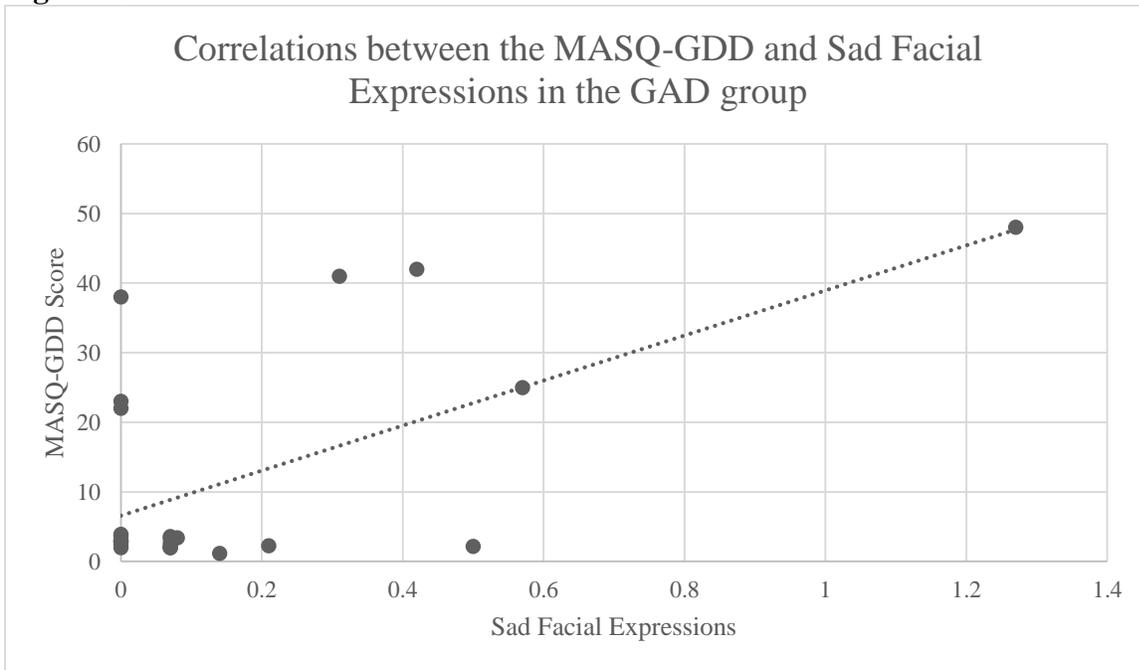
Partial correlations between state-level subjective and physiological ratings and fearful facial expressions as a Function of group during the Fear Video.

Measure	1	2	3	4	5	M	SD
1. Fear facial exp.	—	-.30	.04	-.13	-.17	.16	.27
2. State subj. fear	.05	—	—	—	—	2.95	2.39
3. RVAS	—	-.69*	—	—	—	21.00	27.51
4. WVAS	—	-.68*	—	—	—	34.75	33.42
5. HRV	—	-.18	—	-.68	—	27.38	13.39
M	2.72	.27	14.55	22.09	.33		
SD	2.00	.51	24.36	28.21	.54		

Note. Correlations for GAD participants (n=26) are presented above the diagonal, and correlations for control participants (n=22) are presented below the diagonal. Means and standard deviations for GAD participants are presented in the vertical columns, and means and standard deviations for control participants are presented in the horizontal rows. A test of independent correlations was computed by converting Pearson’s r to Fisher’s z and examining the difference between controls and GADs. M = mean, SD = standard deviation, RVAS = Rumination Visual Analogue Scale, WVAS = Worry Visual Analogue Scale, HRV = Heart Rate Variability

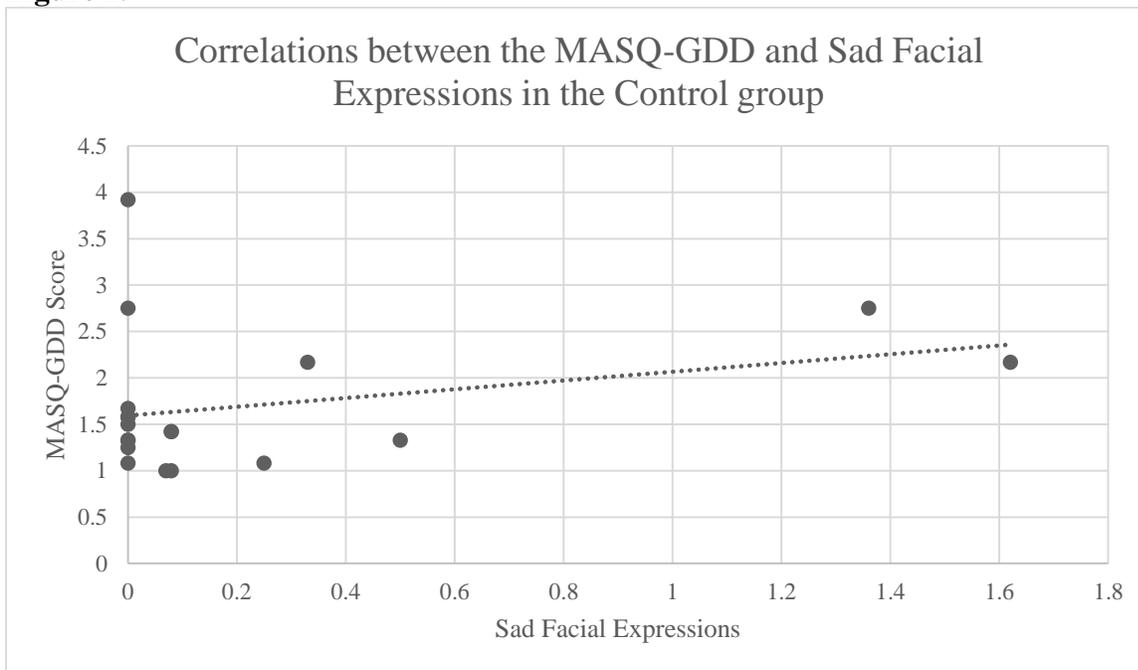
* $p \leq .05$

Figure 1.



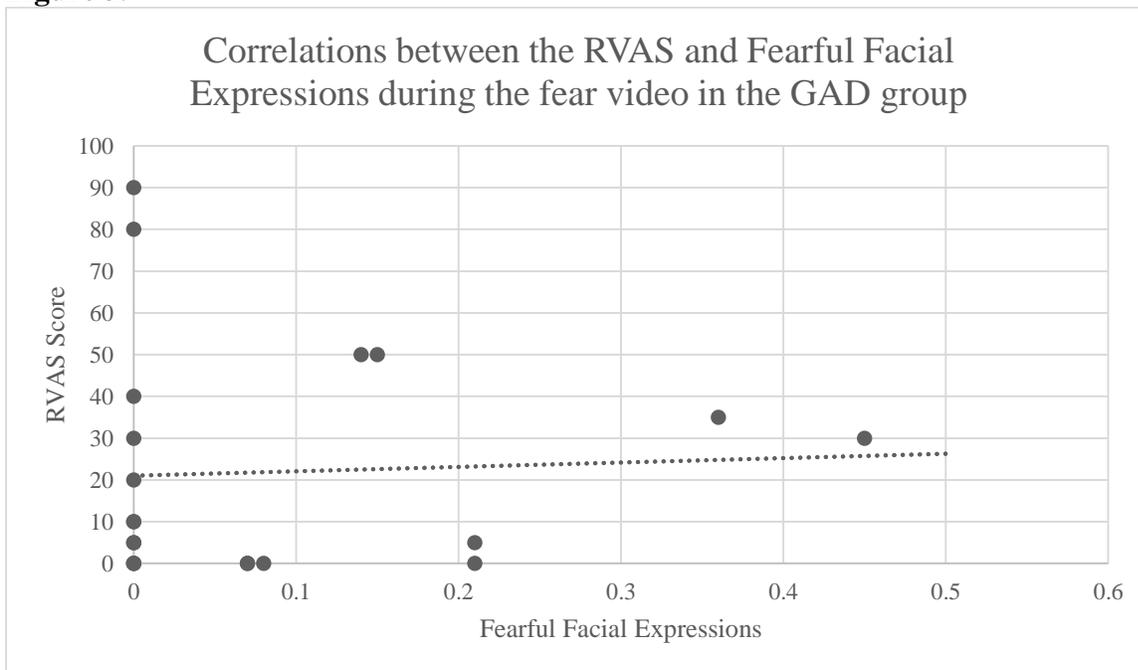
Note: MASQ-GDD = The Mood and Anxiety Symptom Questionnaire- General Distress Depression subscale.

Figure 2.



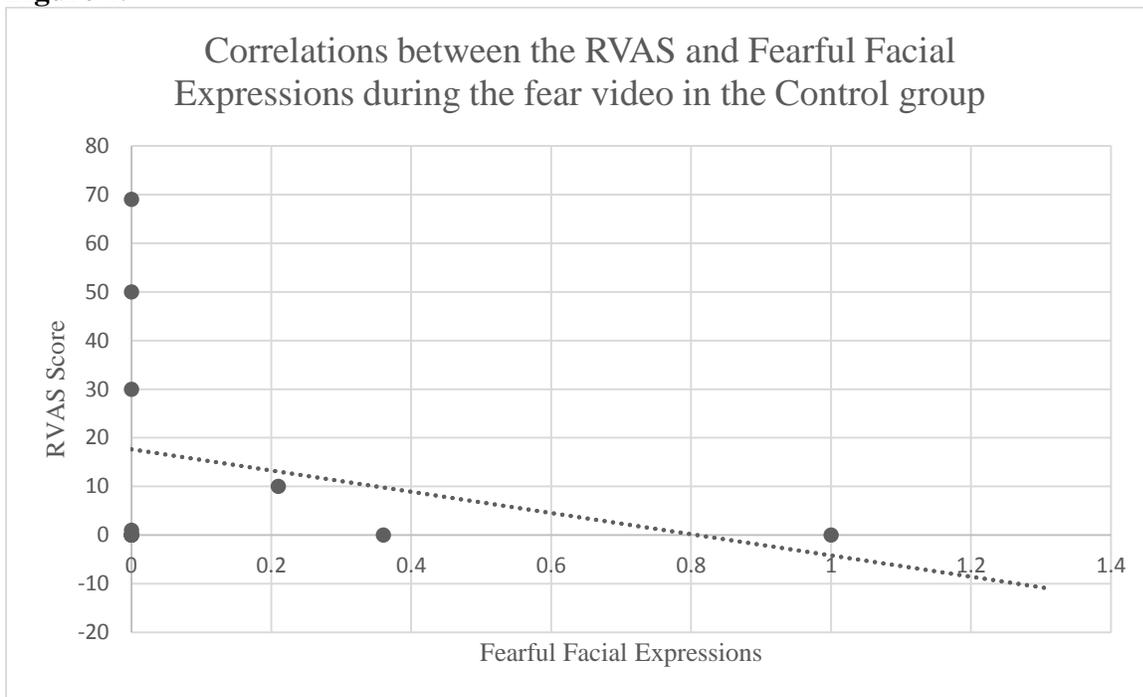
Note: MASQ-GDD = The Mood and Anxiety Symptom Questionnaire- General Distress Depression subscale.

Figure 3.



Note: RVAS = Rumination Visual Analogue Scale.

Figure 4.



Note: RVAS = Rumination Visual Analogue Scale.