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Behavioral Indicators of Emotional Avoidance and Subsequent Worry in Generalized Anxiety Disorder and Depression

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Abstract

Empirically-supported theories posit that individuals with generalized anxiety disorder (GAD) experience uncomfortable affective states and distress in response to perceived emotionally-laden contexts (e.g., interpersonal situations), and are motivated to avoid emotional content through worry. Although we have extensive self-report and physiological evidence for the role of emotional avoidance and subsequent worry in GAD, behavioral evidence is lacking. In the current study, we investigated behavioral avoidance of emotion and subsequent worry in GAD, as well as in depression. Participants viewed either an anxious or neutral video and then viewed slides consisting of mutilation images, followed by a worry assessment. We recorded facial expressivity during the slide-viewing task. We used diminished facial expressivity and disengagement from the slide-viewing task as indices of behavioral avoidance. Our findings provide preliminary support for the assertion that emotional avoidance demonstrates an exacerbating role in worry and that this relationship might be particularly pronounced in GAD.

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Keywords: generalized anxiety disorder, worry, emotion, emotional avoidance, emotion regulation, facial expression

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Introduction

Worry is a cognitive process involving repetitive, verbal-linguistic thoughts about possible negative outcomes for future events (Borkovec, Alcaine, & Behar, 2004). Once it begins, worry can be difficult to stop, and it is frequently experienced as chronic and pervasive (Davey, Eldridge, Drost, & MacDonald, 2007; Paulesu et al., 2010). Worry is associated with high levels of trait anxiety, although it is important to note that worry is not synonymous with anxiety and is regarded as a separate but related psychological construct (e.g., Gladstone et al., 2005; McLaughlin, Borkovec, & Sibrava, 2007; Startup & Davey, 2001). Within clinical contexts, worry is most often associated with anxiety disorders, and in particular with generalized anxiety disorder (GAD; e.g., Davey et al., 2007; Holaway, Heimberg, & Coles, 2006; Mennin, Heimberg, Turk, & Fresco, 2005; Roemer et al., 2009).

GAD is a chronic form of anxiety characterized by intense and persistent worry (Davey et al., 2007; Roemer et al., 2009). Individuals with GAD display impairment in multiple domains, including social (e.g., Roemer et al., 2009; Yoon & Zinbarg, 2007) and occupational (e.g., Hoffman, Dukes, & Wittchen, 2008; Michelson, Lee, Orsillo, & Roemer, 2011) areas. They also report difficulties with emotion regulation (Mennin et al., 2005) and experience uncomfortable levels of psychological distress and physiological arousal in response to aversive stimuli associated with negative emotion (Aldao, Mennin, Linardatos, & Fresco, 2010; Brosschot, Gerin, & Thayer, 2006; Hofmann et al., 2005; Llera & Newman, 2010; Stapinski, Abbott, & Rapee, 2010). Consequently, individuals with GAD are motivated to avoid such stimuli (Borkovec et al., 2004). Worry can be employed to facilitate avoidance of aversive emotional stimuli and associated discomfort (Borkovec et al., 2004). Although the function of worry and emotional avoidance in individuals with GAD is demonstrated in neurobiological (Etkin, Prater, Hoeft, Menon, & Schatzberg,

2010), psychophysiological (Llera & Newman, 2010; Oathes, Siegle & Ray, 2011; Weinberg & Hajcak, 2011), and self-report (Mennin et al., 2005; Roemer, Salters, Raffa, & Orsillo, 2005) data, there is a lack of behavioral data to corroborate these findings. In the present study, we seek to address this gap by providing behavioral support for the role of worry and emotional avoidance in GAD.

Theories of GAD and the Role of Worry in Emotional Avoidance

Important advances in the study and treatment of GAD have emerged from an increased focus on the functional relationship between emotional avoidance and excessive worry. One of the foundational theories in this line of research is Borkovec's avoidance theory (Borkovec et al., 2004). Borkovec and colleagues (2004) posit that individuals with GAD utilize worry in an attempt to cognitively avoid processing of negative emotional stimuli and decrease physiological hyperarousal typically associated with exposure to emotional stimuli. Empirical support for Borkovec's conceptualization of worry as a functional avoidance mechanism is extensive (e.g., Ladouceur et al., 2000; Llera & Newman, 2010; Oathes, Siegle, & Ray, 2011; see Behar, DiMarco, Hekler, Mohlman, & Staples, 2009; Borkovec et al., 2004). However, other researchers have empirically extended this theoretical approach by seeking to clarify *why* emotional stimuli are highly aversive to individuals with GAD. Roemer and Orsillo, in their acceptance-based model of GAD (Roemer & Orsillo, 2002; Roemer et al., 2005), propose that individuals with GAD use worry as a form of experiential avoidance (i.e., attempt to terminate or discontinue internal experiences such as somatic distress or extremely strong emotions; see Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). In this model, emotional stimuli are one of multiple types of stimuli that are represented internally and therefore increase distress in individuals with GAD. Newman and Llera (2011), in their contrast avoidance theory, propose that individuals with GAD prefer to be in a constant negative state compared to intermittent shifts from positive to negative states, and that worry is a preparatory process that facilitates avoidance of these shifts, or contrasts. It is important to note that in this theory, emotional stimuli are not inherently aversive to individuals with GAD, but that the *contrast* in states is extremely aversive and avoidance of these contrasts promotes further avoidance of emotional stimuli.

Mennin and colleagues (Mennin & Fresco, in press; Mennin, Heimberg, Turk, & Fresco, 2002; Mennin et al., 2005) propose an emotion dysregulation model (EDR) of GAD, which adapts basic emotion science (for comprehensive reviews, see Gross, 2009; Gross & Feldman Barrett, 2011) in consideration of GAD and other complex psychopathology and incorporates both acceptance and avoidance theories of GAD. Mennin and Fresco (in press) identify two temporally connected areas of emotion deficits that contribute to GAD: deficits in emotion generation and deficits in emotion regulation. Deficits in emotion generation are characterized by intense subjectively perceived emotional activation in response to perceived threats that obstruct potential reward or facilitate potential loss. Deficits in emotion regulation are characterized by initially rigid and stereotyped attentional shifts to both internal and external emotional stimuli, followed by a likelihood of using elaborative but maladaptive regulation strategies, such as worry. These responses can have an additive effect in which the initial maladaptive response (e.g., disengagement) can increase the potency of the subsequent elaborative response (e.g., worry). In contrast, if the individual is already emotionally primed (e.g., already upset or distressed) and the initial response is adaptive and allows the individual to process the negative stimulus (e.g., engagement) then the later, elaborate response might be lessened as well. These deficits contribute to narrowed behavioral repertoires, as maladaptive strategies are reinforced when distress is temporarily reduced. Further, individuals with GAD then also have more difficulty gaining clarity in their emotional response and knowing how to subsequently take instrumental action. Empirical evidence supports multiple subcomponents of this model, including increased emotional intensity and increased likelihood of using elaborative but maladaptive strategies (e.g., Mennin et al., 2005; Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006).

From these studies, it appears that emotions and the functional role of worry in relation to emotions might play key roles in the development and maintenance of GAD (for a review, see Behar et al., 2009). Further, there are a number of shared features in these theories and the surrounding evidence for each. Most central is the idea that emotions are aversive or unpleasant to individuals with GAD and thus are subsequently avoided to initially manage emotion-related experiences, often through the process of worry, which is eventually maintained as a frequent and consistent cognitive activity that contributes to prolonged long-term distress.

Behavioral Indicators of Emotional Avoidance

Considerable empirical evidence supports the argument that individuals with GAD experience intense responses to emotion and that worry is enacted functionally to address these types of responses (Aldao et al., 2010; Borkovec & Roemer, 1995; Borkovec et al., 2004; Hofmann et al., 2005; McLaughlin, Mennin, & Farach, 2007). The avoidance function of worry is also supported through numerous empirical studies (for review, see Borkovec et al., 2004). However, these studies are largely comprised of data from subjective (e.g., self-report questionnaires) and physiological measures (e.g., cardiac activity, skin conductance). Subjective measures of emotion, although simple to implement, are problematic due to potentially large differences in individual conceptualizations of discrete emotions (e.g., Brackett & Mayer, 2003; Duncan & Barrett, 2007; Russell, 2003). Additionally, participants might have difficulty recalling long term changes in emotional thoughts and behaviors, compared to short-term, state emotion (Robinson & Clore, 2002). Physiological measures of emotion are informative and benefit from optimal temporal resolution. However, physiology is only one facet of an emotional response, and is not necessarily a comprehensive representative of internal experience or associated with emotion-related behavior (e.g., Behar et al., 2009; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). Incorporation of behavioral evidence into our knowledge of emotional avoidance and reactivity in individuals with GAD would help corroborate these self-report and physiological findings. Two proposed behavioral indicators of emotional avoidance are behavioral disengagement from aversive stimuli and suppression of facial expressivity.

Disengagement from aversive stimuli can be accomplished through different mechanisms, including attentional (e.g., prioritizing overt attention to non-aversive stimuli over aversive stimuli; Georgiou et al., 2005; Verkuil, Brosschot, Putman, & Thayer, 2009), cognitive/experiential (e.g., thinking about future activities when confronted with immediately threatening stimuli; Borkovec et al., 2004; Hayes et al., 1996; McLaughlin, Borkovec, & Sibrava, 2007) and overt behavioral mechanisms. Behavioral disengagement is the act of physically and overtly terminating contact with a stimulus (e.g., covering eyes with hands or walking out of viewing distance). Use of behavioral disengagement is associated with negative affect and perseverative cognitions, such as worry (e.g., Davey et al., 2007; Meeten & Davey, 2011; Startup & Davey, 2001).

Facial expressions are primarily used to communicate affective information to others in social contexts (Butler et al., 2003; De Sonneville et al., 2002; Gross, John, & Richards, 2000; Zaki, Bolger, & Ochsner, 2009), and can be generated consciously or automatically (Gross & Levenson, 1993; Gross et al., 2000; Hagemann, Levenson, & Gross, 2006; Krumhuber & Manstead, 2009). Individuals routinely categorize facial expressions with discrete emotion labels, such as anger, sadness, fear, or happiness, which facilitates communication of affective information (e.g., Duncan & Barrett, 2007; Gross & Feldman Barrett, 2011; Lindquist & Barrett, 2008; Lindquist, Barrett, Bliss-Moreau, & Russell, 2006; Russell, 2003). An important distinction between facial expression and emotion is that displayed facial expression, although commonly associated with specific emotion categories, does not necessarily indicate the presence of a specific internal experience or emotion (Gross et al., 2000; Lindquist et al., 2006). Suppression of facial expressivity (i.e., inhibition of displays or configurations of facial features), however, is associated with regulation of intense emotions and is intended to reduce uncomfortable physiological arousal (e.g., rapid heart rate) in response to external or internal stimuli, although previous findings indicate that arousal is actually sustained or increased while suppressing (Butler et al., 2003; Goldin, McRae, Ramel, & Gross, 2008; Gross, 1998; Gross & Levenson, 1993; Hagemann et al., 2006; Tull, Jakupcak, & Roemer, 2010).

The Present Study

At present, most studies have examined how worry contributes to mood (e.g., Davey et al., 2007; Newman & Llera, 2011). Research that focuses on worry as an outcome of or subsequent to different types of emotional processing, as well as the interaction between emotion, avoidance, and subsequent worry, is scarce. In the present study, we investigated behavioral indicators of emotional avoidance and the influence of these behavioral responses on subsequent worry to provide further evidence for the role of an emotional avoidance mechanism in individuals with GAD. We examined earlier and later displays of behavioral disengagement (relative to the duration of the encounter) and frequency of displayed facial expressivity as indicators of behavioral emotional avoidance during induced anxious and non-anxious states in non-comorbid GAD, non-comorbid depression, and healthy participants.

We also designed the current study to test the potentially maladaptive relationship between initial activation in response to an aversive stimulus (e.g., state anxiety), avoidance responses, and subsequent worry, as conceptualized in the current theories of GAD. Accordingly, we incorporated a manipulation in which we attempted to induce anxiety in half of our participants. We also assessed intensity and depth of worry with an objective, experimenter administered, measure of worry perseverative strength to better measure the direct relationship between emotion and subsequent state-level worry responding, as opposed to trait worry.

We hypothesized that individuals with GAD who were primed for anxiety and then avoided subsequent emotional material (i.e., mutilation slides) would demonstrate greater depth of worry compared to those with GAD who were primed for anxiety but did not avoid the subsequent emotional material or to those who received a neutral prime regardless of subsequent emotional engagement. We did not expect a difference in levels of worry as a result of anxiety priming or subsequent disengagement in either the depression or the control group. We also hypothesized that individuals with GAD or depression that received the anxiety prime would display fewer expressions of fear and disgust when compared to individuals with GAD who received the neutral prime. In contrast, we hypothesized that the controls would not suppress facial expressivity and would display expected levels of expressive potentiation in fear and disgust as a result of receiving the anxiety prime (compared to the neutral prime).

We included a depression group to address issues of specificity in emotional avoidance and worry characteristics given arguments that GAD and major depression are difficult to reliably distinguish (e.g., Watson, 2005; but see Mennin, Heimberg, Fresco, & Ritter, 2008). As noted above, those participants with depression were expected to show similar response to indices of behavioral avoidance compared to those with GAD. However, given that depression is associated with greater use of past-oriented cognitions (e.g., rumination) than future-oriented cognitions (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008), we did not expect emotional priming and subsequent behavioral avoidance indices to produce greater levels of worry in those with depression.

Method

Participants

We recruited 105 (82 women, *M* age = 19.8, *SD* = 3.0) undergraduate students enrolled in an introductory psychology class at a metropolitan university. Participants either met criteria for self-reported GAD (GAD-Q-IV; Newman et al., 2002) but no depression (BDI-II; Beck, Steer, & Brown, 1996), self-reported depression but no GAD, or did not meet clinical criteria on either measure (i.e., control). See Table 1 for participant characteristics.

Table 1: Participant characteristics

	All Participants (*N* = 105)	**GAD (*n* = 32)**	**Depression (*n* = 26)**	**Control (*n* = 47)**
Age in years, *M* (*SD*)	19.8 (3.0)	20.5 (4.7)	19.2 (1.0)	19.6(2.0)
Gender, *n* (%)				
Women	82 (78.1)	25 (78.1)	22 (84.6)	35 (74.5)
Men	23 (21.9)	7 (21.9)	4 (14.4)	12 (25.5)
Race/ethnicity, *n* (%)				
White	63 (60.0)	21 (65.6)	16 (61.5)	26 (55.3)
Asian	14 (13.3)	4 (12.5)	5 (19.2)	5 (10.6)
Hispanic	13 (12.2)	4 (12.5)	2 (7.7)	7 (14.9)
Black	5 (4.8)	1 (3.1)	0 (0.0)	4 (8.5)
Other	9 (8.6)	2 (6.3)	3 (11.5)	5 (10.6)
GAD-Q-IV, *M* (*SD*)	7.4 (2.8)	10.1 (1.1)	7.9 (1.7)	5.2 (2.3)
BDI-II, *M* (*SD*)	13.5 (9.6)	11.7 (4.8)	26.4 (1.4)	7.3 (4.6)

Note. GAD = generalized anxiety disorder; GAD-Q-IV = Generalized Anxiety Disorder Questionnaire-IV; BDI-II = Beck Depression Inventory-II.

Materials

Generalized Anxiety Disorder Questionnaire – IV (GAD-Q-IV; Newman et al., 2002).

We utilized the categorical scoring system for the GAD-Q-IV to assess self-reported DSM-IV (American Psychiatric Association [APA], 2005) criteria for GAD. The categorical scoring system compares individual items to specific DSM-IV criteria for GAD to determine whether a GAD diagnosis is applicable (Newman et al., 2002). Participants who met GAD criteria and with BDI-II scores of 19 or lower were included in the GAD group. The GAD-Q-IV has been found to have high concordance with a diagnosis of GAD, as determined by the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown, DiNardo, & Barlow, 1994), a semi-structured diagnostic interview. It is also related to measures of excessive worry, such as the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990), and uncorrelated with conceptually unrelated measures (Newman et al., 2002). Newman et al. (2002) report 96 % specificity and 67 % sensitivity for the GAD-Q-IV categorical scoring system.

Beck Depression Inventory II (BDI-II; Beck et al., 1996).

The BDI-II is a 21-item self-report questionnaire of depressive symptoms. Each symptom is rated on a four-point scale ranging from 0 to 3. Total scores range from 0 to 63. In this study, participants with BDI-II scores of 20 or higher and who did not meet GAD criteria were included in the depression group, in accordance with recommendations made by Beck et al. (1996). Beck et al. (1996) report good psychometric properties for the BDI-II.

Multiple Affect Adjective Check List – Revised (MAACL-R; Zuckerman & Lubin, 1985).

The MAACL-R is a 132-item adjective checklist of current moods that is commonly used as a manipulation check in mood induction studies. The MAACL-R consists of five unipolar scales—Anxiety, Depression, Hostility, Positive Affect, and Sensation Seeking. It has been shown to have high internal consistency and good convergent and discriminant validity (Lubin, Van Whitlock, & Zuckerman, 1998). A number of studies have detected change in response to musical mood induction procedures using the MAACL-R (e.g., Blagden & Craske, 1996; Segal, Gemar, & Williams, 1999). We used the Anxiety (10 words) and Depression (12 words) subscales of the "Today" form of the MAACL-R to assess levels of state affect. For the purposes of this study, the MAACL-R was modified (from a checked item procedure) to be rated on a 5-point scale (from *"right now I feel very much like this"* to *"right now I feel not at all like this"*). This alteration was meant to increase the sensitivity of the MAACL-R to changes in state affect.

Worry Catastrophizing Assessment (WCA; Vasey & Borkovec, 1992).

The WCA is an experimenter-administered interview of worry consequences. The procedure for the interview is as follows: First, the interviewer asks the participant to generate a list of current worries. Next, the participant is asked to rate the severity of these worries. The most severe worry topic is chosen to be the focus of the interview. The interview begins with the question, "What is it about [most severe worry topic] that worries you?" The interviewer then asks, "What about [most severe worry topic] would you find fearful or bad if it actually happened?" Following the answer to this question, the interviewer repeats this same question about the content of the previous response. This is continued until the participant is unable to generate a further step. In this study, the experimenter recorded the number of individual statement steps (i.e., how many times the participant elaborates on each worry topic) as an index of depth of worry. This index has been found to reliably differentiate worriers from non-worriers in the content and severity of reported worries (e.g., Davey et al., 2007; Davey, Jubb, & Cameron, 1996; Meeten & Davey, 2011; Vasey & Borkovec, 1992).

Video clip stimuli.

Participants viewed either a "neutral" or an "anxiety" color video clip. The anxiety video contained a segment from "The Silence of the Lambs" (for a description of this video clip, which is commonly used in studies of emotion, see Gross & Levenson, 1995). The neutral video contained a segment from a weather channel, in which a weatherman

reported on an incoming storm and displayed images of the storm. Videos with similar content, such as a brief clip from a nature documentary, have been used as control stimuli in prior studies and were found to not elicit emotional responses (e.g., Ellard, Farchione, & Barlow, 2012; Rottenberg, Ray, & Gross, 2007). We used video clips of similar duration and video resolution.

Slide viewing task.

Participants viewed a series of increasingly disgusting images of body mutilation from the International Affect Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) in a slide-viewing task. Each picture[1] was displayed for 15 seconds and a total of 16 images were displayed, for a total of 240 seconds. The task could be terminated at any point via a participant button press.

Procedure

Research assistants obtained informed consent at the beginning of the experimental sessions. We randomly assigned participants to one of two conditions: a neutral condition (neutral video and false skin conductance monitoring) or an anxiety condition (anxiety video and shock threat). We also informed participants that they would be video-recorded throughout the session. Participants then completed the BDI-II, GAD-Q-IV, and the MAACL-R. Following the administering of these scales, research assistants prepared participants for the mood induction. For all participants, research assistants affixed façade electrodes on the inner right arm, two inches away from the wrist. The façade electrodes were part of a Thermo-Couple Self-Checking electrode apparatus (New Rochelle, New York). Immediately before watching the video clips, participants in the neutral condition received the following instructions: "*You're going to be watching a film clip. This clip has been shown not to affect people's moods. We're going to be measuring your skin response as you watch."* Participants in the anxiety condition received the following instructions: "*You're going to be watching a film clip. This clip has been shown to make people feel anxious. At some point during the clip, you may receive a very mild shock."* After finishing the clips, participants completed the MAACL-R again.

Following video clip viewing, all participants completed the slide-viewing task. Before starting the task, research assistants told participants, "*Now you're going to be watching a series of slides. Some of these slides may be disturbing, so I would like you to watch only as long as you feel like watching. When you would no longer like to watch, press the spacebar once to stop and let me know."* Participants either viewed every picture or exited the slide-viewing task early. We used duration of slide viewing time as an index of overt behavioral disengagement. Next, interviewers conducted the Worry Catastrophizing Assessment with participants. Finally, participants completed the GAD-Q-IV and the BDI-II. We then debriefed participants and granted course credit for their participation in the study.

Facial Coding

We coded video recordings of participant's facial expressions during the slide-viewing task using the Facial Expression Coding System (FACES; Kring & Sloan, 2007). FACES was developed and is intended to assess aspects of facial expressivity consistent with empirically-supported models of emotion (e.g., Russell, 1980, 2003). FACES has been used in several studies of emotion (for review, see Kring & Sloan, 2007), as well as studies examining emotional components of psychopathology (e.g., Aghevli, Blanchard, & Horan, 2003; Wagner, Roemer, Orsillo, & Litz, 2003). In FACES, an *expression* is regarded as any change in the face from a neutral display to a non-neutral display and back to a neutral display. When this activity is observed, coders rate the valence (positive, negative), intensity (i.e. 1 = *low,* 4 = *very high)*, and duration of the expression, then use this information to summarize the observed expression with an appropriate emotional descriptor (e.g., fear, disgust). Two undergraduates, trained to use FACES by the third author (D.S.M.), rated video recordings of experimental sessions for fear and disgust expressions. First, the two coders separately coded a random selection of 25% of the video recordings. Then, the coders met to develop a consensus score on the video recordings. Disagreements

[1] IAPS pictures used: 3550, 3160, 3030, 3100, 3010, 3051, 3130, 3060, 3000, 3053, 3170, 3400, 3071, 3120, 3168, 3080.

were resolved by reviewing the video recordings again independently, then discussing the rating. Coder 1 and Coder 2 were 96% reliable with each other, and reliable with the consensus score at rates of 98% and 95%, respectively. Thus, Coder 1 was determined to be effectively reliable and completed the remainder of the video coding on his own.

Results

Preliminary Analyses

To determine if there was a significant age difference between the GAD, depression, and control groups, as well as between assigned prime video condition, we conducted a Group (GAD, Depression, Control) × Condition (Anxious, Neutral) ANOVA on self-reported age. We also conducted chi-square analyses to determine if gender or race/ethnicity differed significantly between groups. We did not find significant differences between groups or between assigned condition for age, $F < 1$, $p = .71$, gender, $\chi^2(1, 105) = 0.97$, $p = .65$, or race/ethnicity, $\chi^2(1, 104) = 0.21$, $p = .33$.

Mood Induction

The MAACL-R anxiety measure was used as a manipulation check for mood induction as a result of video viewing. The MAACL-R depression measure was used to determine if the priming condition effects would be anxiety-specific. Utilizing a Group (GAD, Depression, Control) × Condition (Anxious, Neutral) ANOVA, there was not a significant difference in MAACL-R anxiety score changes among the groups, $F(2, 99) = 1.99$, $p = .74$, $\eta_p^2 = .04$, but there was a Condition × Time interaction, $F(1, 99) = 7.08$, $p < .01$, $\eta_p^2 = .07$. This interaction was driven by a decrease in MAACL-R anxiety scores from the neutral video, $t(52) = 3.37$, $p < .01$, $d = 0.35$, rather than from an increase in the anxiety video, $t(52) = -0.32$, $p = .74$, $d = 0.04$. In contrast, no main effects or interactions were found for MAACL-R depression scores, $F(2, 99) = 0.29$, $p = .75$, $\eta_p^2 = .01$. See Table 2 for means and standard deviations of anxiety and depression scores pre- and post video viewing.

Table 2: Means and standard deviations of anxiety and depression levels before and after mood induction

Condition	Anxiety Video		Neutral Video	
	Baseline	Induction	Baseline	Induction
MAACL-R Anxiety, *M (SE)*	1.71 (.07)	1.76 (.08)	1.69 (.07)	1.46 (.08)
MAACL-R Depression, *M (SE)*	1.42 (.08)	1.29 (.07)	1.53 (.08)	1.33 (.07)

Note. MAACL-R = Multiple Affect Adjective Check List – Revised.

Slide Viewing Time

In order to determine variability in behavioral disengagement as a function of group or priming status, we measured total slide viewing time in seconds. We conducted a Group (GAD, Depression, Control) × Condition (Anxious, Neutral) ANOVA on slide viewing time. We did not find a Group × Condition interaction, $F(2, 99) = 0.78$, $p = .46$, $\eta_p^2 = .03$. Further, there were no main effects for Group or Condition (all $\eta_p^2 < .03$).

Displayed Facial Expression

We excluded seven cases from facial expression analyses due to incomplete video data. We focused our analyses on facial expressions of fear and disgust, due to these emotions' relevance to negative affect and a higher likelihood of participants displaying these negative expressions during the slide viewing task (Gross & Levenson, 1995). We included fear expressions in our analyses due to the strong association between anxiety inductions and fear responses (e.g., Kreibig, 2010) but also included an additional negative emotion that is not associated with fear (i.e., disgust) to determine the breadth of emotions that might produce expressivity differences resulting from the anxiety prime.

Given bimodal distributions, observer ratings of fear and disgust were dichotomized as “not displayed” (i.e., “not expressed” or “slight expression”) or ‘displayed” (i.e., “somewhat expressed” or greater). In all analyses, we adjusted for overall slide viewing time given disengagement instructions.

Fear expressions.

We utilized nominal logistic regression to examine the effects of Condition (Anxious, Neutral) as a function of Group (GAD, Depression, Control) on dichotomized fearful expression observational codes, while adjusting for total slide viewing time. Fewer individuals in the GAD group demonstrated fearful facial expressions when they had previously watched the anxiety video, compared to individuals in the GAD group who watched the neutral video, $\chi^2(1, 27) = 4.80$, $p < .05$, $\phi = .05$. Similarly, fewer individuals in the Depression group exhibited fearful expressions when they had previously watched the anxiety video, compared to individuals in the Depression group who watched the neutral video, $\chi^2(1, 26) = 5.51$, $p < .05$, $\phi = .05$. In contrast, more control participants who watched the anxiety video demonstrated fearful expressions if they had previously watched the anxiety video, compared to those who had watched the neutral video, $\chi^2(1, 45) = 4.35$, $p < .05$, $\phi = .02$ (see Table 3 for percentages displaying expressions as a function of group and condition).

Table 3: Means and standard error for number of worry steps recorded during Worry Catastrophizing Assessment

	Diagnostic Group		
Slide Viewing Group	**GAD**	**Depression**	**Control**
	Anxiety Condition		
Engaged	6.5 (1.44)	8 (1.44)	6.5 (1.18)
Avoided	11.75 (1.44)*	6.33 (1.67)	7.64 (1.23)
	Neutral Condition		
Engaged	10 (1.54)	7.56 (1.36)	8.89 (1.36)
Avoided	7 (1.36)	10 (2.35)	7.93 (1.05)

Note. GAD = generalized anxiety disorder; Engaged = participants with recorded slide viewing times of ≥ 174 seconds; Avoided = participants with recorded slide viewing times of < 174 seconds. * $p < .05$.

Disgust expressions.

We utilized nominal logistic regression to examine the effects of Condition (Anxious, Neutral) as a function of Group (GAD, Depression, Control) in dichotomized disgust expression observational codes, while adjusting for total slide viewing time. There was a trend for fewer individuals in the GAD group to demonstrate disgust facial expressions when they had previously watched the anxiety video compared to those who watched the neutral video, $\chi^2(1) = 3.15$, $p = .08$. However, no differences in disgust expressions emerged for the Depression group, $\chi^2(1) = .89$, $p = .35$, or Control participants, $\chi^2(1) = .05$, $p = .98$ (see Table 3).

Depth of Worry

To test the hypothesis that individuals with GAD who received an anxiety prime but avoided subsequent emotional stimuli would have the greatest depth of worry, we conducted analyses using either dichotomized variables of facial displays or slide disengagement. We created dichotomous variables to distinguish between participants who more readily engaged with slide content and participants who more readily avoided the slide content. Specifically, we first ran an analysis of Group (GAD, Depression, Control) × Condition (Anxious, Neutral) × Slide Viewing (Avoided, Engaged) ANOVA on number of WCA steps. We created this dichotomous variable by dividing all participants into two groups, based on a median split of the slide viewing time data (med = 174 *s*). We assigned participants with recorded times of < 174 seconds to an “avoided slides” group ($n = 52$), and with recorded times of ≥ 174 seconds to an “engaged slides” group ($n = 53$).

There was a significant Group × Condition × Slide Viewing interaction, $F(2, 93) = 3.76$, $p = .03$, $\eta_p^2 = .08$. To determine which factor was driving the interaction, we conducted simple main effect analyses to examine *post hoc*

within-group variance. We found a significant Condition × Slide Viewing interaction only within the GAD group, $F(1, 28) = 14.24$, $p = .001$, $\eta_p^2 = .34$ but not the depression, $F(1, 22) = 0.92$, $p = .35$, $\eta_p^2 = .04$, or control, $F(1, 43) = 0.73$, $p = .40$, $\eta_p^2 = .02$, groups. This indicates that the observed interaction of Group × Condition × Slide Viewing is driven by differences within the GAD group (see Table 4). Specifically, among those individuals with GAD who watched the anxiety video, those who disengaged from the subsequent slides had a higher number of steps on the WCA, indicating greater depth of worry than those individuals with GAD who viewed the anxiety video but did not disengage, $t(14) = 3.13$, $p < .01$, $d = 1.67$. To a lesser degree, individuals with GAD who viewed the neutral video and disengaged had fewer steps than those who viewed the neutral video and engaged the subsequent slides, $t(14) = -2.14$, $p < .10$, $d = 1.14$. There were no significant main effects for Group, Condition, or Slide Viewing (all $\eta_p^2 < .01$). There were also no significant two-way interactions for Group × Condition, Group × Slide Viewing, or Condition × Slide Viewing (all $\eta_p^2 < .01$).

Similarly, we created median variables for both fear and disgust displays and conducted Group (GAD, Depression, Control) × Condition (Anxious, Neutral) × Facial Display during slides (Fear or Disgust display, no display) ANOVA on number of WCA steps. However, unlike behavioral disengagement, neither fear nor disgust analyses produced main or interaction effects on the WCA (all $\eta_p^2 < .02$).

Table 4: Percentage of observer-coded positive facial expression endorsements during slide viewing task

	GAD		Depression		Control	
	Anxiety (%)	**Neutral (%)**	**Anxiety (%)**	**Neutral (%)**	**Anxiety (%)**	**Neutral (%)**
Fear	0	23	0	23	14	0
Disgust	21	54	50	33	14	16

Note. GAD = generalized anxiety disorder.

Discussion

Summary

In this study, we present preliminary behavioral evidence for the role of emotional avoidance in worry and GAD. Individuals with GAD who viewed an anxiety video and chose to disengage from subsequent aversive stimuli reported significantly greater depth of worry, compared to those who viewed the anxiety video but chose to engage the aversive stimuli. This supports other forms of evidence for the role of emotional avoidance in worry and GAD, including neurobiological (Etkin et al., 2010), psychophysiological (Llera & Newman, 2010; Oathes et al., 2011; Weinberg & Hajcak, 2011), and self-report (Mennin et al., 2005; Roemer et al., 2005) data. Also, to a lesser extent, individuals with GAD who received a neutral prime and choose to *engage* with the aversive stimuli reported significantly greater depth of worry, compared to those who chose to disengage. Further, we found that individuals with GAD and depression who were primed to feel anxious displayed a lower percentage of fearful facial expressions while viewing aversive stimuli, compared to individuals with GAD and depression who received the neutral prime. In contrast, those in the control group who previously viewed the anxiety video expressed a greater percentage of fearful facial expressions than those control participants who had previously watched the neutral video. We also note a trend that indicated that individuals with GAD who were primed to feel anxious displayed a lower percentage of disgust expressions than individuals with GAD who were not primed to feel anxious.

It is important to note, however, that we expected state anxiety, as measured by the MAACL-R, to significantly increase for participants who received the anxiety induction. Although we did observe a significant difference in state anxiety changes between the anxiety and neutral induction conditions, we determined that this effect was driven by a lowering of state anxiety for individuals in the neutral condition, as opposed to an increase in state anxiety in the anxiety condition. One possible explanation is that all participants were at a state anxiety ceiling due to the knowledge that they might receive an electric shock in one of the conditions (told to them during consenting procedures and before baseline MAACL-R ratings). This might have raised their negative anticipation and increased anxiety considerably before contact with the priming videos, regardless of assigned condition (participants were unaware of assigned condition until research assistants administered condition-specific

instructions). Those in the anxiety video induction condition might have maintained this high level of anxiety due to receiving instructions immediately before video viewing that they might receive a shock, but anxiety did not increase due to a possible ceiling. Indeed, it has been suggested that powerful emotion-inducing manipulations might create a "strong situation" in which all participants would respond uniformly given the relevance of a strong threat cue for species survival (Lissek, Pine, & Grillon, 2006). In contrast, participants in the neutral condition might have experienced a decrease in any elevated anticipatory anxiety due to the passive nature of the task and lack of shock instructions, which might account for the relative decrease in state anxiety seen in the neutral condition. Overall, this explanation still supports different levels of state anxiety based on assigned condition.

Despite the lack of increase in subjective anxiety from the anxiety video, many of our findings are driven by the anxiety condition. Thus, a possible explanation for the effects of the anxiety video on subsequent avoidance and worry is that this condition effectively maintained elevated anticipatory anxiety, as opposed to increasing anxiety via negative induction. The inverse explanation that the mood inductions relaxed participants in the neutral condition and did not have an effect on the participants in the anxiety condition is not reflected in our results. In this explanation, we would expect to see the highest levels of worry in participants in the GAD group who received the anxious or "non-relaxing" prime and engaged with the slides, which did not occur. Future studies examining the relationships among emotional reactivity, avoidance, and worry should utilize more reliable priming paradigms.

Interpretations and Implications

A major aim of this study was to demonstrate a relationship between behavioral avoidance and increased levels of subsequent worry. Although overall speed of disengagement did not differ by group, the finding that individuals with GAD who viewed an anxiety video and subsequently avoided aversive stimuli displayed higher levels of worry provides preliminary support for a temporal and generative relationship between emotional avoidance and worry. A perspective that is immediately relevant to these findings is the mood-as-input hypothesis (e.g., Startup & Davey, 2001). The mood-as-input hypothesis is an influential component of the perseveration literature and posits that a person's affective state can influence their thoughts about and behaviors during a task (e.g., negative affect can inhibit motivation to continue a task), depending on the rules of the task. Two stop-rules underlie the mood-as-input hypothesis: the "feel like continuing" stop rule (i.e., an instruction to individuals completing a task to continue work on the task until they wish to stop) and the "as many as can" stop rule, (i.e., an instruction to perform as well as possible on a task without regard for personal preference). Behavioral engagement and disengagement during a task can be conceptualized using the "as many as can" (engagement) and "feel like continuing" (disengagement) stop-rules. Different pathological processes can also be explained within the context of the mood-as-input theory, including worry. The mood-as-input hypothesis asserts that pathological worry, such as seen in GAD, is characterized by exhaustive use of "as many as can" stop rules (i.e., increased perseveration) and is accompanied by increased negative mood (e.g., Meeten & Davey, 2011).

Taken together, empirical evidence in support of the mood-as-input hypothesis strongly suggests that *responses to experienced emotion* can influence subsequent worry, which is a basic assumption of our conceptualization of the relationship between emotional avoidance and worry. In our findings we see that individuals in the GAD group who received the anxiety prime and disengaged from aversive stimuli displayed greater depth of worry. This can be interpreted within the context of the mood-as-input hypothesis: individuals in the GAD group who viewed an anxiety video (and possibly maintained anticipatory anxiety) were more likely to disengage from a "feel like continuing" task (viewing aversive stimuli). They then displayed higher levels of perseveration on an "as many as can" task (worry). In other words, individuals with GAD likely received input not only from their affective state prior to viewing mutilation slides, but also from their reaction to the slides, as well. This interaction is exclusive to individuals in the GAD group, and implies that there are differences in how experienced negative affect and emotional avoidance interact in individuals with GAD compared to individuals with depression and individuals without GAD or depression. It should also be noted that the current study utilizes the same measure of worry (WCA; Vasey & Borkovec, 1992) as the extant research on mood-as-input (Startup & Davey, 2001), which allows us to more easily compare our findings with these previous investigations. Although we cannot conclusively state that individuals with GAD in the anxiety condition were effectively primed, an anticipatory influence that was maintained would likely

produce the same interaction, as the participants would still be using a negative mood as an input, regardless of how the mood was generated.

Our findings can also be viewed within the context of current theories of GAD. Specifically, our findings are consistent with avoidance (cognitive avoidance model, Borkovec et al., 2004; contrast avoidance model, Newman & Llera, 2011) and acceptance models of GAD (Hayes, Follette, & Linehan, 2011; Roemer et al., 2009). A key foundation of both avoidance and acceptance models is that individuals with GAD are more likely to use worry to facilitate avoidance of a current negative state or external threat, and continue to worry despite problematic outcomes. In both lines of theory, an important distinction is made between adaptive (i.e., beneficial and flexible) and maladaptive (i.e., deleterious and rigid) uses of avoidance. We see support for this idea in our findings: individuals with GAD who maintained a negative state throughout the study and chose to disengage from aversive stimuli reported significantly greater depth of worry. Although the exact timeline and specific function of avoidance and worry differs by model and are still the subjects of multiple lines of research, it is clear that the connection between avoidance and worry is a maladaptive one.

The lack of a main effect for group (i.e., worry outcome and slide viewing time did not differ between the GAD, depression, and control groups without taking into account condition and engagement) can be explained within the context of the EDR model. In this perspective, Mennin and Fresco (Mennin & Fresco, in press; Fresco, Mennin & Heimberg, in press) argue that, given the presence of a motivationally salient stimulus, individuals with GAD will demonstrate deficits in both earlier, less elaborative, attentional processing as well as later, more elaborative, verbal processing. Further, Mennin and Fresco propose that an individual with GAD who is already emotionally primed and then chooses to engage with the aversive stimuli will not experience deficits in later, more elaborative processing (e.g., worry). In contrast, individuals with GAD who are not emotionally primed (i.e., not in an activated and preparatory state) who choose to engage with aversive stimuli will experience distress as a basic reaction to the content of the stimuli. Crucially, in the EDR model, individuals with GAD are as likely to avoid aversive stimuli as individuals without pathology. However, the combination of a previously activated or aroused state and avoidant behavior that precludes emotional processing leads to increased worry in individuals with GAD. This conceptualization closely matches our findings: in the current study there were no main effects for group, but individuals with GAD who viewed the anxiety video and then disengaged had the greatest increases in worry elaboration. However, as noted above, given the lack of anxiety priming effects, we cannot definitively say that regulatory efforts were produced from emotion generative increases due to anxiety video viewing or prior anticipation.

The other index of behavioral avoidance in this study, suppression of facial expressivity, provides partial support for increased emotional avoidance in GAD. We offer three points of consideration. First, we note that both individuals with GAD and depression displayed fewer fear expressions compared to controls, which supports an association between negative affect and suppression of fear expressions (e.g., Moore, Zoellner, & Mollenholt, 2008). Further, there was a trend toward fewer disgust expressions displayed by individuals with GAD, which would also support this association. Second, we caution against interpreting these results as indicative of overall expression suppression, regardless of valence. We cannot determine if this suppression effect is unique to negative expressions without controlling for the influence of positive affect and measuring positive facial expressions (e.g., happiness). Finally, although we assert that our findings reflect a suppression effect, it must be noted that habituation is a plausible alternative explanation. A habituation argument would contend that a participant's baseline level of discomfort dropped due to repeated exposure to aversive stimuli, and over time the participant did not generate facial expressions. However, a habituation effect would likely occur across groups and in this investigation, participants in the control group who were primed to feel anxious displayed *increased* facial expressivity, compared to the decreased facial expressivity observed in the GAD and depression groups. Thus, these results do not fully support a habituation argument.

We also emphasize that our use of the WCA is notable for multiple reasons. First, previous studies have primarily used the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990) to assess levels of worry. Although the PSWQ is widely used and has good psychometric properties (Molina & Borkovec, 1994), studies show that it is not a reliable measure of quantity of worry domains or temporal characteristics of worry (e.g., Niles, Lebeau, Liao, Glenn, & Craske, 2012). Due to the pervasive nature of worry and variety of worry content seen in GAD, it is

important to obtain a more detailed profile of worry that can capture what is seen in clinical samples of GAD. The WCA, as a measure of individual worry domains and their perceived consequences, is preferable to the PSWQ for this purpose. Also noteworthy is that the WCA assesses current levels of worry and is likely more sensitive to state levels due to experimental manipulations than subjective assessments of trait worry, such as the PSWQ.

Finally, our findings also contribute to the ongoing nosological discussions of GAD and other anxiety and mood disorders. High rates of comorbidity between GAD and major depressive disorder (MDD) and overlaps in diagnostic symptom criteria are the basis for an argument to reclassify GAD within a general "distress" category that also includes MDD (Watson, 2005). However, reclassification might obscure a number of important and functional differences between GAD and MDD, including the specific role of worry in GAD and the onset and duration of GAD compared to MDD (for review, see Mennin et al., 2008). This, in turn, could hinder diagnostic precision and subsequent efforts to provide treatment appropriate to a person's individual symptoms. In this study, individuals with GAD and depression less often displayed fear expressions than the control group, supporting an association between negative affect and expressive suppression (e.g., Moore et al., 2008). However, individuals with depression did not exhibit any change in depth of worry regardless of which video clip was viewed or if they avoided aversive stimuli, whereas we found significant effects in the GAD group. This is likely indicative of a specific role of worry in GAD compared to depression, and supports the assertion that although GAD and MDD share readily observable characteristics (e.g., negative affect), there are observable differences in how worry presents in individuals with GAD versus individuals with MDD.

One possible explanation for a lack of demonstrated worry effects in the depression group is the temporal distinction between worry and rumination. Rumination is defined in a similar manner as worry (e.g., repetitive thinking about a stressor and its consequences, Nolen-Hoeksema et al., 2008), however, rumination is conceptualized as primarily fixating on past-events and a substitute for forward, motivationally-driven activity (Nolen-Hoeksema et al., 2008). This is in contrast to the future-oriented direction of the worry process (Borkovec et al., 2004). The WCA measures worry with sequential elaborations of a participant's current worry topics, which facilitates a future-oriented response from the participant. For example, if a participant states that he or she is worried about failing an upcoming exam, the interviewer will prompt the participant to state a perceived future consequence of failing the exam. In this way, the interview is structured to naturally follow a linear timeframe. Individuals with depression might not have demonstrated increased depth of worry because their thoughts were focused on past events, and not on future outcomes.

Limitations

Although we present promising behavioral support for the role of emotional avoidance and worry in GAD, there are a number of limitations to consider. A primary limitation is that we did not directly assess if individuals disengaged from the slide-viewing task to functionally avoid the aversive stimuli. It is possible that disengagement served a function other than emotional avoidance. One possibility is that some participants experienced such an intense increase in arousal due to the graphic nature of the slides that they disengaged for physical reasons (e.g., stomach pains, slight regurgitation into the mouth) that are not immediately recognizable as emotional responses. There is also the possibility that participants disengage due to boredom or disinterest in the task. A brief post-task interview that inquires as to the reason or reasons for disengagement would be beneficial in future studies.

Further, we do not have concurrently collected physiological data to support an argument that disengagement served an emotional avoidance function in the current study. This limitation applies to the current study as a whole. A benefit of physiological measurements is that fluctuations in internal activation can be measured "in the moment" with relatively high temporal resolution. These precise measurements, along with knowledge of how different systems (e.g., sympathetic and parasympathetic nervous systems) affect homeostasis, can be connected to observable behavior (i.e., connect what a person does with how a person feels in a given moment). Inclusion of physiological measures at any point where level of arousal is relevant to the interpretability of results would provide greater clarity and context for behavioral findings. For example, it is unclear if participants chose to physically disengage from the aversive images during the slide-viewing task due to an image-specific reaction (e.g., the attributes of one image, in particular, contributed to a large increase in discomfort) or a generally avoidant approach to incoming aversive information. Similarly, it is unclear if participants who chose not to behaviorally

disengage, but indicated higher levels of worry post-task, experienced consistent levels of arousal or if arousal fluctuated during the task. Further, it is unclear if participants in the GAD and depression groups who viewed the anxiety video were actively suppressing spontaneous facial muscle activity or if they were generally not motivated to display a facial expression.

Future studies that incorporate physiological measurements, such as electrocardiography (heart activity) and electromyography (muscle activity), would help address these limitations and clarify some of the previously-addressed uncertainties. In particular, measures of autonomic activity would be ideal to provide a timeline of activation for observed behavioral avoidance, as autonomic activity is strongly linked to presentation of and changes in emotional behavior and cognitions (for review, see Kreibig, 2010). Measures of heart and muscle activity would also help clarify if individuals are actively suppressing in response to a stressor, as defined by decreased muscle activity combined with increased heart rate (e.g., Dimberg, Thunberg, & Elmehed, 2000; Kreibig, 2010). Future studies of emotional avoidance and worry in GAD would benefit from a cohesive design that incorporates behavioral, physiological, and subjective measures. A fuller understanding of how different systems involved in worry and emotion interact and drive behavior will contribute to more informed and focused study of GAD. Another limitation is our reliance on analogue samples of GAD and depression. We used self-report measures (GAD-Q-IV and BDI-II) to determine group affiliation. Further, the mean age of our sample is 19.8, whereas the age of GAD onset is typically in the mid- to late- twenties (Kessler, Wittchen, & Walters, 2004). Observed group differences might not generalize to a clinical population for these reasons. Clinical interviews to determine group affiliation are an appealing alternative. Future research can use clinical interviews to more thoroughly assess important diagnostic considerations of GAD (e.g., depth and content of worry) and MDD (e.g., time course of depression), especially those that are potentially relevant to emotional avoidance (e.g., attentional bias to threat and temporal orientation of repetitive thoughts).

Future Directions

These preliminary findings, as well as the current emotional avoidance literature as a whole, provide important implications for effective treatment of GAD and other disorders that contain an emotional avoidance component. In particular, a better understanding of the functional relationships between emotional experience, avoidance, and subsequent worry could improve treatment by prioritizing targets for intervention, such as dysfunctional emotional responses and chronically maladaptive use of worry. Future treatments could then separately and precisely address these components, as well as consider the relationship between them and how their interaction can lead to elevated and persistent levels of distress and dysfunction. Further research on the relationship between emotional avoidance and worry will help us more comprehensively address the complex functional mechanisms that underlie GAD and concomitant disorders such as comorbid MDD.

References

Aghevli, M. A., Blanchard, J. J., & Horan, W. P. (2003). The expression and experience of emotion in schizophrenia: a study of social interactions. *Psychiatry Research*, *119*, 261-270. http://dx.doi.org/10.1016/S0165-1781(03)00133-1

Aldao, A., Mennin, D. S., Linardatos, E., & Fresco, D. M. (2010). Differential patterns of physical symptoms and subjective processes in generalized anxiety disorder and unipolar depression. *Journal of Anxiety Disorders*, *24*, 250-259. http://dx.doi.org/10.1016/j.janxdis.2009.12.001

American Psychiatric Association. (2005). *Diagnostic and statistical manual of mental disorders.* (4. ed., text rev., 5th printing. ed.). Washington DC: American Psychiatric Association.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II.* San Antonio, TX: Psychological Corporation.

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. http://dx.doi.org/10.1016/j.janxdis.2009.07.006

Blagden, J. C., & Craske, M. G. (1996). Effects of active and passive rumination and distraction: A pilot replication with anxious mood. *Journal of Anxiety Disorders*, *10*, 243–252. http://dx.doi.org/10.1016/0887-6185(96)00009-6

Borkovec, T. D., Alcaine, O. M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. G. Heimberg, C. L. Turk, & D. S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice.* (pp. 77-108). New York, NY US: Guilford Press.

Borkovec, T. D., & Roemer, L. (1995). Perceived functions of worry among generalized anxiety disorder subjects: Distraction from more emotionally distressing topics? *Journal of Behavior Therapy and Experimental Psychiatry*, *26*, 25-30. http://dx.doi.org/10.1016/0005-7916(94)00064-S

Brackett, M. A., & Mayer, J. D. (2003). Convergent, discriminant, and incremental validity of competing measures of emotional intelligence. *Personality and Social Psychology Bulletin*, *29*, 1147 -1158. http://dx.doi.org/10.1177/0146167203254596

Brosschot, J. F., Gerin, W., & Thayer, J. F. (2006). The perseverative cognition hypothesis: A review of worry, prolonged stress-related physiological activation, and health. *Journal of Psychosomatic Research*, *60*, 113–124. http://dx.doi.org/10.1016/j.jpsychores.2005.06.074

Brown, T. A., DiNardo, P., & Barlow, D. H. (1994). Anxiety disorders interview schedule for DSM-IV. Retrieved from http://www.oup.com/us/catalog/general/subject/Psychology/PractitionerClientGuides/?view=usa&ci=9780195186727

Butler, E. A., Egloff, B., Wilhelm, F. H., Smith, N. C., Erickson, E. A., & Gross, J. J. (2003). The social consequences of expressive suppression. *Emotion*, *3*, 48-67. http://dx.doi.org/10.1037/1528-3542.3.1.48

Davey, G. C. L., Eldridge, F., Drost, J., & MacDonald, B. A. (2007). What ends a worry bout? An analysis of changes in mood and stop rule use across the catastrophising interview task. *Behaviour Research and Therapy*, *45*, 1231-1243. http://dx.doi.org/10.1016/j.brat.2006.08.024

Davey, G. C. L., Jubb, M., & Cameron, C. (1996). Catastrophic worrying as a function of changes in problem-solving confidence. *Cognitive Therapy and Research*, *20*, 333-344. http://dx.doi.org/10.1007/BF02228037

De Sonneville, L. M. J., Verschoor, C. A., Njiokiktjien, C., Op het Veld, V., Toorenaar, N., & Vranken, M. (2002). Facial identity and facial emotions: speed, accuracy, and processing strategies in children and adults. *Journal Of Clinical And Experimental Neuropsychology*, *24*, 200-213. http://dx.doi.org/10.1076/jcen.24.2.200.989

Dimberg, U., Thunberg, M., & Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychological Science*, *11*, 86–89. http://dx.doi.org/10.1111/1467-9280.00221

Duncan, S., & Barrett, L. F. (2007). Affect is a form of cognition: A neurobiological analysis. *Cognition & emotion*, *21*, 1184-1211. http://dx.doi.org/10.1080/02699930701437931

Ellard, K., Farchione, T., & Barlow, D. (2012). Relative effectiveness of emotion induction procedures and the role of personal relevance in a clinical sample: A comparison of film, images, and music. *Journal of Psychopathology and Behavioral Assessment*, *34*, 232–243. http://dx.doi.org/10.1007/s10862-011-9271-4

Etkin, A., Prater, K. E., Hoeft, F., Menon, V., & Schatzberg, A. F. (2010). Failure of anterior cingulate activation and connectivity with the amygdala during implicit regulation of emotional processing in generalized anxiety disorder. *American Journal of Psychiatry*, *167*, 545–554. http://dx.doi.org/10.1176/appi.ajp.2009.09070931

Fresco, D. M., Mennin, D. S., & Heimberg, R. G. (in press). Emotion Regulation Therapy for generalized anxiety disorder. *Cognitive and Behavioral Practice.*

Georgiou, G. A., Bleakley, C., Hayward, J., Russo, R., Dutton, K., Eltiti, S., & Fox, E. (2005). Focusing on fear: attentional disengagement from emotional faces. *Visual Cognition*, *12*, 145-158. http://dx.doi.org/10.1080/13506280444000076

Gladstone, G. L., Parker, G. B., Mitchell, P. B., Malhi, G. S., Wilhelm, K. A., & Austin, M.-P. (2005). A Brief Measure of Worry Severity (BMWS): personality and clinical correlates of severe worriers. *Journal of Anxiety Disorders*, *19*, 877-892. http://dx.doi.org/10.1016/j.janxdis.2004.11.003

Goldin, P. R., McRae, K., Ramel, W., & Gross, J. J. (2008). The Neural bases of emotion regulation: Reappraisal and suppression of negative emotion. *Biological psychiatry*, *63*, 577-586. http://dx.doi.org/10.1016/j.biopsych.2007.05.031

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, *74*, 224–237. http://dx.doi.org/10.1037/0022-3514.74.1.224

Gross, J. J. (Ed.). (2007). *Handbook of Emotion Regulation*. New York, NY: Guilford Press.

Gross, J. J. (Ed.). (2009). *Handbook of emotion regulation.* The Guilford Press.

Gross, J. J., & Feldman Barrett, L. (2011). Emotion Generation and emotion regulation: One or two depends on your point of view. *Emotion Review*, *3*, 8 -16. http://dx.doi.org/10.1177/1754073910380974

Gross, J. J., John, O. P., & Richards, J. M. (2000). The dissociation of emotion expression from emotion experience: A personality perspective. *Personality and Social Psychology Bulletin*, *26*, 712 -726. http://dx.doi.org/10.1177/0146167200268006

Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, *64*, 970-986. http://dx.doi.org/10.1037/0022-3514.64.6.970

Gross, J. J, & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition & Emotion*, *9*, 87-108. http://dx.doi.org/10.1080/02699939508408966

Hagemann, T., Levenson, R. W., & Gross, J. J. (2006). Expressive suppression during an acoustic startle. *Psychophysiology*, *43*, 104-112. http://dx.doi.org/10.1111/j.1469-8986.2006.00382.x

Hawksley, J., & Davey, G. C. L. (2010). Mood-as-input and depressive rumination. *Behaviour Research and Therapy*, *48*, 134–140. http://dx.doi.org/10.1016/j.brat.2009.10.004

Hayes, S. C., Follette, V. M., & Linehan, M. (2011). *Mindfulness and Acceptance: Expanding the Cognitive-behavioral Tradition*. New York, NY: Guilford Press.

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, *64*, 1152-1168. http://dx.doi.org/10.1037/0022-006X.64.6.1152

Hoffman, D. L., Dukes, E. M., & Wittchen, H. (2008). Human and economic burden of generalized anxiety disorder. *Depression and Anxiety*, *25*, 72-90. http://dx.doi.org/10.1002/da.20257

Hofmann, S. G., Moscovitch, D. A., Litz, B. T., Kim, H.-J., Davis, L. L., & Pizzagalli, D. A. (2005). The worried mind: Autonomic and prefrontal activation during worrying. *Emotion*, *5*, 464-475. http://dx.doi.org/10.1037/1528-3542.5.4.464

Holaway, R. M., Heimberg, R. G., & Coles, M. E. (2006). A comparison of intolerance of uncertainty in analogue obsessive-compulsive disorder and generalized anxiety disorder. *Journal of Anxiety Disorders*, *20*, 158-174. http://dx.doi.org/10.1016/j.janxdis.2005.01.002

Kessler, R. C., Wittchen, H., & Walters, E. E. (2004). Epidemiology. In Heimberg, R.G., Turk, C.L., & Mennin, D.S (Eds.), *Generalized anxiety disorder: advances in research and practice* (pp. 77-108). New York, NY: Guilford Press.

Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: A review. *Biological Psychology*, *84*, 394–421. http://dx.doi.org/10.1016/j.biopsycho.2010.03.010

Kring, A. M., & Sloan, D. M. (2007). The Facial Expression Coding System (FACES): development, validation, and utility. *Psychological Assessment*, *19*, 210-224. http://dx.doi.org/10.1037/1040-3590.19.2.210

Krumhuber, E. G., & Manstead, A. S. R. (2009). Can Duchenne smiles be feigned? New evidence on felt and false smiles. *Emotion*, *9*, 807-820. http://dx.doi.org/10.1037/a0017844

Ladouceur, R., Dugas, M. J., Freeston, M. H., Léger, E., Gagnon, F., & Thibodeau, N. (2000). Efficacy of a cognitive–behavioral treatment for generalized anxiety disorder: Evaluation in a controlled clinical trial. *Journal of Consulting and Clinical Psychology*, *68*, 957-964. http://dx.doi.org/10.1037/0022-006X.68.6.957

Lang, P., Bradley, M., & Cuthbert, B. (2008). *International affective picture system (IAPS): Affective ratings of pictures and instruction manual* Technical Report A-8. Gainesville, University of Florida, Gainesville, FL.

Lindquist, K. A., & Barrett, L. F. (2008). Constructing emotion: the experience of fear as a conceptual act. *Psychological Science*, *19*, 898-903. http://dx.doi.org/10.1111/j.1467-9280.2008.02174.x

Lindquist, K. A., Barrett, L. F., Bliss-Moreau, E., & Russell, J. A. (2006). Language and the perception of emotion. *Emotion*, *6*, 125-138. http://dx.doi.org/10.1037/1528-3542.6.1.125

Lissek, S., Pine, D. S., & Grillon, C. (2006). The strong situation: A potential impediment to studying the psychobiology and pharmacology of anxiety disorders. *Biological Psychology*, *72*, 265–270. http://dx.doi.org/10.1016/j.biopsycho.2005.11.004

Llera, S. J., & Newman, M. G. (2010). Effects of worry on physiological and subjective reactivity to emotional stimuli in generalized anxiety disorder and nonanxious control participants. *Emotion*, *10*, 640-650. http://dx.doi.org/10.1037/a0019351

Lubin, B., Van Whitlock, R., & Zuckerman, M. (1998). Affect traits in differential diagnosis of anxiety, depressive, and schizophrenic disorders using the Multiple Affect Adjective Check List-Revised. *Assessment*, *5*, 309-319. http://dx.doi.org/10.1177/107319119800500401

Mauss, I. B., Levenson, R. W., McCarter, L., Wilhelm, F. H., & Gross, J. J. (2005). The tie that binds? Coherence among emotion experience, behavior, and physiology. *Emotion*, *5*, 175-190. http://dx.doi.org/10.1037/1528-3542.5.2.175

McLaughlin, K. A., Borkovec, T. D., & Sibrava, N. J. (2007). The effects of worry and rumination on affect states and cognitive activity. *Behavior Therapy*, *38*, 23-38. http://dx.doi.org/10.1016/j.beth.2006.03.003

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. http://dx.doi.org/10.1016/j.brat.2006.12.004

Meeten, F., & Davey, G. C. L. (2011). Mood-as-input hypothesis and perseverative psychopathologies. *Clinical Psychology Review*, *31*, 1259-1275. http://dx.doi.org/10.1016/j.cpr.2011.08.002

Mennin, D. S., & Fresco, D. M. (in press). Emotion Regulation Therapy. In J.J. Gross (Ed.), *Handbook of Emotion Regulation* (Second Edition). New York: Guilford Press.

Mennin, D. S, Heimberg, R. G., Fresco, D. M., & Ritter, M. R. (2008). Is generalized anxiety disorder an anxiety or mood disorder? Considering multiple factors as we ponder the fate of GAD. *Depression And Anxiety*, *25*, 289-299. http://dx.doi.org/10.1002/da.20493

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*, 85-90. http://dx.doi.org/10.1093/clipsy.9.1.85

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. http://dx.doi.org/10.1016/j.brat.2004.08.008

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. http://dx.doi.org/10.1016/0005-7967(90)90135-6

Michelson, S. E., Lee, J. K., Orsillo, S. M., & Roemer, L. (2011). The role of values-consistent behavior in generalized anxiety disorder. *Depression and Anxiety*, *28*, 358-366. http://dx.doi.org/10.1002/da.20793

Molina, S., & Borkovec, T. D. (1994). The Penn State Worry Questionnaire: Psychometric properties and associated characteristics. *Worrying: Perspectives on theory, assessment and treatment.*, Wiley series in clinical psychology. (pp. 265–283). Oxford, England: John Wiley & Sons.

Moore, S. A., Zoellner, L. A., & Mollenholt, N. (2008). Are expressive suppression and cognitive reappraisal associated with stress-related symptoms? *Behaviour Research and Therapy*, *46*, 993–1000. http://dx.doi.org/10.1016/j.brat.2008.05.001

Newman, M. G., & Llera, S. J. (2011). A novel theory of experiential avoidance in generalized anxiety disorder: A review and synthesis of research supporting a contrast avoidance model of worry. *Clinical Psychology Review*, *31*, 371-382. http://dx.doi.org/10.1016/j.cpr.2011.01.008

Newman, M. G., Zuellig, A. R., Kachin, K. E., Constantino, M. J., Przeworski, A., Erickson, T., & Cashman-McGrath, L. (2002). Preliminary reliability and validity of the generalized anxiety disorder questionnaire-IV: A revised self-report diagnostic measure of generalized anxiety disorder. *Behavior Therapy*, *33*, 215-233. http://dx.doi.org/10.1016/S0005-7894(02)80026-0

Niles, A. N., Lebeau, R. T., Liao, B., Glenn, D. E., & Craske, M. G. (2012). Dimensional indicators of generalized anxiety disorder severity for DSM-V. *Journal of Anxiety Disorders*, *26*, 279–286. http://dx.doi.org/10.1016/j.janxdis.2011.12.007

Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, *3*, 400–424. http://dx.doi.org/10.1111/j.1745-6924.2008.00088.x

Oathes, D. J., Siegle, G. J., & Ray, W. J. (2011). Chronic worry and the temporal dynamics of emotional processing. *Emotion*, *11*, 101-114. http://dx.doi.org/10.1037/a0021781

Paulesu, E., Sambugaro, E., Torti, T., Danelli, L., Ferri, F., Scialfa, G.,.. Sassaroli, S. (2010). Neural correlates of worry in generalized anxiety disorder and in normal controls: A functional MRI study. *Psychological Medicine*, *40*, 117-124. http://dx.doi.org/10.1017/S0033291709005649

Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: evidence for an accessibility model of emotional self-report. *Psychological Bulletin, 128*, 934-960. http://dx.doi.org/10.1037/0033-2909.128.6.934

Roemer, L., & Orsillo, S. M. (2002). Expanding our conceptualization of and treatment for generalized anxiety disorder: Integrating mindfulness/acceptance-based approaches with existing cognitivebehavioral models. *Clinical Psychology: Science and Practice*, *9*, 54-68. http://dx.doi.org/10.1093/clipsy.9.1.54

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*, 142-154. http://dx.doi.org/10.1016/j.beth.2008.04.001

Roemer, L., Salters, K., Raffa, S. D., & Orsillo, S. M. (2005). Fear and avoidance of internal experiences in GAD: Preliminary tests of a conceptual model. *Cognitive Therapy and Research*, *29*, 71-88. http://dx.doi.org/10.1007/s10608-005-1650-2

Rottenberg, J., Ray, R. D., & Gross, J. J. (2007). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *The handbook of emotion elicitation and assessment* (pp. 9–28). Oxford University Press.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology;Journal of Personality and Social Psychology*, *39*, 1161-1178. http://dx.doi.org/10.1037/h0077714

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review;Psychological Review*, *110*, 145-172. http://dx.doi.org/10.1037/0033-295X.110.1.145

Salters-Pedneault, K., Roemer, L., Tull, M. T., Rucker, L., & Mennin, D. S. (2006). Evidence of broad deficits in emotion regulation associated with chronic worry and generalized anxiety disorder. *Cognitive Therapy and Research*, *30*, 469-480. http://dx.doi.org/10.1007/s10608-006-9055-4

Segal, Z. V., Gemar, M., & Williams, S. (1999). Differential cognitive response to a mood challenge following successful cognitive therapy or pharmacotherapy for unipolar depression. *Journal of Abnormal Psychology*, *108*, 3-10. http://dx.doi.org/10.1037/0021-843X.108.1.3

Stapinski, L. A., Abbott, M. J., & Rapee, R. M. (2010). Evaluating the cognitive avoidance model of generalised anxiety disorder: Impact of worry on threat appraisal, perceived control and anxious arousal. *Behaviour Research and Therapy*, *48*, 1032-1040. http://dx.doi.org/10.1016/j.brat.2010.07.005

Startup, H. M., & Davey, G. C. L. (2001). Mood as input and catastrophic worrying. *Journal of Abnormal Psychology*, *110*, 83-96. http://dx.doi.org/10.1037/0021-843X.110.1.83

Tull, M. T., Jakupcak, M., & Roemer, L. (2010). Emotion suppression: a preliminary experimental investigation of its immediate effects and role in subsequent reactivity to novel stimuli. *Cognitive Behaviour Therapy*, *39*, 114-125. http://dx.doi.org/10.1080/16506070903280491

Vasey, M. W., & Borkovec, T. D. (1992). A catastrophizing assessment of worrisome thoughts. *Cognitive Therapy and Research*, *16*, 505-520. http://dx.doi.org/10.1007/BF01175138

Verkuil, B., Brosschot, J. F., Putman, P., & Thayer, J. F. (2009). Interacting effects of worry and anxiety on attentional disengagement from threat. *Behaviour Research and Therapy*, *47*, 146-152. http://dx.doi.org/10.1016/j.brat.2008.11.003

Wagner, A. W., Roemer, L., Orsillo, S. M., & Litz, B. T. (2003). Emotional experiencing in women with posttraumatic stress disorder: Congruence between facial expressivity and self-report. *Journal of Traumatic Stress*, *16*, 67-75. http://dx.doi.org/10.1023/A:1022015528894

Watson, D. (2005). Rethinking the mood and anxiety disorders: A quantitative hierarchical model for DSM-V. *Journal of Abnormal Psychology*, Toward a Dimensionally Based Taxonomy of Psychopathology, *114*, 522–536. http://dx.doi.org/10.1037/0021-843X.114.4.522

Weinberg, A., & Hajcak, G. (2011). Electrocortical evidence for vigilance-avoidance in Generalized Anxiety Disorder. *Psychophysiology*, *48*, 842–851. http://dx.doi.org/10.1111/j.1469-8986.2010.01149.x

Yoon, K. L., & Zinbarg, R. E. (2007). Generalized anxiety disorder and entry into marriage or a marriage-like relationship. *Journal of Anxiety Disorders*, *21*, 955-965. http://dx.doi.org/10.1016/j.janxdis.2006.10.006

Zaki, J., Bolger, N., & Ochsner, K. (2009). Unpacking the informational bases of empathic accuracy. *Emotion*, *9*, 478-487. http://dx.doi.org/10.1037/a0016551

Zuckerman, M, & Lubin, B. (1985). *Multiple Affect Adjective Check List-Revised: Manual.* San Diego, CA: Educational and Industrial Testing Service.