The factors that maintain generalized anxiety disorder (GAD) symptoms and worry over time are not entirely clear. The Contrast Avoidance Model (CAM) postulates that individuals at risk for pathological worry and GAD symptoms uniquely fear emotional shifts from neutral or positive emotions into negative emotional states, and consequently use worry to maintain negative emotion in order to avoid shifts or blunt the effect of negative contrasts. This model has received support in laboratory experiments, but has not been investigated prospectively in the naturalistic context of daily life. The present study tested the CAM in a longitudinal experience sampling study with a subclinical sample. Participants selected to represent a broad range of symptoms (N = 92) completed baseline measures of GAD and depression symptoms, and eight weekly assessments of worry, experiences of negative emotional contrasts during their worst event of the week, and situation-specific negative emotion. Consistent with the CAM, GAD symptoms prospectively predicted higher endorsement of negative contrast experiences as worst events, independent of depression symptoms. Unsurprisingly, higher negative contrasts predicted higher negative emotion. However, both higher baseline GAD symptoms and weekly worry uniquely moderated (reduced) this relationship, providing consistent support for the idea that worry may blunt the emotional effects of contrasts. Depression symptoms did not have the same moderating effect. These findings support the CAM in an ecologically valid context.

Keywords: contrast avoidance model; worry; generalized anxiety disorder

Generalized Anxiety Disorder (GAD) is characterized by persistent worry, difficulty concentrating, feeling keyed up, trouble sleeping, chronic fatigue, irritability, and muscle tension (American Psychiatric Association, 2013), with concomitant reductions in quality of life (Bourland et al., 2000; Henning, Turk, Mennin, Fresco, & Heimberg, 2007; Massion, Warshaw, & Keller, 1993; Wittchen, Zhao, Kessler, & Eaton, 1994). Moreover, worry and other GAD symptoms are associated with distress and impairment, even among individuals with subclinical levels (Gentes & Ruscio, 2014; Kessler & Wittchen, 2002). Taxometric analyses reveal that worry (Ruscio, Borkovec, & Ruscio, 2001) and GAD symptoms (Marcus, Sawaqdeh, & Kwon, 2014) reflect continuous, latent symptom dimensions without discrete cutoffs between subthreshold and clinical levels, consistent with the National Institutes of Health’s Research Domain Criteria (RDoC), which emphasize the study of symptom dimensions that impair functioning rather than solely comparing diagnosed groups (Cuthbert & Insel, 2013).

GAD is one of the most challenging anxiety disorders to treat due to difficulty pinpointing the factors that cause and maintain the symptoms and
impairment (Newman et al., 2011). Cognitive behavioral therapy (CBT) is currently the gold-standard treatment for GAD (Otte, 2011), but efficacy rates tend to be lower than for other anxiety disorders (Brown, O’Leary, & Barlow, 2001; Newman et al., 2008). Exposure to feared situations or states is a standard tool for facilitating habituation and extinction of fear in anxiety disorders; however, there exists no consensus about the stimuli or experiences that individuals high in GAD symptoms most fear and avoid. Exposure strategies may not be optimally effective without this information, and therefore elucidation of feared stimuli and specific avoidance strategies that perpetuate fear may lead to more targeted and efficacious interventions for both those with clinical levels of GAD and those with subclinical symptoms.

MODELS OF GAD

Theoretical models of GAD vary in terms of what is assumed to be the core fear underlying GAD. According to the Intolerance of Uncertainty model, the uncertainty that accompanies ambiguous events is thought to constitute the core fear in GAD (Dugas, Gagon, Ladouceur, & Freeston, 1998; Dugas et al., 2005). In contrast, the Cognitive Avoidance Theory of Worry (Behar, DiMarco, Hekler, Mohlman, & Staples, 2009; Borkovec, 1994) suggests that the core fear of GAD is negative emotional imagery and associated arousal, which individuals strive to avoid by chronic use of worry, a verbal-linguistic mode of thought theorized to inhibit more emotionally evocative fear imagery. Similarly, the Emotion Dysregulation theory proposes that individuals with GAD fear and are unable to understand and manage emotional arousal (Mennin, Heimberg, Turk, & Fresco, 2005). Lastly, the Acceptance-Based Model of GAD (Hayes, Orsillo, & Roemer, 2010; Roemer & Orsillo, 2007) postulates a core fear and unwillingness to accept negative thoughts and emotional states. In summary, although distinct, each of these important theories assumes that individuals with, or at risk for, GAD, fear and avoid negative emotional states.

However, several lines of evidence suggest the need for additional clarification regarding what might be feared/avoided in people with GAD symptoms. First, studies that experimentally manipulated worry (e.g., Borkovec & Hu, 1990; Borkovec, Lyonfields, Wiser, & Deihl, 1993) have often been interpreted to suggest that worry facilitates avoidance of emotion and arousal (e.g., lower heart rate increase from worry to threat imagery compared to prior relaxation; Borkovec & Hu, 1990), although such studies typically did not assess resting baselines and therefore were unable to show that lower reactance to feared imagery was not due to a ceiling effect of the worry period as the baseline. In contrast, laboratory studies with multiple time points including a resting baseline have found that instead of inhibiting emotion, worrying induced negative emotion (e.g., Andor, Gerlach, & Rist, 2008; Hofmann et al., 2005; Lyonfields, Borkovec, & Thayer, 1995; Ottiavani et al., 2016; Peasley-Miklus & Vrana, 2000; Stapinski, Abbott, & Rapee, 2010). In addition, exposure to fear stimuli was associated with increased anxiety from baseline whether or not such exposure was preceded by a worry induction (e.g., Stapinski et al., 2010). Moreover, worry has been shown to promote or prolong negative emotion even after worry itself is discontinued, in both GAD (Brosschot, van Dijk, & Thayer, 2007; Zoccola, Dickerson, & Yim, 2011) and nonclinical samples (Llera & Newman, 2014). Thus, it is likely that in early studies (e.g., Borkovec & Hu, 1990), individuals who engaged in worry prior to exposure to fear stimuli were already in a negative emotional state and worrying may have prevented further increases in arousal when exposed to fearful imagery (Newman & Llera, 2011).

Building on the observation that worry promotes negative emotion, the Contrast Avoidance Model (CAM; Newman & Llera, 2011; Newman, Llera, Erickson, & Przeworski, 2014) theorizes that the core fear associated with GAD is a negative emotional contrast—a sharp shift from a neutral or positive emotion into a negative emotional state. According to this model, individuals with GAD are uniquely sensitive to such emotional shifts, and consequently use worry not to avoid negative emotion or arousal, but rather to purposefully induce and perpetuate a state of negative emotional arousal, thereby avoiding or decreasing the degree of unexpected additional shift into a negative state. In other words, individuals with GAD would rather remain in a perpetual worry-induced negative state than risk emotional reactivity when allowing themselves the vulnerability of fully experiencing positive or neutral emotional states. This model, if empirically defensible, might explain processes whereby individuals become at risk for GAD, how GAD symptoms are maintained, and also why extant treatments have not been more effective.

Recent experimental laboratory studies provided initial evidence for the CAM. Llera and Newman (2010) randomly assigned analogue GAD and nonanxious participants to engage in worry, relaxation, or a neutral induction prior to exposure to emotion-inducing video clips. For participants...
with and without GAD symptoms, worry inductions led to significantly higher negative emotion than neutral and relaxation conditions. Furthermore, relaxation led to increased emotion upon subsequent exposure to a fear-inducing video, whereas engagement in worry did not lead to further increase in emotion after the initial negativity caused by the worry. Similarly, with regard to physiological arousal, prior relaxation led to vagal withdrawal upon exposure to the fear clip, whereas worry did not. In a follow-up study with the same design but additional assessments of baseline emotion, skin conductance (SCD), and subjective ratings of coping, for both GAD and control groups, worry caused increased negative emotions relative to other conditions; in contrast, prior relaxation led to larger increases in SCD upon exposure to the fear clip, relative to prior worry (Llera & Newman, 2014). Although these patterns did not differ by GAD status, participants higher in GAD symptoms paradoxically reported finding worry as more helpful than relaxation in coping with exposure to negative film clips, whereas nonanxious participants reported the opposite pattern. Thus, these studies provided evidence that worry increases negative (subjective and physiological) emotional states, prolongs negativity and arousal (thereby preventing negative emotional contrasts), and is surprisingly experienced as helpful in individuals high in GAD symptoms.

However, studies to date have examined the CAM only in controlled laboratory settings and not in more ecologically valid contexts of daily life. Thus, investigation of negative contrast experiences associated with real-life stressors, and how worry relates to such processes, is warranted. In addition, it is important to test the specificity of the CAM to GAD symptoms and worry, in naturalistic contexts. GAD symptoms co-occur frequently with depression symptoms in both clinical (Brown, Campbell, Lehman, Grisham, & Mancill, 2001; Gale & Oakley-Browne, 2004; Ruscio, Seitchik, Gentes, Jones, & Hallion, 2011) and subclinical samples (Aldao, Mennin, & McLaughlin, 2013; Unick, Snowden, & Hastings, 2009). Like GAD symptoms, depression symptoms have been shown to occur dimensionally rather than categorically (Flett, Vredenburg, & Krames, 1997; Prisciandaro & Roberts, 2005). Both symptom dimensions share latent variability due to negative emotions (Brown, Campbell, et al., 2001; Brown, Chorpita, & Barlow, 1998), as well as heritability related to trait neuroticism (general proneness to negative emotions, e.g., Clark, Watson, & Mineka, 1994; Hettema, Neale, Myers, Prescott, & Kendler, 2006) and neuroticism-related life stressors (Uliaszek et al., 2010). Llera and Newman’s (2010) original lab study of contrast avoidance found that depression levels did not differ between worry, relaxation, and neutral inductions, but did report higher depression scores among participants with GAD than control participants, unsurprisingly. Thus, additional research is needed to directly test the contribution of depression symptoms versus worry, when predicting sensitivity to negative contrasts. Nolen-Hoeksema, Wisco, and Lyubomirsky (2008) suggested that depressed individuals may ruminate in order to reduce motivation to strive for goals and subsequently be disappointed, implying a process potentially similar to contrast avoidance. The CAM does not posit that the presence of worry is unique in individuals high in GAD symptoms, but rather that the motivation for worry (avoidance of emotional contrasts) may be unique for these individuals. Negative emotional contrasts and worry are each likely to predict higher negative emotion for everyone, but if the CAM is accurate, chronic worry may uniquely blunt the effects of contrast experiences on emotion (i.e., a moderation effect).

**The Present Study**

Clarification of the core fears and avoidance functions of worry which are unique to individuals with higher GAD symptoms may lead to a fuller understanding of GAD symptoms and maintenance, as well as suggesting potential exposure therapy targets. The purpose of the present study was to test predictions derived from the CAM prospectively in ecologically valid naturalistic contexts over 8 weeks, measuring worry and symptoms dimensionally, consistent with a focus on the study of dimensional psychopathology rather than discrete groups (Cuthbert & Insel, 2013). Additionally, we examined specificity of the model to GAD symptoms and worry after accounting for depression symptoms. The first three hypotheses test relatively straightforward predictions, laying a foundation for testing our core moderation hypothesis (Hypothesis 4) pertaining to the CAM.

**Hypothesis 1. GAD Symptoms Predict Endorsement of Negative Contrasts as Worst Events of the Week, Independent of Depression Symptoms**

Specifically, we hypothesized that higher baseline GAD symptoms would prospectively predict higher weekly situational negative emotional contrasts during what participants consider the worst event of each week, even when controlling for weekly depression symptoms. Because individuals high in depression and/or GAD symptoms may endorse
negative contrasts as stressful events, we expected both types of symptoms to predict the extent to which participants endorsed their “worst” weekly events as involving negative contrasts. However, finding that a link of GAD symptoms to negative contrasts remains when depression symptoms are controlled for would provide evidence that sensitivity to contrasts is not explained by depression symptoms.

Hypothesis 2. GAD Symptoms and Worry Predict Negative Emotions Independent of Depression Symptoms

GAD symptoms, depression, and negative emotion share common variance (e.g., Aldao et al., 2013). The CAM assumes that worry promotes negative emotions over time, but does not assume that only worry does so. We expected both depression symptoms and baseline GAD symptoms or weekly worry (in separate models) to independently predict weekly negative emotion levels.

Hypothesis 3. Negative Contrasts Predict Negative Emotion

The CAM assumes that negative contrast experiences are aversive in general (especially so for individuals at risk for GAD). The extent to which participants endorsed their “worst” weekly events as involving negative contrasts was hypothesized to predict higher weekly negative emotion, even after controlling for depression symptoms and GAD symptoms or worry. Such an effect would be unsurprising given that both the stressor and emotion are negatively valenced, but would nonetheless confirm negative contrast experiences as naturalistic stressors.

Hypothesis 4. GAD Symptoms and Worry Moderate the Effect of Negative Contrasts on Emotion

Our core hypothesis—the prediction of greatest relevance to the CAM—was that baseline GAD symptoms would moderate the effects of weekly situational negative contrasts on negative emotion during the worst event of the week. Specifically, we expected that although contrasts would positively predict negative emotion across the full sample, this relationship would be less positive for individuals high in baseline GAD symptoms. This would be consistent with the idea that chronic and uncontrollable worry (and related symptoms) may reduce the emotional spillover of negative contrasts, helping such individuals feel more able to cope with possible negative contrasts when they do occur. This interaction effect is one way to operationalize the theory that worry makes negative contrasts less aversive and therefore may be negatively reinforced. Also, we hypothesized the same interaction effect when using weekly worry as the moderator variable instead of GAD, which would provide additional evidence that chronic worry (as opposed to other GAD symptoms beyond worry) may slightly blunt the negative emotional consequences of contrasts. Moreover, finding this moderation by both baseline GAD symptoms and weekly worry would suggest that the process operates at both trait-like and state levels. These effects were expected even when controlling for depression symptoms and the interaction of depression symptoms with negative contrasts (we did not expect the same moderating effect by depression symptoms).

Method

Participants

Ninety-two general psychology students (76% female, 24% male) participated in this study, ranging from 18–28 years old (M = 19.56; SD = 1.60). Participants described themselves as Caucasian (63.5%), Asian-American (14.5%), Hispanic/Latino (9%), African American (2%), or “biracial/other” (11%). We recruited individuals with a broad range of scores (M = 5.42, SD = 3.23, range = 0 - 12.75) on the Generalized Anxiety Disorder Questionnaire IV (GAD-Q-IV; Newman et al., 2002), including those with high levels of symptoms. Using a cut-score (7.67) shown to balance sensitivity and specificity in indicating clinical levels of GAD (Moore et al., 2014; Rodebaugh et al., 2008), 22 of the 91 (24%) participants would be considered as having clinical symptom levels (consistent with high student counseling center utilization at the study university). Thus, our sample included wide variability in GAD symptoms and a substantial proportion of high-symptom individuals, appropriate for analyses of dimensional symptoms.

Procedure

We employed a prospective diary method. Conenting participants visited the lab to complete baseline measures of GAD symptoms as well as a brief measure of reasons for worry to test convergent validity for our situational measure of negative contrasts (Week 1). Subsequently, they completed seven weekly assessments (Weeks 2 through 8) including worry and depression symptoms (focusing on the past week). Each week, they also wrote about the “worst event of the past week” and rated the extent to which it involved a negative emotional contrast, providing an “event-anchored” index permitting situation-specific experiences (Simonson, Sanchez, Arger, & Mezulis,
Event-anchored negative emotion was also assessed weekly, as were weekly depression symptoms and worry. All measures were completed on a survey website. Students received course credit for their participation.

MEASURES

Baseline Only Measures

Generalized anxiety symptoms. The Generalized Anxiety Disorder Questionnaire IV (GAD-Q-IV; Newman et al., 2002) is a 9-item self-report measure of GAD criteria as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994). Five dichotomous items assess the presence of frequent, excessive, and uncontrollable worry about which respondents are distressed. Six dichotomous items assess associated anxiety symptoms (restlessness, fatigue, sleep disturbance, irritability, muscle tension, and concentration problems). One free-response item invites noting frequent worry topics (1 point per worry, up to 6 points). Two items on a 9-point Likert scale from 0 (not at all true) to 8 (very severe) assess distress and impairment. Item responses are coded, weighted, and summed to create a dimensional composite. Dichotomous items are coded 1 or 0; the discrete number of worries is divided by 3; the number of anxiety symptoms is divided by 2; responses to impairment and distress items are divided by 4. The GAD-Q-IV has demonstrated internal consistency (α = .79 in our sample), convergent and divergent validity, and good sensitivity and specificity in predicting GAD diagnosis (Newman et al., 2002; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005). It has utility as both a dichotomous assessment to screen for risk of GAD and also as a continuous measure (Moore et al., 2014; Newman et al., 2002) with unifactorial structure (Rodebaugh et al., 2008).

Reasons for worry. Participants completed the 5-item protection against negative emotions sub-scale of the Why Worry-II (WW-II; Hebert, Dugas, Tulloch, & Holowka, 2014), a measure of positive beliefs about worry (M = 2.1, SD = 1.80). This sub-scale assesses a construct that is similar to, but not redundant with, sensitivity to negative contrasts, providing a preliminary test of convergent validity for our weekly measure of negative contrasts. Sample items include, “If I worry, I will be less disturbed when unforeseen events occur.” The scale ranges from 1 (not at all true) to 5 (absolutely true). The WW-II has demonstrated internal consistency and evidence of convergent and divergent validity (Hebert et al., 2014); α = .90 for the subscale in our sample.

Weekly Measures

Situational negative contrast. Participants completed a situational measure of negative contrast during Weeks 2–8 (SNCS; Llera & Newman, 2016). We used four items adapted from a trait measure of sensitivity to negative emotional contrasts (Contrast Avoidance Questionnaire–Worry), which was under development at the time of the study but has shown preliminary evidence of reliability and construct validity (Llera & Newman, 2016). Whereas the full trait measure assesses multifactor constructs related to the CAM and transdiagnostic forms of contrast avoidance, our aim was to capture the core theory-based construct of emotional contrast states themselves. Given the need for a brief measure of repeated states, we selected items that were adapted and/or inspired by wordings from the parent measure, making sure that each referenced a sense of having been in a positive or neutral state prior to a sudden shift into negative emotion. We adapted items to pertain to the specific situational context of the “worst event of the week.” Before completing these items, participants briefly wrote about the worst event to cue the memory (these open-ended responses themselves were not analyzed). Items required respondents to think about the event and rate the degree to which it involved an abrupt shift from positive or neutral mood into negative mood states on a scale ranging from 0 (not at all true) to 4 (completely true). Items included: “I was feeling fine, but then experienced a very uncomfortable sudden negative mood shift,” “I got my hopes up and then was disappointed,” “the bad event became harder to deal with because I was in a good mood before it happened,” and “I should have remained worried so that I could not have been emotionally caught off guard by this event.” Items were averaged for each weekly total (M = 8.67, SD = 4.25); these items were internally consistent (mean α = .83, SD = .04) and demonstrated unifactorial structure in principal components analyses.

Worry. Weekly worry was assessed weekly using the Penn State Worry Questionnaire–3 (PSWQ-3; Berle, Starcevic, Moses, Hannan, Milicevic, & Sammut, 2011), a 3-item self-report measure of pathological worry on a 5-point Likert scale from 1 (not at all typical of me) to 5 (very typical of me). Respondents rated worry for the past week (e.g., “I worried all the time”); M = 5.42, SD = 3.23. The PSWQ-3 has demonstrated internal consistency (mean α = .92, SD = .02 in our sample), convergent and discriminant validity, and is highly correlated with the longer parent measure (Kertz, Lee, & Björgvinsson, 2014).
Depression symptoms. The 10-item short form of Center for Epidemiological Studies-Depression Scale (CESD-10; Andersen, Malmgren, Carter, & Patrick, 1994) assessed depression symptoms in the past week (e.g., “I felt depressed”) on a scale ranging from 0 (rarely or none of the time) to 4 (most of or all of the time); M = 12.40, SD = 4.85. This measure has demonstrated reliability (mean α = .82, SD = .05 in our sample) and validity in a range of populations (Bradley, Bagnell, & Brannen, 2010; Björgvinsson, Kertz, Bigda-Peyton, McCoy, & Aderka, 2013; Cheng, Chan, & Fung, 2006; Irwin, Artin, & Oxman, 1999).

Negative emotion. Each week, participants completed the 5-item negative affect (NA) scale from a brief version of the Positive and Negative Affect Schedule (PANAS; Mackinnon et al., 1999; Watson & Clark, 1994), providing a brief measure of a range of negative emotions (for consistency across the paper, we refer to “negative emotion”). Participants rated the extent to which they felt upset, nervous, afraid, ashamed, and hostile during their worst event of the week, on a 1 (very slightly or not at all) to 5 (extremely) scale (M = 7.76, SD = 4.96). This brief scale has been shown to measure a single latent factor distinct from positive affect (Mackinnon et al., 1999) and which showed internal consistency in our study (mean α = .78, SD = .05).

Results
DATA ANALYTIC PLAN AND PRELIMINARY ANALYSES
Data screening suggested that assumptions about skew, kurtosis, and linearity were met. Prior to testing substantive hypotheses, we examined the psychometric properties of the Situational Negative Contrast items. As noted, these items were internally consistent. With regard to convergent validity, aggregated (e.g., mean) scores of the negative contrast measure across the seven weekly time points correlated moderately and positively with baseline measures of the WW-II belief that worry protects from negative emotions, as expected (r = .38, p < .001), but not so highly as to imply redundancy. In addition, higher mean weekly contrast across the seven weekly time points correlated with higher levels of baseline GAD symptoms (r = .36, p < .001), worry (r = .45, p < .001), weekly depression symptoms (r = .64, p < .001), and negative emotion (r = .61, p < .001), as would be expected.

Our foundational and core hypotheses (H1-H4) were tested via multilevel modeling (MLM), which accounts for both between- and within-person variability in repeated measures designs, handles unbalanced data, and does not assume independence of observations. Baseline variables (GAD symptoms) were modeled at level 2 (the person) and repeated measures were nested within participants (level 1), including weekly worry, depression symptoms, situational negative contrast, and negative emotion. Roughly 83% of the data was present (637 out of 760 possible weekly entries were completed). Based on recommendations for MLM when more than 5% of data are missing (Heck, Thomas, & Tabata, 2010), we used multiple imputation to handle missing data and create pooled parameter estimates. We adopted an autoregressive (AR1) covariance structure appropriate to repeated measures data, and calculated restricted maximum likelihood (REML) parameter estimates, as appropriate to small data sets in which fit of nested models is not compared (Raudenbush & Bryk, 2002). Our goal was not to test for changes over time and thus we did not include time in the main models.

First, tests of an unconditional model for negative emotion showed significant variability in intercepts between individuals (p < .0001), suggesting that participants differed in their average levels of emotion; also, the intra-class correlation coefficient (ICC) estimating the ratio of between-person variability to total variability (across all time points) was .45, suggesting substantial within-person variability. Given this and significant variability in intercepts (i.e., differing mean levels) for negative contrasts (p < .001), we modeled random intercepts in models predicting contrasts. Additionally, we assumed random slopes in models with negative contrast predicting negative emotion based on significant variance in slopes (i.e., this relationship varied across participants). These preliminary tests justified the use of random effects. We grand-mean-centered (i.e., subtracted the mean from scores) both baseline and weekly predictor variables so that higher scores in predictors reflected between-participant differences (deviations above the sample mean at a given week), consistent with the theory of sensitivity to negative contrasts as a variable explaining differences between people related to GAD symptoms (Llera & Newman, 2010).

Single predictor effects on intercepts indicated prediction of average levels of the outcome variable across assessments (e.g., SNC predicting emotion), whereas interaction effects indicated that a variable predicted a smaller or greater relationship (e.g., if GAD symptoms predicted a lower slope between SNC and emotion). We controlled for depression symptoms to test specificity. Results were similar with and without gender controlled, so we report results without gender controlled.
Table 1
Multilevel Models Testing Hypotheses 1 Through 4

<table>
<thead>
<tr>
<th>Variables</th>
<th>Predictor Variable</th>
<th>B</th>
<th>SE</th>
<th>95% CI</th>
<th>p</th>
<th>pr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative contrast (SNC)</td>
<td>GAD symptoms (GAD-Q-IV total)</td>
<td>0.25</td>
<td>0.09</td>
<td>0.07, 0.43</td>
<td>.006</td>
<td>0.29</td>
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<tr>
<td></td>
<td>Depression symptoms (CES-D)</td>
<td>0.21</td>
<td>0.04</td>
<td>0.13, 0.29</td>
<td>&lt;.001</td>
<td>0.23</td>
</tr>
<tr>
<td>Negative emotion (model with GAD-Q-IV)</td>
<td>Depression symptoms</td>
<td>0.18</td>
<td>0.04</td>
<td>0.10, 0.26</td>
<td>&lt;.001</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>SNC</td>
<td>0.36</td>
<td>0.06</td>
<td>0.24, 0.48</td>
<td>&lt;.001</td>
<td>0.54</td>
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<tr>
<td></td>
<td>Depression symptoms*SNC</td>
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<td>0.01</td>
<td>-0.01, 0.03</td>
<td>0.190</td>
<td>0.09</td>
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<tr>
<td></td>
<td>GAD symptoms</td>
<td>0.39</td>
<td>0.09</td>
<td>0.22, 0.57</td>
<td>&lt;.001</td>
<td>0.43</td>
</tr>
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<td></td>
<td>GAD symptoms*SNC</td>
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<td>0.02</td>
<td>-0.07, -0.01</td>
<td>.016</td>
<td>-0.33</td>
</tr>
<tr>
<td>Negative emotion (model with weekly PSWQ-3)</td>
<td>Depression symptoms</td>
<td>0.14</td>
<td>0.04</td>
<td>0.05, 0.22</td>
<td>.001</td>
<td>0.15</td>
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<tr>
<td></td>
<td>SNC</td>
<td>0.36</td>
<td>0.06</td>
<td>0.24, 0.47</td>
<td>&lt;.001</td>
<td>0.53</td>
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<td></td>
<td>Depression symptoms*SNC</td>
<td>0.02</td>
<td>0.01</td>
<td>0.001, 0.03</td>
<td>0.038</td>
<td>0.16</td>
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<tr>
<td></td>
<td>Worry (PSWQ-3)</td>
<td>0.34</td>
<td>0.06</td>
<td>0.22, 0.46</td>
<td>&lt;.001</td>
<td>0.26</td>
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<tr>
<td></td>
<td>Worry*SNC</td>
<td>-0.04</td>
<td>0.01</td>
<td>-0.07, -0.01</td>
<td>.003</td>
<td>-0.27</td>
</tr>
</tbody>
</table>

Note. pr = partial correlation. SNC = situational negative contrast. GAD-Q-IV = Generalized Anxiety Disorder Questionnaire for DSM-IV. PSWQ-3 = Penn State Worry Questionnaire, 3-item version. CES-D = Center for Epidemiological Studies Depression Scale. Negative emotion = Positive and Negative Affect Scale, negative affect scale. Both situational negative contrast and negative emotion were rated on the worst event of the week.

**Main Analyses**

Based upon the theory of sensitivity to negative contrasts as a core, independent feature of GAD symptoms, we utilized SPSS (version 23) “MIXED” command to test whether baseline symptoms predicted weekly situational negative contrasts (SNC) during worst events of the week, controlling for depression symptoms. In line with Hypothesis 1, higher GAD symptoms predicted higher endorsement of contrasts as “worst” events when controlling for depression symptoms, which also predicted higher negative contrasts (but with a slightly smaller effect size; see Table 1 for parameter estimates).

Next we tested our hypothesized model to assess the main effects and interaction of SNC and baseline GAD symptoms on negative emotion, while accounting for the main effects and interaction of SNC and depression symptoms (see Table 1). As expected, higher baseline GAD symptoms and weekly depression symptoms predicted higher weekly negative emotion (supporting Hypothesis 2). Similarly, in situations in which individuals endorsed higher negative contrast, they reported higher situational negative emotion (supporting Hypothesis 3). However, our core hypothesis relevant to the CAM (Hypothesis 4) was supported by a significant interaction of GAD symptoms and SNC such that higher GAD symptoms predicted a slightly less positive association between SNC and emotion (see Figure 1A), even accounting for the interaction of depression symptoms and SNC (which was not significant). Thus, although higher levels of generalized anxiety and depression symptoms were each associated with being more likely to report “worst events” as involving negative contrasts, and these contrasts generally predicted emotion, higher GAD symptoms appeared to blunt the effects of contrasts on negative emotion.1

Finally, we retested the same full model but replaced baseline GAD symptoms with weekly worry, as this would strengthen the case that weekly worry (as opposed to other symptoms) may serve the hypothesized function of blunting effects of negative contrast experiences on emotion. In this model, consistent with expectations, weekly worry and depression symptoms both uniquely predicted negative emotion (supporting Hypothesis 2). In this model higher weekly SNC was again associated with higher negative emotion on average (supporting Hypothesis 3). Worry moderated this relationship such that on the weeks that individuals reported the highest worry, the slope of the relationship between negative contrasts and emotion was somewhat less positive, consistent with Hypothesis 4 (see Figure 1B). Also, depression symptoms interacted with SNC such that higher depression predicted stronger

1 We note that when the GAD symptom variable was used as a dichotomous variable to indicate possible presence of GAD based on the validated cut-point of 7.67 (Moore et al., 2014), the same pattern of results was present. GAD status ($B = 2.67, SE = 0.68, p < .001$), depression symptoms ($B = 0.19, SE = 0.04, p < .001$), and SNC ($B = 0.43, SE = 0.07, p < .001$) predicted higher NA. GAD status moderated the SNC-NA relationship, reducing it ($B = -0.27, SE = 0.13, p = .368$), whereas depression symptoms did not moderate this relationship ($B = 0.01, SE = 0.01, p = .27$).
association of SNC and negative emotion, which was unexpected. Nonetheless, the fact that worry and GAD symptoms had the same moderating effect even after accounting for depression symptoms provides evidence of specificity.  

Discussion

The present study is the first to examine and provide support for the CAM of GAD symptoms (Newman & Llera, 2011; Newman, Llera, Erickson, & Przeworski, 2014) outside of the laboratory context in a prospective, longitudinal design. Because GAD symptoms and worry reflect a continuum (Marcus et al., 2014; Ruscio et al., 2001) and cause impairment even outside of clinically diagnosed individuals (Gentes & Ruscio, 2014; Kessler & Wittchen, 2002), we examined dimensional GAD symptoms in a subclinical sample with broad symptom variability. The study also was novel in its focus on participants’ ideographic stressors, providing greater ecological validity than standardized stimuli. We assessed SNC with items developed to measure individual differences, but adapted for weekly “situational” contexts. These items were internally consistent, and mean weekly levels correlated positively, but moderately, with beliefs that worry helps protect one from unpleasant emotions, as well as GAD symptoms and mean weekly worry, negative emotion, and depression symptoms.

We first tested whether GAD symptoms and worry predicted endorsement of contrasts as “worst” events, independent of the effects of depression symptoms (Hypothesis 1). Zero-order correlations suggested that negative contrasts correlated positively with each symptom type, although most strongly for depression symptoms as well as with negative emotion. However, multilevel models showed that, controlling for a positive association between weekly depression symptoms and negative contrasts, individuals with higher baseline GAD symptoms were still more likely to view their worst weekly events as characterized by negative emotional contrasts. This suggests support for the CAM (Llera & Newman, 2014; Newman et al., 2014), in that accounting for common variance between depression and GAD symptoms (i.e., general negative emotion) did not remove the effect of GAD symptoms. However, although depression symptoms could not explain the link between GAD symptoms and endorsement of contrasts as stressors, depression also uniquely predicted this endorsement of contrasts, suggesting a possible transdiagnostic process. Nolen-Hoeksema et al. (2008) theorized that depressed individuals may

\[ \text{FIGURE 1} \]
Baseline GAD total symptoms and weekly worry moderate the effects of negative contrast experiences on negative emotion. Note. Possible range of scores on negative emotion outcome variable is 5 to 25.
generate states of helplessness to reduce motivation and protect against further disappointment. This parallels how other theorized mechanisms of GAD are not exclusive to GAD; for instance, intolerance of uncertainty correlates with depression, not just GAD symptoms (Boswell, Thompson-Hollands, Farchione, & Barlow, 2013; Yook, Kim, Suh, & Lee, 2010). It may be that predominantly generally anxious versus depressed individuals are each sensitive to contrasts, but differentially employ worry vs. rumination to manage this sensitivity. Further research must delineate shared versus unique links between GAD, depression, sensitivity to negative contrasts, and avoidance strategies.

Given the overlap between generalized anxiety and depression symptoms (Brown et al., 2001; Kircanski, Thompson, Sorenson, Sherdell, & Gotlib, 2015), it is not surprising that both GAD and depression symptoms predicted higher negative emotion in weekly situations deemed as most stressful. Nonetheless, the fact that baseline GAD symptoms and weekly worry each predicted weekly negative emotion, when depression symptoms were controlled, was consistent with Hypothesis 2 and the CAM’s insistence that worry creates negative emotions rather than inhibiting them. These effects in the context of naturalistic stressors extend laboratory paradigms showing that worry induced negative emotion and physiological arousal (Llera & Newman, 2010; Lyonfields et al., 1995; Stapinski et al., 2010), as well as naturalistic studies supporting such links (Calmes & Roberts, 2007; Hoehn-Saric, McLeod, Funderburk, & Kowalski, 2004).

We additionally hypothesized that stressors for which participants reported negative contrasts would be associated with higher negative emotion (Hypothesis 3), but that this relationship would be moderated (diminished) by higher GAD symptoms and worry (Hypothesis 4). Supporting Hypothesis 3, even while controlling for depression and GAD symptoms (or worry), higher SNC was associated with higher negative emotion, suggesting that negative contrasts were distressing in general. This was relatively unsurprising given the negative valence of both variables. However, we also tested whether our core hypothesis of whether GAD symptoms moderated the relationship between contrasts and emotion, after controlling for depression symptoms and the interaction of depression symptoms with negative contrasts (all terms included simultaneously to provide a conservative test of specificity). As hypothesized, higher baseline GAD symptoms were associated with a less positive relationship between contrasts and negative emotion, even after accounting for depression symptoms and the (nonsignificant) interaction of depression symptoms with negative contrasts. Similarly, when we retested this full model (to test our core hypothesis) with weekly worry as the moderator instead of GAD symptoms, the same interaction was present: Higher weekly worry was associated with a slightly less positive slope between situational contrasts and negative emotion, supporting Hypothesis 4, whereas depression moderated the contrast-emotion relationship but in the opposite direction.

Thus, the present results may begin to clarify which factors of the CAM are truly unique to GAD symptoms. Whereas both GAD symptoms/worry and depression symptoms predicted endorsement of contrasts as stressful, the former uniquely appeared to blunt the effects of negative contrasts on emotion (i.e., if individuals worried more, then when they encountered negative contrasts they reported slightly less negative emotion). We also note that the same interaction was present when GAD symptoms were measured as a dichotomous (at-risk vs. low symptoms) rather than dimensional variable. What may be specific to GAD symptoms is the defensive use of worry to prepare for potential negative contrasts and thereby reduce their aversive emotional consequences. An alternative interpretation might explain away this moderation effect as an artifact of a ceiling effect, if individuals with higher GAD symptoms were chronically so high in negative emotion (regardless of current worry) that negative contrasts cannot further increase their emotion. However, we note that the actual range of negative emotion in our study was large (5–25) with an upper limit that was notably higher than the highest average level even for high-worry/GAD participants (approximately 15; see Figures 1A and 1B). Thus, although the CAM does imply that GAD individuals deliberately induce chronic negative states via worry, neither the theory nor our data suggest a true ceiling effect (even high-worry individuals can feel worse).

Contrasting the consistent pattern of GAD symptoms/worry decreasing the relation of negative contrasts to negative emotion, depression symptoms either did not moderate or increased the relationship (when GAD or worry were in the model, respectively). Depressed individuals experience poor cognitive control, such as difficulty in shifting from rumination to reappraisals likely to reduce distress during stressors (i.e., Joorman & Gotlib, 2010). Therefore, whereas individuals at risk for GAD are theorized to worry intentionally to maintain a negative state (Llera & Newman, 2014), depressed individuals may be sensitive to contrasts, but become stuck in a pattern of rumination because of the lack of cognitive control and therefore not experience it as helping them limit
emotional effects of contrasts. This might explain why contrasts were associated with more strongly associated with negative emotion in individuals with higher depression symptoms, after accounting for effects of worry. However, future studies are required to replicate and clarify this pattern of results.

The fact that negative contrasts were likely to constitute the “worst events” for individuals high in GAD symptoms, even controlling for depression symptoms, complements existing studies (Newman & Llera, 2011) in suggesting that exposure to negative contrasts should be explored as a new avenue for treatment. Exposure has shown to be only moderately effective as treatment for GAD (Otte, 2011), perhaps due to an imprecise conceptualization of what individuals with GAD symptoms fear and avoid. In addition, our results suggest that in naturalistic contexts, worry may protect individuals from experiencing the full effects of negative contrasts on emotion, implying that relevant exposures should be accompanied by “response prevention” to help individuals reduce worry as a negatively reinforced process. In this study, individuals were free to worry in their daily lives. It is possible that if they were induced to limit worry or engage in alternative activities (e.g., relaxation or acceptance-based strategies) then the relationship between contrasts and emotion may have been different. Future lab-based studies and intervention studies should experimentally manipulate such strategies to determine whether GAD-prone individuals not engaged in worry demonstrate fear habituation responses to repeated contrast exposures.

Additionally, GAD and worry have both been linked to heterogeneous interpersonal problems (Newman & Erickson, 2010; Przeworski et al., 2011; Salzer, Pincus, Winkelbach, Leichsenring, & Leibing, 2011), but the ways in which such diverse interpersonal problems may maintain GAD symptoms are unknown. Future research should examine whether individuals with GAD symptoms use particular classes of interpersonal behaviors (e.g., dominance, warmth, submission, or coldness) to prevent or manage negative contrasts, providing a mediating link between symptoms and particular types of interpersonal problems. It is possible that individuals intentionally use specific interpersonal strategies to avoid negative contrasts.

We note limitations of the present study. Our sample was of moderate size and did not receive formal diagnostic interviews. However, our statistical tests were adequately powered given the repeated measures design. In addition, we sampled a moderately ethnically diverse sample (36% minority) with a broad range of GAD symptoms, and ensured a substantial number of cases with high levels of symptoms. Our decision to recruit a range of participants rather than dichotomous diagnostic categories was consistent with the empirical evidence of dimensional nature of worry and GAD symptoms (e.g., Ruscio et al., 2001) and the RDoC focus on symptom dimensions rather than categories (Cuthbert & Insel, 2013). However, we note that our core hypothesis was supported whether we analyzed the GAD-Q-IV as a dimensional or categorical variable. This study collected data from undergraduate students, which may limit generalizability. Future studies should seek to replicate and extend our findings to a treatment-seeking sample, to compare the relatively complex items of our situational contrast avoidance measure to potential simpler items, and to incorporate assessments beyond self-report methods (e.g., biological markers of stress). Additionally, our study is not able to speak to the moment-by-moment variability that would be possible in shorter studies with more frequent experience sampling, and it is unsurprising that auxiliary tests showed no lagged effects of negative contrasts in the context of worst events of 1 week predicting residual changes at in the worst event of the next week. Future studies should employ such methods to test the CAM in a fine-grained approach. Additionally, future studies should assess sensitivity to negative contrasts with a longer measure with multiple subconstructs (Llera & Newman, 2016), and should disentangle the relative contribution of negative contrast versus other dimensions of stressors (e.g., intensity, frequency). Some of our internal consistency values were only moderately high, but they were reasonable given that several constructs were assessed with brief scales and did not preclude detection of significant effects which were consistent with theory-derived predictions. Despite limitations, our results were novel, theory-consistent, and present across both GAD symptoms and worry, were similar with and without gender controlled, and showed specificity beyond depression symptoms in a longitudinal design, providing a basis for further investigation of the CAM model of GAD symptoms and worry.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

References


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