THE ROLE OF EMOTION REGULATION IN THE RELATIONSHIP BETWEEN SOCIAL ANXIETY AND DEPRESSION: A DAILY DIARY STUDY

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ABSTRACT

Social anxiety and depression are commonly comorbid, and together they result in greater functional impairment and a poorer prognosis than when either condition occurs alone. Although the onset of social anxiety precedes the development of depression in the large majority of comorbid cases, little research has directly examined factors that contribute to the occurrence of depression in individuals with social anxiety. Theoretical models implicate emotion and emotion regulation in the development and maintenance of internalizing disorders. Emotion regulation research has predominantly focused on expressive suppression (ES), the suppression of outward emotion, and cognitive reappraisal (CR), the modification of cognitions to manage emotion. Social anxiety and depression are both characterized by maladaptive patterns of emotion regulation, exhibiting an overreliance on ES and an underutilization of CR. The present study investigated the role of emotion regulation, specifically ES and CR, in the relationship between social anxiety and depression over time. Our primary aim was to evaluate ES and CR, separately, as mediators of the relationship between social anxiety and depression. Our secondary aim was to evaluate additional mediating and/or moderating effects of related variables (i.e., relationship quality, positive and negative affect, and reward sensitivity). Our final exploratory aim was to evaluate whether emotion regulation (i.e., ES and CR) for positive emotions differs from emotion regulation for negative emotions in the relationships proposed by our primary and secondary aims.

Undergraduate participants (N=137) completed an in-person laboratory session (i.e., baseline), followed by a 14-day daily diary period. During the daily diary period, participants reported on their daily experiences of social anxiety, depressed mood,
emotion, emotion regulation, and relationship quality. Approximately two weeks after the end of the daily diary period (i.e., four weeks after baseline), participants completed a final in-person laboratory session (i.e., endpoint). Multilevel modeling was used to analyze observation-level data over the two-week diary period, and bootstrapping methods were used for person-level analyses over the full four-week study period. Daily diary analyses failed to support the hypothesized mediation models. Average social anxiety across the daily diary period was positively associated with daily depressed mood, but observation-level social anxiety was not. Exploratory analyses revealed affect-specific effects of emotion regulation, such that higher perceived success in ES (i.e., daily ES self-efficacy) for positive affect and less frequent use of CR (i.e., daily CR frequency) for negative affect significantly predicted higher next-day depressed mood. Person-level analyses across the four-week study period yielded some support for our hypotheses, in that ES frequency and positive affect acted as sequential mediators of the relationship between social anxiety and depression. Higher social anxiety predicted more frequent ES, which predicted lower positive affect, which then predicted higher depression. However, the mediation model was no longer significant after controlling for baseline depression.

Our results highlight the role of emotion dysregulation in predicting depression and provide initial support for the mediating effects of ES and CR in the relationship between social anxiety and depression. These findings also emphasize the importance of investigating affect-specific effects, with particular attention paid to emotion regulation for positive affect and its role in the co-occurrence of social anxiety and depression. Future research would benefit from longitudinal studies across longer time periods and examining these relationships within a clinical sample.
For my family.
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CHAPTER 1
INTRODUCTION

Social anxiety disorder (SAD) is the fourth most common mental disorder, with an estimated lifetime prevalence of 12.1% (Kessler et al., 2005). Comorbidity research indicates that over 80% of individuals with SAD meet criteria for at least one additional diagnosis, suggesting that SAD rarely occurs in isolation (Ruscio et al., 2008). SAD exhibits particularly high rates of comorbidity with major depressive disorder (MDD; Pini et al., 1997), and individuals with SAD are 3.5-4.5 times more likely to develop MDD than those without SAD (Beesdo et al., 2007; Ruscio et al., 2008; Stein et al., 2001). Large-scale studies indicate that the onset of SAD comes before the development of MDD in up to 70% of comorbid cases (Fava et al., 2000; Kessler, Stang, Wittchen, Stein, & Walters, 1999), and co-occurring SAD and MDD result in greater functional impairment, poorer prognosis (Kessler et al., 1999; Stein et al., 2001), greater risk for alcohol dependence (Nelson et al., 2000), and higher rates of suicidality (Mineka, Watson, & Clark, 1998) than when SAD occurs alone. Thus, it is of substantial importance to understand the factors that may contribute to the occurrence of depression among individuals with social anxiety.

The tripartite model of anxiety and depression, developed by Clark and Watson (1991), originally proposed that the relationship between anxiety and depression could be captured through three emotion-related factors: a physiological hyperarousal factor uniquely related to anxiety, a positive affect factor uniquely related to depression, and a negative affect factor shared by both anxiety and depression. According to the model, depression was best characterized by high negative affect and low positive affect (i.e.,
anhedonia), whereas anxiety was best characterized by high negative affect and high physiological arousal. However, the original model encompassed anxiety broadly without considering the heterogeneity among different types of anxiety, and further research has indicated that the tripartite factors have unique relationships within the anxiety disorders. Unlike other anxiety disorders, SAD appears to be characterized by low positive affect in addition to high negative affect (Brown, Chorpita, & Barlow, 1998; Hughes et al., 2006; Kashdan et al., 2013). Thus, the pattern of tripartite factors in SAD (i.e., heightened negative affect and diminished positive affect) more closely resembles that of MDD than of other anxiety disorders. It is possible that this shared maladaptive pattern of emotion serves as a common underlying mechanism for SAD and MDD and partly accounts for the secondary development of depression among individuals with social anxiety.

Indeed, theoretical models implicate emotion and emotion regulation in the development and maintenance of both mood and anxiety disorders (e.g., Heimberg, Brozovich, & Rapee, 2014; Hofmann, Sawyer, Fang, & Asnaani, 2012). Emotion regulation encompasses a multi-faceted, heterogeneous, and complex set of processes by which an individual influences his or her own emotional experience and emotional expression (Gross, 1998). By far the most prominent theoretical model of emotion regulation in the psychological literature is James Gross’ (1998) process model of emotion regulation. Gross proposes that emotion generation occurs through a temporal sequence of steps that begins with a psychologically-relevant situation. The situation is attended to (attention) and then appraised by the individual (appraisal) according to his/her personally-relevant goals and biases. In reaction to the appraisal, an emotional
response is generated, which subsequently modifies the situation and restarts the emotion-generating process over again.

The situation-attention-appraisal-response sequence of emotion generation provides the structure within which emotion regulation occurs. The process model of emotion regulation outlines five “families” of emotion regulation strategies that occur at various points in the emotion generation process: situation selection, situation modification, attentional deployment, cognitive change, and response modulation (Gross, 2014). Situation selection reflects an effort to regulate emotions by choosing to enter or avoid potential emotion-generating situations. This family of emotion regulation strategies involves reflection on related situations, prediction of the emotions that will be generated, and a subsequent decision as to whether or not to enter that situation. Once an individual chooses to enter a situation, four additional strategies can be utilized. Situation modification reflects an effort to regulate emotion by purposefully changing the external environment to alter its emotional influence. Attentional deployment reflects an effort to regulate emotion by carefully directing attention (e.g., concentrating or distracting) within an emotion-generating situation. Cognitive change reflects an effort to regulate emotion by changing one’s subjective appraisal of the emotion, the emotion-generating situation, or feelings of self-efficacy in the situation. Finally, response modulation reflects an effort to regulate emotion by influencing one’s physiological response or behavioral actions in an emotion-generating situation. Response modulation may take the form of internal modulation, through mechanisms such as drug use or exercise, or may occur via attempts to control outward emotional expression. These five categories of emotion regulation strategy are not inherently adaptive or maladaptive, but their utility
depends on the contexts in and effectiveness with which they are employed (Gross, 2014).

The process model provides a useful theoretical framework within which to examine the nature of emotion and emotion regulation in internalizing disorders. Impairments in emotion regulation, collectively referred to as emotion dysregulation, have been highlighted as key components of internalizing disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Campbell-Sills, Ellard, & Barlow, 2014; Cisler, Olatunji, Feldner, & Forsyth, 2010; Gross & Jazaieri, 2014; Hofmann et al., 2012; Joormann & Siemer, 2014) and underlying mechanisms of both SAD (Goldin et al., 2014; Wirtz, Hofmann, Riper, & Berking, 2014) and MDD (Berking, Wirtz, Svaldi, & Hofmann, 2014). Gross and Jazaieri (2014) recently called for psychology to move beyond generalities about problematic emotional processing and instead make “more specific statements about the precise nature of these problematic emotional responses” (Gross & Jazaieri, 2014, p. 389). With this call to action in mind, the present study is designed to develop a more nuanced understanding of the ways in which emotion dysregulation contributes to maladaptive patterns of emotion and may account for the occurrence of depression in social anxiety. Although research on emotion regulation in psychopathology covers a broad range of strategies, we focus specifically on the two emotion regulation strategies most frequently studied in the mood and anxiety disorder literature: expressive suppression (ES) and cognitive reappraisal (CR).

**Expressive Suppression**

ES refers to the suppression of outward emotional expression, such as “putting a smile on” even when feeling anxious, or the opposite, keeping a “poker face” even when
feeling pleased (Gross, 2014). The strategy falls within the *response modulation* category of the process model of emotion regulation and is marked as a *response-focused strategy*, because ES is typically used to regulate emotion after the emotion has already been generated (i.e., late in the emotion-generative process; Gross, 2014). ES is meant to regulate the outward, or behavioral, emotional response, but may do little to regulate the internal, or felt, emotional response. In fact, using ES to manage negative emotions, such as sadness or anxiety, has been shown to heighten the felt intensity of negative emotion, whereas using ES to manage positive emotions, such as happiness, actually dampens the inward experience of positive emotion (Campbell-Sills, Barlow, Brown, & Hofmann, 2006; Gross, 2014; Gross & John, 2003; Kalokerinos, Greenaway, & Denson, 2014).

ES also has a detrimental influence on quality of life and social relationships. More frequent use of ES is associated with lower life satisfaction and lower levels of self-esteem, optimism, and well-being across a number of life domains (Gross & John, 2003; Hu et al., 2014; Moore, Zoellner, & Mollenholt, 2008). Furthermore, ES is related to poor outcomes in interpersonal relationships. For instance, conversation partners of participants that used ES while discussing an emotional video reported feeling lower levels of rapport with the participant, less liking for the participant, and less desire for a future interaction compared to the conversation partners of participants that did not use ES (Butler et al., 2003). More frequent ES has also been associated with less social sharing of both negative and positive emotions and greater discomfort with close relationships (Gross & John, 2003). Consequently, individuals that use ES more frequently report receiving less social and emotional support from their peers, and their peers report feeling less close to them (Gross & John, 2003). Because ES is related to
negative consequences in emotional experience, social functioning, and overall well-being, it is generally thought to be a maladaptive strategy for emotion regulation.

Research overwhelmingly demonstrates that individuals with social anxiety use ES more frequently than individuals without social anxiety. Individuals with social anxiety possess dysfunctional beliefs about emotional expression, endorsing the view that expressing emotion conveys weakness and leads to social rejection (Spokas, Luterek, & Heimberg, 2009; Rusch, Westermann, & Lincoln, 2012). In line with these beliefs, socially anxious individuals exhibit an overreliance on ES and report using ES more frequently on both a trait and daily level than do individuals without social anxiety (Blalock, Kashdan, & Farmer, 2016; Kashdan & Steger, 2006; Kivity & Huppert, 2016; Marques et al., 2009; O’Toole, Jensen, & Fentz, 2014; Spokas et al., 2009). However, ES is not only ineffective at regulating emotions but also yields detrimental social and emotional consequences for individuals with social anxiety (Kashdan & Breen, 2008; Kashdan & Steger, 2006; O’Toole et al., 2014; Turk et al., 2005). More frequent daily ES has been shown to maintain social anxiety over time and predict fewer daily positive events (Kashdan & Steger, 2006; O’Toole et al., 2014). The consequences of suppressing the expression of positive emotion are especially damaging, with greater daily ES for positive (but not negative) emotions resulting in lower positive affect and fewer positive social experiences the following day for individuals high in social anxiety (Farmer & Kashdan, 2012). The consequences of ES were not observed for individuals low in social anxiety. Thus, using ES represents a problematic emotion regulation strategy choice for individuals with SAD.
Compared to ES in social anxiety, ES in depression is relatively understudied, and the direct relationship between ES and depression is less clear. Correlational research in non-clinical samples generally indicates a positive relationship between ES and depressive symptoms, such that more frequent ES is associated with higher levels of depression (Fergus & Bardeen, 2016; Gross & John, 2003; Joormann & Gotlib, 2010; Moore et al., 2008). However, some studies have found no relationship between ES and depressive symptoms (Schroder, Dawood, Yalch, Donnellan, & Moser, 2015; Wisco & Nolen-Hoeksema, 2010), and the findings from research in clinically depressed samples are mixed (Arditte & Joormann, 2011; Forkman et al., 2014a; 2014b; Joormann & Gotlib, 2010). Thus, overreliance on ES may not be as broadly characteristic of depression as it is of social anxiety.

Nonetheless, ES, particularly for positive emotions, may act as a pathway from social anxiety to depression. Frequent ES maintains social anxiety over time and contributes to low levels of positive affect, a shared component of the affective profiles of social anxiety and depression. For individuals with social anxiety, an overreliance on ES may reduce their experience of positive affect, thereby contributing to anhedonia and increasing risk for depression. Alternatively, more frequent ES may indirectly increase risk for depression through its association with poor interpersonal outcomes, including fewer positive social experiences, less social support, and poorer quality friendships (Farmer & Kashdan, 2012; Gross & John, 2003). More frequent ES, especially for positive emotions, may impede the development of new social connections and create distance in existing relationships. Indeed, providing inadequate positive emotional responses to a partner’s shared good news predicts declines in relationship quality and
relationship termination for socially anxious individuals (Kashdan et al., 2013).
Moreover, interpersonal factors have long been recognized as contributors to the
development and maintenance of depression (see Hames, Hagan, & Joiner, 2013, for
review). As such, reductions in social support, coupled with the detrimental affective
consequences of using ES, may greatly increase risk for developing depression among
individuals with social anxiety.

Preliminary evidence for this pathway comes from a study by Mauss and
colleagues (2011) that examined the discrepancy between inward experience and outward
expression of positive emotion. The researchers measured the extent to which positive
emotion was experienced internally relative to the extent to which positive emotion was
expressed outwardly; a larger discrepancy represented more felt emotion but less outward
expression (i.e., more ES). Among undergraduates, a larger discrepancy for positive
emotion was related to lower levels of social connectedness six months later, which, in
turn, was related to higher levels of depression after one year. Thus, it could be that 1)
individuals with social anxiety use ES more frequently, 2) the resulting suppression of
positive emotion impedes relationship formation and reduces friendship quality, and 3)
depression develops subsequent to reductions in social connectedness and social support.

**Cognitive Reappraisal**

CR reflects an effort to change the subjective evaluation of an emotion-generating
situation to modify its emotional impact (Gross, 2014; Gross & John, 2003). For instance,
an individual who feels nervous about a job interview may tell himself that the interview
is “a chance for me to learn more about the company,” thereby alleviating some of his
anxiety (Gross, 2014). In the process model of emotion regulation, CR falls within the
cognitive change family and is considered an antecedent-focused strategy, because the strategy is typically used early in the emotion-generation process, before the emotional response has become fully activated (Gross & John, 2003). Research suggests that the effects of CR are separate from the effects of ES. When measured using the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) in undergraduate samples, the two constructs were not significantly correlated, and their effects on other constructs (e.g., depressive symptoms, impulse control) were additive rather than interactive (Kashdan & Steger, 2006). Thus, the two strategies are considered independent.

Unlike ES, CR is associated with an enhanced ability to regulate emotions in the desired direction (Kalokerinos et al., 2014). More frequent CR is associated with experiencing and expressing more positive emotion and less negative emotion (Andreotti et al., 2013; Gross & John, 2003; Nowlan, Wuthrich, & Rapee, 2016). In other words, using CR to regulate emotions yields affective benefits, corresponding with more internally felt and outwardly expressed positive emotion as well as less internally felt and outwardly expressed negative emotion. The emotional benefits of CR coincide with broader quality-of-life benefits. More frequent CR is associated with higher levels of life satisfaction, self-esteem, optimism, and environmental mastery, but lower levels of depression and anxiety (Gross & John, 2003; Hu et al., 2014; Moore et al., 2008). Using CR as an emotion regulation strategy also has important social implications. More frequent CR is associated with more frequent social sharing of emotions, closer peer relationships, and higher likability ratings from peers (Gross & John, 2003). Given its associated positive outcomes in emotional experience, social relationships, and life
satisfaction, CR is widely considered to be an adaptive emotion regulation strategy (D’Avanzato, Joormann, Siemer, & Gotlib, 2013).

Research indicates that individuals with social anxiety use CR just as frequently as those without social anxiety, but they benefit less from its use. Trait and daily CR frequency does not differ for those with high versus low levels of social anxiety (Farmer & Kashdan, 2012; Kashdan & Steger, 2006; Kivity & Huppert, 2016; O’Toole et al., 2014; Werner, Goldin, Ball, Heimberg, & Gross, 2011). However, individuals with social anxiety consistently rate themselves as less successful (i.e., having lower self-efficacy) in using CR as an emotion regulation strategy (Helbig-Lang, Rusch, Rief, & Lincoln, 2015; Kivity & Huppert, 2016). More frequent CR predicted greater positive affect and fewer negative social events for individuals low in social anxiety, but CR frequency had no relation to affect or social events for individuals high in social anxiety (Farmer & Kashdan, 2012; O’Toole et al., 2014). Thus, individuals with social anxiety do use CR, but they may not do so in an effective way, as they do not reap the same social and emotional rewards as their non-anxious counterparts.

Alternatively, the utility of CR for socially anxious individuals could be undermined by their beliefs about their ability to successfully use CR for emotion regulation. For individuals with social anxiety, low confidence in their ability to use CR to manage anxiety and other negative emotions may act like a self-fulfilling prophecy, subsequently reducing the effectiveness of their emotion regulation attempts. Being able to use CR more effectively – or believing that it can be used effectively – to regulate negative emotions may be more important than simply using CR more frequently for individuals with social anxiety.
Whereas social anxiety is characterized by ineffective CR, depression is more clearly defined by infrequent CR. Less frequent CR relates to higher depressive symptomatology among undergraduate, community, and clinical samples, and individuals with current MDD report less frequent CR than do their remitted depressed and non-depressed peers (Aldao et al., 2010; Andreotti et al., 2013; D’Avanzato et al., 2013; Desrosiers, Vine, Klemanski, & Nolen-Hoeksema, 2013; Gross & John, 2003; Jermann et al., 2008; Joormann & Gotlib, 2010; Schroder et al., 2015; Wisco & Nolen-Hoeksema, 2010). In contrast to social anxiety, CR self-efficacy does not show a direct relationship with depression; behavioral research suggests that individuals with depression are effective at using CR when reminded to do so (Diedrich, Grant, Hofmann, Hiller, & Berking, 2014; Millgram, Joormann, Huppert, & Tamir, 2015; Smoski, Keng, Schiller, Minkel, & Dichter, 2013). Thus, individuals with depression seem able to use CR effectively, but may not choose to do so during the emotion-generating situations when the strategy could be most helpful.

Deficits in CR provide another potential pathway between social anxiety and the secondary development of depression. The research reviewed above indicates that individuals with social anxiety (believe that they) are ineffective at using CR to regulate their emotions. Given the association between depression and less frequent CR, individuals with social anxiety that also use CR less frequently may be more vulnerable to developing depression. Indeed, low CR frequency has been shown to be predictive of depressive symptoms among individuals with SAD (D’Avanzato et al., 2013). Thus, using CR less frequently may contribute to the subsequent occurrence of depression among individuals with social anxiety.
But why might some individuals with social anxiety use CR more or less frequently than others? It may simply be that believing CR cannot be used effectively encourages less frequent use of that particular strategy. Alternatively, an intriguing connection between reward sensitivity and emotion regulation may help to expand this pathway one step further. Reward sensitivity reflects goal-directed behavior to attain rewards and responsiveness to received reward, and the construct is often represented in the psychological literature by the behavioral approach system (BAS). An underactive BAS is theorized to play a role in the development and maintenance of SAD (Kimbrel, 2008; Kimbrel, Mitchell, & Nelson-Gray, 2010) and also has been linked to the emergence of depressive states (Alloy & Abramson, 2010). Recent research found that CR mediates the relationship between BAS and social anxiety, with low BAS predicting less frequent CR and, subsequently, heightened social anxiety (O’Connor et al., 2014). Similar findings have emerged in depression research, such that less frequent CR was associated with higher depression among those with low BAS, but not those with high BAS (Dennis, 2007). Thus, the co-occurrence of low BAS with less frequent CR may be an especially detrimental combination for the manifestation of internalizing symptoms and provides a potential link between social anxiety and depression. Given that low reward sensitivity (i.e., anhedonia) is also a hallmark characteristic of depression (APA, 2013), individuals with social anxiety who also endorse low BAS may be less likely to utilize CR and more vulnerable to the secondary occurrence of depression.

**The Present Study**

Emotion regulation research reveals that social anxiety and depression are characterized by problematic use of both ES and CR. Social anxiety is related to more
frequent ES and less effective CR, whereas depression is related to moderately more frequent ES and less frequent CR. Despite these overlapping patterns of emotion dysregulation, no research has yet examined the role of ES and CR in the relationship between social anxiety and depression. In the present study, we investigate the role of emotion regulation strategies, specifically ES and CR, in the pathway from social anxiety to depression over time.

Our study extends previous research on emotion regulation, social anxiety, and depression in three important ways. First, we evaluated depression in the context of social anxiety. The majority of emotion regulation research on social anxiety statistically controls for depression, making interpretations about their overlap difficult (if not impossible), whereas the majority of emotion regulation research on depression does not include measures of social anxiety at all. Only one publication to date has conducted a comparison of ES and CR patterns in social anxiety and depression, finding that individuals with SAD exhibited more frequent ES than did individuals with MDD, whereas individuals with MDD exhibited less frequent CR than did individuals with SAD (D’Avanzato et al., 2013). This research emphasizes the differences between social anxiety and depression, whereas we hoped to illuminate pathways from one to the other. Thus, we examined the role of emotion regulation in the dynamic and interactive relationship of social anxiety and depression together rather than separate from one another.

Second, we investigated the changing relationships of social anxiety, depression, and emotion regulation over time. Much of our current knowledge about these relationships (outside of a treatment context) comes from cross-sectional research.
However, social anxiety temporally precedes the development of depression in the majority of comorbid cases (Fava et al., 2000; Kessler et al., 1999), suggesting that the relationship is necessarily a time-dependent process. Thus, we examined the role of ES and CR in the relationship between social anxiety and depression over two time periods: (1) a two-week daily diary timeline with 14 data points and (2) a four-week timeline with three data points. The brief two-week daily diary time period allows for a fine-grained analysis of the day-to-day person-centered relationships among our variables of interest to reflect incremental changes over a brief time period. The longer four-week time period allows for a broader examination of our constructs at a trait level, which may capture more gradual person-level changes over time.

Finally, we aimed to expand the scope of emotion regulation research by including specific vulnerability factors that could influence the relationships between emotion regulation, social anxiety, and depression. For instance, incorporating measures of positive and negative affect, relationship quality, and reward sensitivity (i.e., BAS) allowed for a more robust examination of additional mediators and potential moderators of the relationship between social anxiety and depression over time, helping to determine not only if but also how emotion regulation confers risk for the development of depression among persons with social anxiety.

**Aims and Hypotheses**

Our study comprised two primary aims. First, we evaluated whether ES mediated the relationship between social anxiety and depression. Specifically, we hypothesized that social anxiety would predict ES frequency, and that ES frequency would, in turn, predict depression (Hypothesis 1a). We did not expect ES self-efficacy to act as a mediator in the
relationship between social anxiety and depression (Hypothesis 1b). Second, we evaluated whether CR mediated the relationship between social anxiety and depression. We hypothesized that social anxiety would predict CR frequency (Hypothesis 2a) and CR self-efficacy (Hypothesis 2b), which each, in turn, would predict depression.

Our secondary aims reflected our interest in evaluating the contribution of additional vulnerability factors in the mediation models hypothesized above. First, given that high ES frequency results in low positive affect and poor social outcomes for individuals with social anxiety (Farmer & Kashdan, 2012; O’Toole et al., 2014), we examined affect (Hypothesis 3a) and interpersonal factors (i.e., relationship quality; Hypothesis 3b) as additional mediators in the hypothesized relationship between social anxiety, ES frequency, and depression. Second, because reward sensitivity has been shown to interact with CR frequency in both social anxiety and depression (Dennis, 2007; O’Connor et al., 2014), we examined the moderating effect of trait reward sensitivity (i.e., BAS) on the hypothesized relationships between social anxiety, CR frequency, and depression (Hypothesis 4).

Finally, our exploratory aim was to examine whether emotion regulation for positive emotions differs from emotion regulation for negative emotions in the hypothesized relationships above. In doing so, we hoped to extend previous literature (Farmer & Kashdan, 2012) by elucidating the differential roles of emotion regulation for positive and negative affect in the relationship between social anxiety and depression.
CHAPTER 2

METHODS

Participants and Procedures

Participants were 137 undergraduate students at a large public university in Philadelphia, PA. Inclusion criteria required that participants were currently enrolled in undergraduate courses, at least 18 years of age, and fluent in written and spoken English. The Institutional Review Board approved the study procedures, and all participants provided written informed consent. Participants were given course credit for their involvement in the study and were offered the opportunity to participate in a $50 raffle for completing all phases of the study.

Data for the present study were collected during three phases of assessment. At the baseline assessment (Phase 1), participants attended an in-person laboratory session during which they completed a battery of trait-level self-report questionnaires, including measures of social anxiety, depression, emotion, emotion regulation, reward sensitivity, and interpersonal relationships. Beginning one day after the baseline assessment (Phase 2), participants completed a computerized daily diary every evening for 14 days. In each diary, participants reported on their daily experience of social anxiety, depressed mood, emotion, emotion regulation, and interpersonal variables. Approximately two weeks after the final daily diary assessment (i.e., four weeks after the baseline assessment; Phase 3), participants returned to the laboratory and completed an endpoint assessment, which included a final battery of trait-level self-report questionnaires. All questionnaires were completed using the online data collection tool FluidSurveys (www.fluidsurveys.com).
Of the 137 enrolled participants who completed the baseline assessment and daily diaries, 105 (76.6%) returned to complete the endpoint assessment. The full study sample was used in our daily diary analyses, whereas only the completer sample was used for our person-level analyses. Each set of analyses is described in detail below. Demographic data for both groups of participants are provided in Table 1.

### Table 1. Sample Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Full Sample (N=136*)</th>
<th>Compliers Only (n=104*)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Age (Years)</td>
<td>20.17 (3.13)</td>
<td>20.20 (3.36)</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>55 (52.4)</td>
</tr>
<tr>
<td>Black/African American</td>
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<td>23 (21.9)</td>
</tr>
<tr>
<td>Asian</td>
<td>21 (15.3)</td>
<td>14 (13.3)</td>
</tr>
<tr>
<td>Other/Multi-Race</td>
<td>16 (11.7)</td>
<td>12 (11.4)</td>
</tr>
<tr>
<td>Hispanic (Yes)</td>
<td>13 (9.5)</td>
<td>11 (10.6)</td>
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<tr>
<td>Gender (Female)</td>
<td>104 (75.9)</td>
<td>80 (76.2)</td>
</tr>
<tr>
<td>Marital Status (Single)</td>
<td>133 (97.1)</td>
<td>103 (98.1)</td>
</tr>
</tbody>
</table>

*Note.* Demographic data were missing for one participant due to a data collection error at baseline; the table reflects demographics for the 136 enrolled participants and 104 completers with available data.

Materials

**Baseline and Endpoint Measures.**

Demographic Characteristics. Demographic characteristics were assessed at baseline using a questionnaire designed to gather information on participant gender, age, race, ethnicity, marital status, employment status, and years of education.

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1 A comparison of the completer group and the non-completer group is presented in the Results section below, under the heading Preliminary Person-Level Analyses (p. 40).
Social Anxiety. The Social Anxiety Interaction Scale (SIAS; Mattick & Clarke, 1998) is a 20-item measure designed to assess anxious cognitions, behaviors, and feelings in social interactions. Items are rated on a Likert-type scale ranging from 0 (not at all characteristic of me) to 4 (extremely characteristic of me). The SIAS has been shown to have excellent internal consistency (Cronbach’s $a$’s between 0.88 and 0.94), as well as good test-retest reliability, discriminant validity, and construct validity. Previous research has indicated that the psychometric properties of the scale are improved by removing the reverse-scored items (Rodebaugh, Woods, & Heimberg, 2007). As recommended, all 20 items were administered to participants, but only the 17 straightforward items were used in the present analyses.

It should be noted that due to an administration error, 67 participants only received the first 14 items of the 20-item measure. Of these 14 items, three items are reverse-scored, and as such, a straightforward SIAS score was calculated for these participants by averaging the 11 straightforward items. Bivariate correlations using participants that completed the full questionnaire revealed that the 11-item straightforward score was strongly and positively correlated with the full 17-item straightforward score at baseline ($r=0.98$, $p<.001$) and endpoint ($r=0.99$, $p<.001$). Consequently, the SIAS straightforward score was calculated as the average item score for all participants, using either 11 or 17 straightforward items, depending on which version of the questionnaire the participant was administered. Internal consistency was excellent for the 11 straightforward items at baseline ($a=.91$) and endpoint ($a=.91$) as well as for the 17 straightforward items at baseline ($a=.95$) and endpoint ($a=.95$).
Depression. The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) is a 21-item self-report questionnaire designed to assess the presence and severity of depressive symptoms. The measure has demonstrated excellent internal consistency in undergraduate ($\alpha=.89$; Whisman, Perez, & Ramel, 2000) and psychiatric outpatient samples ($\alpha=.93$; Beck et al., 1996) in addition to good one-week test-retest reliability, convergent validity, and discriminant validity (Beck et al., 1996). The BDI-II demonstrated excellent internal consistency at both baseline ($\alpha=.93$) and endpoint ($\alpha=.95$) in the current study.

Emotion and Emotion Regulation. The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item measure that examines components of positive emotion (e.g., excited, inspired) and negative emotion (e.g., afraid, guilty). Items are rated using a Likert-type scale ranging from 1 (not at all) to 5 (extremely) to indicate “to what extent, on average, you have felt this way in the past month.” The positive affect (PA) and negative affect (NA) subscales of the PANAS have demonstrated excellent internal consistency (all $\alpha$’s > .85), as well as strong convergent validity (Watson et al., 1988). The PANAS subscales exhibited good internal consistency at baseline (PA: $\alpha=.90$; NA: $\alpha=.89$) and excellent internal consistency at endpoint (PA: $\alpha=.93$; NA: $\alpha=.92$) in the current study.

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item self-report measure designed to assess frequency of emotion regulation strategy use. The measure comprises two subscales: a four-item Expressive Suppression subscale (e.g., “When I am feeling negative emotions [e.g., anxiety, sadness], I make sure not to express them”) and a six-item Cognitive Reappraisal subscale (e.g., “I control my emotions by
changing the way I think about the situation I’m in”). Items are rated on a Likert-type scale ranging from 1 (strongly agree) to 7 (strongly disagree). The subscales have exhibited acceptable internal consistency (ES: \(\alpha = .73\); CR: \(\alpha = .79\)) and good convergent and discriminant validity in previous research (Gross & John, 2003). In the present study, internal consistency for the ES subscale was acceptable at baseline (\(\alpha = .68\)) and endpoint (\(\alpha = .75\)), and internal consistency for the CR subscale was good at baseline (\(\alpha = .88\)) and endpoint (\(\alpha = .91\)).

The Emotion Regulation Questionnaire – Self-Efficacy (ERQ-SE; Goldin et al. 2009) is a 10-item extension of the original ERQ. Using the same statements provided by the ERQ, the ERQ-SE measures perceived effectiveness of ES and CR with statements such as “When I really want to, I am very capable of changing what I’m thinking about when I want to feel more positive emotion.” As with the ERQ, items are rated on a Likert-type scale ranging from 1 (strongly agree) to 7 (strongly disagree). The CR subscale of the ERQ-SE exhibits excellent internal consistency (\(\alpha = .95\); Goldin et al., 2012); internal consistency data for the ES subscale of the ERQ-SE have not been previously published. In the present study, internal consistency for the ES subscale was acceptable at baseline (\(\alpha = .66\)) and endpoint (\(\alpha = .75\)), and internal consistency for the CR subscale was excellent at baseline (\(\alpha = .90\)) and endpoint (\(\alpha = .95\)).

**Reward Sensitivity.** The Behavioral Inhibition System-Behavioral Approach System Scale (BIS-BAS; Carver & White, 1994) is a 20-item measure assessing behavioral inhibition and behavioral approach tendencies. The measure provides a single total score for behavioral inhibition and three sub-scores for behavioral activation: Drive, Fun Seeking, and Reward Responsiveness. The BIS-BAS subscales have demonstrated
adequate internal consistency (α’s between .66 and .76) and good convergent and discriminant validity (Carver & White, 1994). Given that BAS has been shown to relate to emotion regulation in samples with social anxiety (O’Connor et al., 2014) and samples with depression (Dennis, 2007), we used the BAS subscales to assess trait levels of reward sensitivity in our sample. A BAS subtotal was calculated by combining the scores of the three subscales to examine overall levels of BAS, and the combined BAS subtotal demonstrated adequate internal consistency in the present sample (α=.79). The BIS-BAS was only administered at baseline.

**Daily Diary Measures.**

Daily Social Anxiety was assessed using a brief 7-item measure of social anxiety developed by Kashdan and Steger (2006). Five of the items were derived from the Brief Fear of Negative Evaluation Scale (Leary, 1983) and two of the items were agreed upon by the International Consensus Group on Depression and Anxiety (Ballenger et al., 1997). The items are rated on a Likert-type scale ranging from 1 (very slightly/not at all) to 5 (extremely). This brief social anxiety measure has demonstrated excellent internal reliability (α=.95; Kashdan & Steger, 2006). Internal consistency was excellent for the present study as well (α=.95).

Daily Depressed Mood was assessed using the Patient Reported Outcomes Measurement Information System Depression Short Form (PROMIS-Dep; Pilkonis et al. 2011), developed by the National Institutes of Health. The PROMIS-Dep is an 8-item unidimensional measure of depressed mood that has been shown to be comparable to traditional measures of depression symptom severity, including the BDI (Olino et al., 2013; Pilkonis et al. 2011). The items are rated on a Likert-type scale ranging from 0
(never) to 4 (always). In a non-clinical adult sample, the PROMIS-Dep demonstrated good internal consistency ($\alpha=0.83$) and was shown to assess depression severity over a broader range than traditional depression symptom measures (Pilkonis et al. 2011). Internal consistency was excellent in the present study ($\alpha=0.96$).

**Daily Positive and Negative Emotions** were assessed using the same 20-item PANAS (Watson et al., 1988) used at the baseline assessment. Items were again rated using a Likert-type scale ranging from 1 (not at all) to 5 (extremely), but the instructions were modified to inquire about “to what extent, on average, you have felt this way today.” The daily versions of the PANAS subscales both exhibited excellent internal consistency (PA: $\alpha=0.92$; NA: $\alpha=0.91$) in the present study.

**Daily Emotion Regulation** was assessed using an 8-item measure, with four items pertaining to emotion regulation frequency and four items pertaining to emotion regulation self-efficacy. The original ERQ validation paper was used to select the two CR frequency items and the two ES frequency items with the highest factor loadings across four samples (Gross & John, 2003), and the four corresponding items from the ERQ-SE were also included. Instructions and item wording were amended to assess emotion regulation over the past 24 hours.

For ES frequency, participants responded to the following statements: “I controlled my **negative emotions** [emphasis in original] by not expressing them,” and “I controlled my **positive emotions** by not expressing them.” The corresponding ES self-efficacy statements were: “When I really wanted to, I was very capable of controlling my **negative emotions** by not expressing them,” and “When I really wanted to, I was very capable of controlling my **positive emotions** by not expressing them.” For CR frequency,
participants responded to the following statements: “When I wanted to feel less negative emotion, I changed the way I was thinking about the situation,” and “When I wanted to feel more positive emotion, I changed the way I was thinking about the situation.” The corresponding CR self-efficacy statements were: “When I really wanted to, I was very capable of changing the way I’m thinking about the situation when I want to feel less negative emotion,” and “When I really wanted to, I was very capable of changing the way I’m thinking about the situation when I want to feel more positive emotion.”

Previous studies only have used daily measures of emotion regulation frequency, either using an 8-item frequency-only scale (Kashdan & Steger, 2006) or a 2-item frequency-only scale (Farmer & Kashdan, 2012). By selecting four frequency items, we were able to include the four corresponding self-efficacy items while still keeping participant burden low. In the present study, our CR frequency and self-efficacy items exhibited good internal reliability ($\alpha=.83$ and $\alpha=.85$, respectively), and our ES frequency and self-efficacy items exhibited acceptable internal reliability ($\alpha=.67$ and $\alpha=.75$, respectively).

*Daily Relationship Quality* was assessed using adaptations of three items on friendship quality that were employed in the National Comorbidity Study Replication (NCS-R) and have shown good factorial validity in previous studies on SAD (Rodebaugh, 2009; Rodebaugh, Fernandez, & Levinson, 2012). The items examined emotional closeness (i.e., “How much did you open up to your friends if you needed to talk about your worries?”), behavioral closeness (i.e., “How often did you talk on the phone, chat through social media, or get together with friends?”), and social support (i.e.,
“How much did you rely on your friends for help if you had a problem?”). Items were rated with regard to daily friendship quality on a Likert-type scale ranging from 1 (not at all) to 4 (a lot). The daily relationship quality measure exhibited good internal consistency in the present study (α=.84).

**Data Analytic Plan: Daily Diary Data**

Daily diary data were collected once per day for 14 days. Because repeated measures data are considered “nested” within participants, hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002) was used to test our proposed hypotheses using the daily diary data. HLM provides important data analytic advantages for repeated measures analyses. This statistical methodology can accommodate non-independence of observations, and relative to traditional regression techniques, provides more efficient coefficient estimates and less biased estimates of standard error when using nested data, thereby reducing the chances of Type I error. Thus, HLM allows for a within-person approach to the measurement of emotion regulation, social anxiety, and depression, providing a more powerful test of theories of emotion dysregulation and internalizing disorders than a between-person approach.

The original daily diary variables represent a mixture of within- and between-person effects. Centering techniques were used to isolate the within-person (i.e., Level 1) variation from the between-person (i.e., Level 2) variation. Specifically, a new variable representing between-person variability was created by averaging the original predictor variables across the daily diary period, and a new variable representing within-person

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2 Note that item wording has been modified to reflect friendship quality over the previous day and has been updated to incorporate technological changes in day-to-day communication (i.e., “chat through social media”).

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variability was created by person-mean centering the original predictor variables. In other words, each daily diary predictor variable was represented by a between-person (i.e., person-specific mean) factor and a within-person (i.e., deviations from the person-specific mean) factor, thereby allowing us to examine the separate contributions of each. Daily depression was the outcome variable.

When testing mediation models, temporality of data must be established, with the independent variable ($X$) assessed at an initial time point ($t$), the mediating variable ($M$) assessed at a second time point ($t+1$), and the dependent variable ($Y$) assessed at a third time point ($t+2$). Thus, prior to analyzing the data, we created lagged variables such that the mediating variables (ES frequency, ES self-efficacy, CR frequency, and CR self-efficacy) were led by one time point ($t+1$ day) and the dependent variable (depressed mood) was led by two time points ($t+2$ days).

Separate multilevel models were examined for each of our primary and secondary hypotheses. All models were analyzed as lower level mediation. To test Hypotheses 1 and 2, $X$ was represented by within-person (i.e., person-centered or Level 1) social anxiety at time $t$, and $M$ was represented by the hypothesized within-person (Level 1) mediator at time $t+1$, and $Y$ was represented by daily depressed mood at time $t+2$ (Figure 1). To test Hypothesis 3, $X$ was again represented by within-person social anxiety at time $t$, $M_1$ and $M_2$ were represented by the hypothesized within-person mediators at time $t+1$, and $Y$ was represented by daily depressed mood at time $t+2$ (Figure 2). To test Hypothesis 4, $X$ was represented by within-person social anxiety at time $t$, $M$ was represented by the hypothesized within-person mediator at time $t+1$, $Y$ was represented by daily depressed mood at time $t+2$ (Figure 2), and the moderator $W$ was represented by
between-person (i.e., Level 2) reward sensitivity measured at baseline (Figure 3).

Between-person (i.e., center averaged or Level 2) variables calculated from the daily diary data were entered into each of the models simultaneously as covariates.
Each model also included two random effects such that our outcome variable (depressed mood) was allowed to vary randomly between participants (i.e., random within-person effect) and across time (i.e., random effect of time). Restricted maximum likelihood was used to estimate regression results, as this method provides less biased estimates of the variance components than does full maximum likelihood.

Mediation was evaluated using the R package “mediation” (Tingley, Yamamoto, Hirose, Keele, & Imai, 2014), which was designed to investigate causal mechanisms using continuous mediators and outcomes and can accommodate multilevel models. For each mediation model, we ran two separate regression models: one regression model examined the effect of the independent variable ($X$) on the mediator ($M$), and the second model examined the effect of the independent variable and the mediator on the dependent variable ($Y$). Using these two regression models, the mediation package employs a parametric approach to estimate the average causal mediation effect (i.e., the indirect effect). This approach assumes normally-distributed sampling distributions and uses a preset number of simulations to randomly generate parameters and calculate the uncertainty estimates. We used the default number of simulations (1000) in our analyses. The mediation package also was used to test our double-mediation models (Hypothesis 3a, 3b) and moderated mediation model (Hypothesis 4).

All daily diary analyses were conducted with the free software environment R version 3.3.2 (R Development Core Team, 2016). Multilevel models were estimated using the R package “lme4” (Bates, Maechler, Bolker, & Walker, 2015).
**Data Analytic Plan: Person-Level Data**

In addition to the 14 daily diary data points, person-level data also were collected at baseline and endpoint in-person laboratory sessions. We utilized these two additional time points to examine our hypotheses using the same constructs over a slightly longer period of time (three data points over four weeks instead of 14 data points over two weeks). In order to establish the temporality of data necessary to test our hypothesized mediation models, we used the person-level (i.e., aggregate) variables from the daily diary data as our Time 2 variables, creating a single data point by averaging across the 14 daily diary entries. Thus, our person-level data analyses utilized data collected at the baseline laboratory visit (T1), during the daily diary period (T2), and at the endpoint laboratory visit (T3).

Because these analyses included data aggregated across a two-week time period (rather than independent observations nested within participants), mediational analyses were conducted using Hayes’ PROCESS macro (v2.16; Hayes, 2013) for SPSS (IBM Corp., 2016). PROCESS utilizes bootstrapping methods to estimate the mediating effects of the variable of interest with regard to the relation between other, distinct variables. In the present study, each of our analyses was performed using 5000 bootstrap resamples to yield 95% confidence intervals (CIs) for the conditional indirect effects of the hypothesized mediation models. An estimated 95% CI that did not include zero would reflect that the identified mediator variable exerted a significant indirect effect on the relationship between T1 social anxiety and T3 depression.

In addition to testing the hypothesized models from our Primary Aims, the PROCESS macro allows for tests of mediation models with two mediators (Hypothesis
3a and 3b) as well as moderated mediation models (Hypothesis 4). Hypotheses 3a and 3b were tested using a model that estimated the direct and indirect effect(s) of T1 social anxiety ($X$) on T3 depression ($Y$) through two mediators ($M_1$ and $M_2$) chained together in serial. Hypothesis 4 was tested using a model that allowed for the indirect effect of T1 social anxiety ($X$) on T3 depression ($Y$) through ES frequency ($M$) to be moderated along the $X \rightarrow M$ and $X \rightarrow Y$ pathways.
CHAPTER 3

RESULTS

Preliminary Daily Diary Analyses

One hundred and thirty seven (N=137) participants completed a total of 1,506 daily diaries. Participants completed an average of 11.12 ($SD=3.33$) of 14 daily diaries over the two-week diary period. In order to determine whether diary non-completion influenced our variables of interest, bivariate correlations were examined at the participant level using number of diaries completed. Number of diaries completed was significantly correlated with person-level negative affect ($r=-.25$, $p=.004$), such that participants with higher levels of negative affect across the daily diary period completed fewer diaries overall. No other daily diary variables were associated with number of diaries completed (all $p's>.05$).

Missingness was further examined within the daily diaries that were completed. No data points were missing for the daily depressed mood outcome measure. One data point was missing for the daily social anxiety measure, eight data points were missing for CR and ES frequency measures, 10 data points were missing for CR and ES self-efficacy measures, two data points were missing for the positive and negative affect measures, 11 data points were missing for the daily relationship quality measure, and nine data points were missing for the person-level reward-sensitivity measure. Given that less than 5% of data were missing for each variable of interest within completed diaries, we determined that missingness appeared to be minimal and was unlikely to affect our results. Observations with missing data on the variables of interest, as well as those missing data as a result of leading the depressed mood variable by two days, were removed from the
dataset to create a complete sample to use across all analyses. The final sample consisted of 1,217 observations from 131 participants. Means and standard deviations of all variables of interest (prior to z-standardization) are presented in Table 2.

Table 2. Descriptive Statistics for Daily Diary Measures

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressed Mood</td>
<td>5.65</td>
<td>6.07</td>
<td>0.00-32.00</td>
</tr>
<tr>
<td>Social Anxiety</td>
<td>12.76</td>
<td>6.22</td>
<td>7.00-35.00</td>
</tr>
<tr>
<td>CR Frequency</td>
<td>16.33</td>
<td>4.28</td>
<td>4.00-28.00</td>
</tr>
<tr>
<td>CR Self-Efficacy</td>
<td>17.33</td>
<td>4.15</td>
<td>4.00-28.00</td>
</tr>
<tr>
<td>ES Frequency</td>
<td>14.50</td>
<td>3.71</td>
<td>4.00-28.00</td>
</tr>
<tr>
<td>ES Self-Efficacy</td>
<td>17.42</td>
<td>4.04</td>
<td>4.00-28.00</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>26.99</td>
<td>7.43</td>
<td>10.00-50.00</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>17.84</td>
<td>6.23</td>
<td>10.00-50.00</td>
</tr>
<tr>
<td>Relationship Quality</td>
<td>7.78</td>
<td>2.36</td>
<td>3.00-12.00</td>
</tr>
</tbody>
</table>

Note. Descriptive statistics were calculated at the observation level (rather than at the person level); n=131 participants with 1,217 daily observations; CR=Cognitive Reappraisal; ES=Expressive Suppression.

Primary Aims: Daily Diary Data

Hypothesis 1a: Expressive Suppression Frequency. The hypothesis that daily (observation-level) ES frequency would mediate the relationship between daily (observation-level) social anxiety and daily (observation-level) depressed mood was not supported (Table 3). There was no effect of observation-level social anxiety on ES frequency (b=0.003, p>.10), no effect of observation-level social anxiety on depressed mood (b=-0.006, p>.10), and no effect of observation-level ES frequency on depressed mood (b=0.011, p>.10). Additionally, the indirect effect of social anxiety on depressed mood through ES frequency was non-significant (b=0.0001, 95% CI [-0.005, 0.005]).
There was a significant person-level effect, such that higher average social anxiety over the daily diary period significantly predicted daily depressed mood \((b=0.67, p<.01)\). However, person-level ES frequency was not a significant predictor of daily depressed mood \((b=-0.02, p>.10)\).

**Hypothesis 1b: Expressive Suppression Self-Efficacy.** The hypothesis that daily (observation-level) ES self-efficacy would not mediate the relationship between daily (observation-level) social anxiety and daily (observation-level) depressed mood was supported (Table 3). There was no effect of social anxiety on ES self-efficacy \((b=-0.001, p>.10)\) and no effect of social anxiety on depressed mood \((b=-0.005, p>.10)\). There was a small effect of observation-level ES self-efficacy, such that higher ES self-efficacy predicted higher next-day depressed mood, but the effect did not reach significance at the \(p<.05\) threshold \((b=0.04, p<.10)\). The indirect effect of social anxiety on depressed mood through ES self-efficacy was non-significant \((b=-0.004, 95\% CI [-0.014, 0.003])\). Again, person-level social anxiety predicted daily depressed mood \((b=0.68, p<.01)\), but person-level ES self-efficacy did not \((b=-0.07, p<.10)\).

**Hypothesis 2a: Cognitive Reappraisal Frequency.** The hypothesis that daily (observation-level) CR frequency would mediate the relationship between daily (observation-level) social anxiety and daily (observation-level) depressed mood was not supported (Table 3). There was no effect of social anxiety on CR frequency \((b=-0.04, p>.10)\) and no effect of social anxiety on depressed mood \((b=-0.006, p>.10)\). There was a small effect of observation-level CR frequency on depressed mood, such that lower CR frequency predicted higher next-day depressed mood, but the effect did not reach significance at the \(p<.05\) threshold \((b=-0.05, p<.10)\). The indirect effect of social anxiety
on depressed mood through CR frequency was non-significant \((b=0.004, 95\% \text{ CI} [-0.002, 0.015])\).

As before, person-level social anxiety predicted daily depressed mood \((b=0.65, p<.01)\). Person-level CR frequency also emerged as a significant predictor of daily depressed mood, paralleling the trend of observation-level CR frequency. Lower average CR frequency over the daily diary period predicted higher daily depressed mood \((b=-0.16, p<.01)\).

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Hypothesis 1a</th>
<th>Hypothesis 1b</th>
<th>Hypothesis 2a</th>
<th>Hypothesis 2b</th>
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<tr>
<td><strong>Observation Level</strong></td>
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</tr>
<tr>
<td>Time</td>
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<td>0.002 (0.01)</td>
<td>0.002 (0.01)</td>
<td>0.002 (0.01)</td>
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<tr>
<td>Social Anxiety</td>
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<td>-0.005 (0.03)</td>
<td>-0.006 (0.03)</td>
<td>-0.005 (0.04)</td>
</tr>
<tr>
<td>ES Frequency</td>
<td>0.011 (0.02)</td>
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<tr>
<td>ES Self-Efficacy</td>
<td>0.042 (0.03)</td>
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<tr>
<td>CR Frequency</td>
<td></td>
<td>-0.047 (0.03)</td>
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<td>CR Self-Efficacy</td>
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<td>0.032 (0.03)</td>
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<td><strong>Person Level</strong></td>
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</tr>
<tr>
<td>Social Anxiety</td>
<td>0.674 (0.05)**</td>
<td>0.675 (0.05)**</td>
<td>0.650 (0.04)**</td>
<td>0.649 (0.04)**</td>
</tr>
<tr>
<td>ES Frequency</td>
<td>-0.022 (0.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES Self-Efficacy</td>
<td>-0.071 (0.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Frequency</td>
<td></td>
<td>-0.157 (0.04)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Self-Efficacy</td>
<td></td>
<td></td>
<td></td>
<td>-0.151 (0.04)**</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person Effect</td>
<td>0.304</td>
<td>0.293</td>
<td>0.272</td>
<td>0.267</td>
</tr>
<tr>
<td>Time Effect</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>Observation Error Term</td>
<td>0.295</td>
<td>0.295</td>
<td>0.296</td>
<td>0.296</td>
</tr>
</tbody>
</table>

**Mediation Effects**

<table>
<thead>
<tr>
<th></th>
<th>Hypothesis 1a</th>
<th>Hypothesis 1b</th>
<th>Hypothesis 2a</th>
<th>Hypothesis 2b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Effect of Social Anxiety</td>
<td>0.0001 (-0.005, 0.005)</td>
<td>-0.004 (-0.014, 0.003)</td>
<td>0.004 (-0.002, 0.015)</td>
<td>-0.004 (-0.017, 0.004)</td>
</tr>
<tr>
<td>Direct Effect of Social Anxiety</td>
<td>-0.020 (-0.149, 0.093)</td>
<td>-0.017 (-0.144, 0.096)</td>
<td>-0.014 (-0.154, 0.120)</td>
<td>-0.020 (-0.141, 0.104)</td>
</tr>
</tbody>
</table>

**Hypothesis 2b: Cognitive Reappraisal Self-Efficacy.** The hypothesis that daily (observation-level) CR self-efficacy would mediate the relationship between daily...
(observation-level) social anxiety and daily (observation-level) depressed mood was not supported (Table 3). There was a small effect of social anxiety on CR self-efficacy, such that higher levels of social anxiety predicted lower next day ratings of CR self-efficacy ($b=-0.06, p<.10$), but the effect did not reach significance at the $p<.05$ threshold. There was no effect of social anxiety on depressed mood ($b=-0.01, p>.10$), nor was there an effect of CR self-efficacy on depressed mood ($b=0.03, p>.10$). The indirect effect of social anxiety on depressed mood through CR self-efficacy was non-significant ($b=-0.004, 95\% CI [-0.017, 0.004]$).

Person-level social anxiety again predicted daily depressed mood ($b=0.65, p<.01$). Person-level CR self-efficacy also emerged as a significant predictor of daily depressed mood, such that lower average CR self-efficacy over the daily diary period predicted higher daily depressed mood ($b=-0.15, p<.01$).

**Secondary Aims: Daily Diary Analyses**

*Hypothesis 3a: Expressive Suppression Frequency with Positive Affect.* Neither observation-level social anxiety ($b=-0.005, p>.10$) nor observation-level ES frequency ($b=0.01, p>.10$) significantly predicted next-day depressed mood. However, observation-level positive affect did emerge as a significant predictor, such that lower positive affect predicted higher next-day depressed mood ($b=-0.07, p<.05$). Although significant, the effect is small. The hypothesis that ES frequency and daily positive affect would sequentially mediate the relationship between social anxiety and next-day depressed mood was not supported, as the indirect effect was not significant ($b=0.001, 95\% CI [-0.01, 0.01]$; Table 4).
Significant person-level effects emerged for social anxiety and positive affect. Specifically, higher average levels of social anxiety predicted higher daily depressed mood \((b=0.63, p<.01)\), and lower average levels of positive affect predicted higher daily depressed mood \((b=-0.17, p<.01)\). Person-level ES frequency did not predict depressed mood during the daily diary period \((b=-0.03, p>.10)\).

Table 4. Hypothesized Double Mediation Models Predicting Daily Depressed Mood (Secondary Aim)

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Hypothesis 3a</th>
<th>Hypothesis 3b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observation Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>0.00002 (0.01)</td>
<td>0.001 (0.01)</td>
</tr>
<tr>
<td>Social Anxiety(^1)</td>
<td>-0.005 (0.03)</td>
<td>-0.007 (0.03)</td>
</tr>
<tr>
<td>ES Frequency(^1)</td>
<td>0.010 (0.02)</td>
<td>0.006 (0.02)</td>
</tr>
<tr>
<td>Positive Affect(^1)</td>
<td>-0.065 (0.03)*</td>
<td></td>
</tr>
<tr>
<td>Relationship Quality(^1)</td>
<td></td>
<td>-0.052 (0.03)*</td>
</tr>
<tr>
<td><strong>Person Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Anxiety(^2)</td>
<td>0.631 (0.05)**</td>
<td>0.670 (0.05)**</td>
</tr>
<tr>
<td>ES Frequency(^2)</td>
<td>-0.033 (0.05)</td>
<td>-0.049 (0.05)</td>
</tr>
<tr>
<td>Positive Affect(^2)</td>
<td>-0.171 (0.04)**</td>
<td></td>
</tr>
<tr>
<td>Relationship Quality(^2)</td>
<td></td>
<td>-0.116 (0.05)**</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person Effect</td>
<td>0.261</td>
<td>0.278</td>
</tr>
<tr>
<td>Time Effect</td>
<td>0.003</td>
<td>0.003</td>
</tr>
<tr>
<td>Observation Error Term</td>
<td>0.295</td>
<td>0.295</td>
</tr>
<tr>
<td><strong>Mediation Effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Effect of Social Anxiety</td>
<td>0.001 (-0.01, 0.01)</td>
<td>-0.0001 (-0.01, 0.01)</td>
</tr>
<tr>
<td>Direct Effect of Social Anxiety</td>
<td>0.042 (-0.07, 0.15)</td>
<td>-0.045 (-0.08, 0.17)</td>
</tr>
</tbody>
</table>

Note. All variables except Time are z-standardized; the mediator variable was led by one day, the outcome variable (depressed mood) was led by two days; ** \(p<.01\), * \(p<.05\), \(^1\) \(p<.10\); \(^1\) Person-centered; \(^2\) Aggregate; CI=Confidence Interval, CR=Cognitive Reappraisal, ES=Expressive Suppression, SE=Standard Error

**Hypothesis 3b: Expressive Suppression Frequency with Relationship Quality.**

There was no significant predictive effect of observation-level social anxiety \((b=-0.007\),
or observation-level ES frequency ($b=0.006, p>.10$) on next-day depressed mood. However, the predictive effect of observation-level relationship quality indicated that poorer daily relationship quality predicted higher next-day depressed mood, but the effect did not reach significance at the $p<.05$ threshold ($b=-0.05, p<.10$). The hypothesis that ES frequency and daily relationship quality would sequentially mediate the relationship between social anxiety and next-day depressed mood was not supported, as the indirect effect was not significant ($b=-0.0001, 95\% CI [-0.01, 0.01]; Table 4$).

Significant person-level effects emerged for social anxiety and relationship quality, with higher average levels of social anxiety predicting higher daily depressed mood ($b=0.67, p<.01$) and poorer average relationship quality predicting higher daily depressed mood ($b=-0.12, p<.01$). As before, person-level ES frequency did not predict depressed mood during the daily diary period ($b=-0.05, p>.10$).

**Hypothesis 4: Cognitive Reappraisal Frequency and Reward Sensitivity.**

Regression models were generated to examine (1) the interaction of person-level BAS and observation-level social anxiety predicting CR frequency (BAS x social anxiety), as well as (2) the interaction of BAS x social anxiety predicting daily depressed mood. Results indicated that the BAS x social anxiety interaction was neither a significant predictor of CR frequency ($b=0.02, p>.10$) nor of depressed mood ($b=0.03, p>.10$). To test for moderated mediation, the hypothesized mediation model was assessed at two levels of the moderator: one standard deviation above the mean (+1 $SD$) and one standard deviation below the mean (-1 $SD$). At +1 $SD$, the indirect effect of social anxiety on depressed mood through CR frequency was not significant ($b=0.001, 95\% CI [-0.006, 0.009], p=.72$). At -1 SD, the indirect effect also was not significant ($b=0.003, 95\% CI [-
Thus, the hypothesis that BAS would act as a moderator of the effect of social anxiety on depressed mood through CR frequency was not supported.

**Exploratory Aims: Daily Diary Analyses**

All four hypotheses were examined using emotion regulation variables calculated separately for positive affect and for negative affect (rather than collapsing across the two). By and large, the results remained the same across analyses, with two notable exceptions. (1) Observation-level (daily) ES self-efficacy for positive affect emerged as a significant predictor of next-day depressed mood ($b=0.07$, $p<.01$), such that participants who were better able to hide their positive emotions experienced higher levels of next-day depressed mood. Observation-level ES self-efficacy for positive affect was not a mediator of the relationship between social anxiety and depressed mood ($b=0.0001$, $95\%$ CI $[-0.012, 0.014]$). Observation-level (daily) ES self-efficacy for negative affect was not a significant predictor of depressed mood ($b=0.005$, $p>.10$), nor did it mediate the social anxiety-depressed mood relationship ($b=0.0004$, $95\%$ CI $[-0.007, 0.006]$). (2) Observation-level (daily) CR frequency for negative affect emerged as a significant predictor of depressed mood ($b=-0.07$, $p<.01$), such that participants who used CR less frequently to manage their negative emotions experienced higher levels of next-day depressed mood. However, daily CR frequency for negative emotions did not mediate the relationship between social anxiety and depressed mood ($b=0.005$, $95\%$ CI $[-0.004, 0.018]$). Observation-level (daily) CR frequency for positive affect was not a significant predictor of daily depressed mood ($b=-0.009$, $p>.10$), nor did it mediate the social anxiety-depressed mood relationship ($b=0.0007$, $95\%$ CI $[-0.005, 0.007]$).
Controlling for Depression: Daily Diary Analyses

We re-ran our analyses controlling for depressed mood on day one (predicting depressed mood two days later), and the results were largely unchanged. Person-level social anxiety remained a significant predictor of daily depressed mood, and the indirect effects of all tested mediation models remained non-significant. Results of the analyses when controlling for initial depressed mood are presented in Tables 5 and 6.

Table 5. Hypothesized Mediation Models Predicting Daily Depressed Mood, Controlling for Initial Depressed Mood (Primary Aims)

<table>
<thead>
<tr>
<th>Fixed Effects</th>
<th>Hypothesis 1a</th>
<th>Hypothesis 1b</th>
<th>Hypothesis 2a</th>
<th>Hypothesis 2b</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Observation Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>0.001 (0.01)</td>
<td>0.002 (0.01)</td>
<td>0.001 (0.01)</td>
<td>0.002 (0.01)</td>
</tr>
<tr>
<td>Social Anxiety</td>
<td>-0.051 (0.04)</td>
<td>-0.050 (0.04)</td>
<td>-0.050 (0.04)</td>
<td>-0.049 (0.04)</td>
</tr>
<tr>
<td>ES Frequency</td>
<td>0.007 (0.02)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES Self-Efficacy</td>
<td></td>
<td>0.040 (0.03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Frequency</td>
<td></td>
<td>-0.048 (0.03)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Self-Efficacy</td>
<td></td>
<td></td>
<td></td>
<td>0.036 (0.03)</td>
</tr>
<tr>
<td><strong>Person Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Anxiety</td>
<td>0.565 (0.05)**</td>
<td>0.566 (0.04)**</td>
<td>0.544 (0.04)**</td>
<td>0.546 (0.04)**</td>
</tr>
<tr>
<td>ES Frequency</td>
<td>-0.020 (0.04)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ES Self-Efficacy</td>
<td>-0.056 (0.04)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Frequency</td>
<td>-0.133 (0.04)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR Self-Efficacy</td>
<td>-0.123 (0.04)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control Variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial Depression</td>
<td>0.165 (0.03)**</td>
<td>0.162 (0.03)**</td>
<td>0.163 (0.03)**</td>
<td>0.161 (0.03)**</td>
</tr>
<tr>
<td><strong>Random Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person Effect</td>
<td>0.195</td>
<td>0.187</td>
<td>0.172</td>
<td>0.171</td>
</tr>
<tr>
<td>Time Effect</td>
<td>0.002</td>
<td>0.002</td>
<td>0.002</td>
<td>0.002</td>
</tr>
<tr>
<td>Observation Error Term</td>
<td>0.310</td>
<td>0.309</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Mediation Effects</th>
<th>b (95% CI)</th>
<th>b (95% CI)</th>
<th>b (95% CI)</th>
<th>b (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Effect of Social Anxiety</td>
<td>0.0001 (-0.004, 0.003)</td>
<td>-0.003 (-0.014, 0.006)</td>
<td>0.003 (-0.006, 0.013)</td>
<td>-0.005 (-0.016, 0.001)</td>
</tr>
<tr>
<td>Direct Effect of Social Anxiety</td>
<td>-0.094 (-0.232, 0.450)</td>
<td>-0.111 (-0.254, 0.032)</td>
<td>-0.010 (-0.246, 0.052)</td>
<td>-0.087 (-0.218, 0.064)</td>
</tr>
</tbody>
</table>

Note. All variables except Time are z-standardized; the mediator variable was led by one day, the outcome variable (depressed mood) was led by two days; ** p<.01, *p<.05, *p<.10; 1Person-centered; 2Aggregate; CI=Confidence Interval, CR=Cognitive Reappraisal, ES=Expressive Suppression, SE=Standard Error
Preliminary Person-Level Analyses

We next examined our hypothesized relationships at the person level, incorporating data collected at baseline and endpoint assessments across a longer four-week time period. Specifically, we used baseline levels of social anxiety as our T1 predictor, and we used endpoint levels of depression as our T3 outcome variable. We
used daily diary data as our T2 mediator and moderator variables, averaging across diaries in order to obtain participant-level (aggregate) variables to use in our models.

From our full sample of 137 participants, 105 participants (76.6%) completed the endpoint (T3) study visit, which occurred approximately four weeks after their baseline study visit. Due to a computer error, baseline data were missing for one participant, who was subsequently removed from these analyses. Data from the remaining 104 participants were used to examine our hypothesized relationships across the four-week time period. See Table 1 for demographic data on this subsample. Independent sample t-tests revealed no differences in age, gender, social anxiety, depression, emotion regulation, or positive affect at baseline (all p’s > .10) when comparing participants who did versus did not complete the endpoint study visit. In parallel with the daily diary data, completers exhibited lower baseline levels of negative affect than did non-completers ($t(134)=-2.16$, $p=.03$). Completers also logged significantly more daily diaries than did non-completers ($M_{completers}=11.70$, $M_{non-completers}=9.19$; $t(134)=3.88$, $p<.001$), likely reflecting higher levels of engagement in the study by completers overall.

**Primary Aims: Person-Level Analyses**

**Hypothesis 1a: Expressive Suppression Frequency.** T1 social anxiety emerged as a strong predictor of T2 ES frequency ($b=0.39$, $p<.001$) as well as T3 depression ($b=0.56$, $p<.001$). However, T2 ES frequency did not significantly predict T3 depression ($b=0.07$, $p=0.41$), and the indirect effect of social anxiety on depression through ES frequency was not significant ($b=0.03$, 95% CI [-0.03, 0.10]).

**Hypothesis 1b: Expressive Suppression Self-Efficacy.** T1 social anxiety did not predict T2 ES self-efficacy ($b=0.10$ $p=.34$), but did predict T3 depression ($b=0.59$,
p<.001). T2 ES self-efficacy did not significantly predict T3 depression (b=-0.05, p=.55), and the indirect effect of social anxiety on depression through ES self-efficacy was not significant (b=-0.005, 95% CI [-0.05, 0.01]).

**Hypothesis 2a: Cognitive Reappraisal Frequency.** T1 social anxiety did not predict T2 CR frequency (b=-0.16 p=.12), but again predicted T3 depression (b=0.56, p<.001). T2 CR frequency predicted T3 depression at a trend level (b=-0.15, p=.08), although the indirect effect of social anxiety on depression through CR frequency was not significant (b=0.02, 95% CI [-0.0004, 0.08]).

**Hypothesis 2b: Cognitive Reappraisal Self-Efficacy.** T1 social anxiety did not predict T2 CR self-efficacy (b=-0.15 p=.14), but did predict T3 depression (b=0.55, p<.001). T2 CR self-efficacy was a significant predictor of T3 depression (b=-0.19, p=.02), although the indirect effect of social anxiety on depression through CR self-efficacy was not significant (b=0.03, 95% CI [-0.001, 0.08]).

**Secondary Aims: Person-Level Analyses**

**Hypothesis 3a: Expressive Suppression Frequency with Positive Affect.** Linear regression results revealed that T1 social anxiety significantly predicted T2 ES frequency (b=0.39, p<.001), T2 positive affect (b=-0.29, p=.005), and T3 depression (b=0.50, p<.001). T2 ES frequency did not significantly predict T2 positive affect (b=-0.15, p=.12). Finally, T2 positive affect significantly predicted T3 depression (b=-0.20, p=.02), but T2 ES frequency did not (b=0.04, p=.63).

Mediation results revealed that two of the three mediation pathways were significant. Specifically, the indirect effect of social anxiety on depression through only positive affect was significant (b=0.06, 95% CI [0.01, 0.14]), but the indirect effect of
social anxiety through only ES frequency was not significant \((b=0.02, 95\% \text{ CI} [-0.04, 0.09])\). The indirect effect of the double mediation model, with ES frequency entered as the first mediator and positive affect entered as the second mediator, was also significant \((b=0.01, 95\% \text{ CI} [0.0002, 0.04])\), providing support for Hypothesis 3a. Notably, a second mediation analysis was conducted with the order of the mediators reversed (positive affect followed by ES frequency), and the indirect effect of the double mediation was not significant \((b=0.002, 95\% \text{ CI} [-0.004, 0.02])\).

**Hypothesis 3b: Expressive Suppression Frequency with Relationship Quality.**

Linear regression models again demonstrated that T1 social anxiety significantly predicted T2 ES frequency \((b=0.39, p<.001)\), T2 relationship quality \((b=-0.28, p=.007)\), and T3 depression \((b=0.53, p<.001)\). T2 ES frequency predicted T2 relationship quality at a trend level \((b=0.18, p=.06)\). However, neither T2 relationship quality \((b=-0.09, p=.30)\) nor T2 ES frequency \((b=0.05, p=.53)\) significantly predicted T3 depression. Mediation results revealed that none of the three mediation pathways was significant (all CI’s included zero).

**Hypothesis 4: Cognitive Reappraisal Frequency and Reward Sensitivity.** Linear regression models were generated within PROCESS to examine whether T1 social anxiety and T1 reward sensitivity (i.e., BAS) interacted to predict T2 CR frequency or T3 depression. Neither T1 social anxiety \((b=-0.12, p=.25)\), T1 BAS \((b=-0.16, p=.12)\), nor their interaction \((b=0.02, p=.76)\) significantly predicted T2 CR frequency. T1 social anxiety \((b=0.53, p<.001)\) and T2 CR frequency \((b=-0.16, p=.048)\) emerged as significant predictors of T3 depression, but T1 BAS did not \((b=-0.09, p=.29)\). In contrast with the daily diary data, the interaction of T1 social anxiety and T1 BAS did significantly predict
T3 depression \((b=0.13, p=.02)\), such that the positive effect of social anxiety on depression was slightly stronger for participants with higher levels of trait reward sensitivity. However, moderated mediation was not supported, as the indirect effect of the mediation model was not significant at any level of the moderator (i.e., all CI’s included zero).

**Exploratory Aims: Person-Level Analyses**

All four hypotheses were examined using emotion regulation variables calculated separately for positive affect and for negative affect (rather than collapsing across the two). By and large, the results remained the same across analyses, with two notable exceptions. (1) T2 ES frequency for negative affect emerged as a significant mediator of the relationship between T1 social anxiety and T3 depression \((b=0.029, 95\% CI [0.001, 0.084])\), whereas T2 ES frequency for positive affect did not \((b=-0.003, 95\% CI [-0.04, 0.03])\). Furthermore, the double mediation model of social anxiety through ES frequency and affect (Hypothesis 3a) was significant when using ES frequency for negative affect and negative affect as mediators \((b=0.02, 95\% CI [0.002, 0.069])\), but the same model was not significant when using ES frequency for positive affect and positive affect as mediators \((b=0.0005, 95\% CI [-0.005, 0.012])\).

(2) When examining Hypothesis 4 using CR frequency for positive affect only, the moderated mediation emerged as significant. The interaction of T1 social anxiety and T1 BAS significantly predicted both T2 CR frequency for positive affect \((b=0.21, p=.001)\), as well as T3 depression \((b=0.16, p=.009)\). The higher order indirect effect of the moderated mediation was also significant \((b=-0.03, 95\% CI [-0.072, -0.002])\), indicating that the indirect effect of social anxiety on depression through CR frequency
for positive affect was a function of BAS, such that the strength of the indirect effect decreased as BAS increased. Conditional indirect effects at varying levels of the moderator indicated that T2 CR frequency for positive affect significantly mediated the relationship between T1 SA and T3 depression when BAS was low (i.e., at roughly 1 SD below the mean; \( b=0.04, 95\% \text{ CI} [0.003, 0.114] \)), but not when BAS was average (i.e., at the mean; \( b=0.01, 95\% \text{ CI} [-0.011, 0.060] \)) or high (i.e., at roughly 1 SD above the mean; \( b=-0.02, 95\% \text{ CI} [-0.083, 0.007] \)). The moderated mediation model was not significant when using CR frequency for negative affect only (\( b=-0.010, 95\% \text{ CI} [-0.048, 0.008] \)).

**Controlling for T1 Depression: Person-Level Analyses**

In contrast with the daily diary analyses, none of our models remained significant after controlling for T1 levels of depression. T1 social anxiety exhibited a strong positive correlation with both T1 depression (\( r=.68, p<.001 \)) and T3 depression (\( r=.57, p<.001 \)). However, after controlling for T1 depression, the relationship between T1 social anxiety and T3 depression was nearly zero (\( r_{\text{partial}}=-.008, p=.93 \)), and none of our predicted mediation models emerged as significant.
CHAPTER 4

DISCUSSION

Our study was the first to examine the influence of emotion regulation on the relationship between social anxiety and depression over time. We examined our hypothesized relationships across two time periods: a two-week period with daily data collection, and a four-week period with data collection at baseline, averaged across the daily diaries, and at endpoint. Although none of our hypotheses was supported across the two-week daily diary period, trends observed in the daily diary data emerged as significant when examined using person-level data across a four-week time period (when not controlling for baseline depression).

Daily Diary Analyses

None of the hypothesized mediation models reached significance in the daily diary analyses, but the trend-level effects were in line with previously published research on emotion regulation. Our exploratory analyses, in which we separated emotion regulation for positive versus negative affect, helped to further clarify these trends. For example, participants who used CR less frequently to regulate their emotions experienced higher depressed mood the following day, at a trend level. When examining positive and negative affect separately, this relationship emerged as significant for negative affect but not for positive affect. Specifically, participants who were less likely to reframe their thoughts to regulate their negative emotions were more likely to experience depressed mood the following day, even after controlling for between-person differences in social anxiety and CR frequency. This finding is in line with a large body of literature showing that less frequent CR relates to higher depressive symptomatology among undergraduate,
community, and clinical samples (Aldao et al., 2010; Andreotti et al., 2013; D’Avanzato et al., 2013; Desrosiers et al., 2013; Gross & John, 2003; Joormann & Gotlib, 2010; Wisco & Nolen-Hoeksema, 2010). It also offers an important, although perhaps unsurprising, extension of this literature – that the failure to use CR to manage negative emotions specifically may be an important vulnerability factor for the development and maintenance of depression, even on a day-to-day basis.

Additionally, participants who experienced higher social anxiety endorsed lower CR self-efficacy the following day, at a trend level. This finding parallels previous research that has shown social anxiety to be more closely linked with problematic CR effectiveness than with problematic CR frequency (e.g., Helbig-Lang et al., 2015; Kivity & Huppert, 2016). Importantly, this trend emerged even after controlling for between-person differences in social anxiety and CR self-efficacy, suggesting that within-person fluctuations in social anxiety could negatively influence subsequent emotion regulation attempts. Our study is the first to show preliminary evidence of the nuances of this relationship on a day-to-day basis.

Unexpectedly, participants who reported higher ES self-efficacy experienced higher levels of next-day depressed mood, at a trend level. Our exploratory analyses extended this finding one step further, revealing that this relationship was significant for ES self-efficacy for positive emotion only, and not for ES self-efficacy for negative emotion. Although no literature has specifically reported on ES self-efficacy, previous research has shown that using ES to manage emotions often has the opposite of its intended effect; masking outward emotional expression actually heightens the felt intensity of negative emotion and dampens the inner experience of positive emotion.
It would follow that individuals who are especially good at hiding their emotions may be more likely to experience these maladaptive emotion consequences associated with ES. Participants who were particularly effective at hiding their positive emotions may be hit doubly hard, in that their experience of positive affect is lessened and they miss out on opportunities to capitalize on those positive feelings by expressing and sharing them with close others (Mauss et al., 2010), contributing to increases in depressed mood the following day.

Certain expected relationships among our daily diary constructs were not observed, although they have found strong support in previous literature. Most notably, within-person levels of social anxiety did not predict depressed mood two days later. Across all of our analyses, between-person differences in social anxiety emerged as a robust predictor of daily depressed mood, and it may be that the variance accounted for by person-level social anxiety superseded any day-to-day fluctuations in social anxiety. The absence of this relationship also may help to explain, in part, our null mediation models across our primary and secondary study hypotheses. We also were surprised that no association was found between social anxiety and ES frequency, a relationship that has found strong support on both a trait and daily level in previously published literature (Blalock et al., 2016; Kivity & Huppert, 2016; Marques et al., 2009; O’Toole et al., 2014; Spokas et al., 2009). One possible explanation for these differing results may be our decision to examine social anxiety dimensionally rather than categorically; we did not split our participant sample into “high social anxiety” and “low social anxiety” groups as has been done in all previous daily diary research in this area. Additional analyses of our
dataset examining high versus low socially anxious participants will be an important next step in understanding our daily diary findings in relation to previous research.

Another future direction will be to examine predictors of next-day social anxiety for our participants. For this particular study, we were primarily interested in the directionality of social anxiety predicting to depression, given that this developmental trajectory has received strong support in large-scale retrospective and longitudinal studies (Beesdo et al., 2007). However, within-person experiences of depression, affect, and emotion regulation may well contribute to subsequent increases in social anxiety over time, and investigating day-to-day affective predictors of social anxiety will be important to our understanding of the development and maintenance of the disorder.

**Person-Level Analyses**

Our person-level analyses provided an intriguing between-person examination of our hypotheses over a longer four-week time period. As with our daily diary analyses, none of our primary hypotheses were supported, but our secondary hypotheses revealed the contributions of additional variables in the relationships between social anxiety, emotion regulation, and depression over time.

As predicted, ES frequency and positive affect acted as sequential double mediators for the social anxiety-depression relationship. Participants who reported higher social anxiety at baseline used ES more frequently and experienced lower positive affect over the daily diary period, which, in turn, was associated with higher depression at endpoint. In other words, socially anxious individuals are more likely to hide their emotions from others, which lessens their overall experience of positive emotions, contributing to the subsequent occurrence of depression. A growing body of literature on
positivity impairments in social anxiety supports the theory that deficits in experiencing and regulating positive emotion play a causal role in the development and maintenance of social anxiety (Gilboa-Schechtman, Shachar, & Sahar, 2014). Our results extend these relationships one step further by connecting the affective consequences of emotion regulation with the subsequent experience of depression for individuals with social anxiety. Thus, positivity impairments not only may be a risk factor for social anxiety, but also may play a key role in the high prevalence of secondary depression among socially anxious individuals.

When differentiating between emotion regulation for positive versus negative affect, the impact of ES frequency for negative affect also emerged as a relevant factor, although not in the expected direction. Specifically, our findings suggested that participants with higher social anxiety at baseline experienced less frequent ES for negative emotions, which contributed to higher levels of negative affect over the daily diary period and subsequently higher depression at endpoint. These results are directly in contrast with previous literature on affect-specific ES in social anxiety, which found higher social anxiety to be linked with more frequent ES for negative emotions and failed to find an effect of social anxiety and ES for negative emotions on subsequent negative affect (Farmer & Kashdan, 2012). Nonetheless, our results raise the possibility that socially anxious individuals who are more likely to express (rather than hide) their negative emotions may be more prone to experiencing depression down the line.

Interpersonal theories of depression posit that depressed individuals use more animated facial expressions to express sadness and exhibit more self-disclosure of negative emotions (Jacobson & Anderson, 1982), which in combination with behaviors like
excessive reassurance-seeking, is likely to engender social rejection from others and heighten depression (Hames et al., 2013). It may be that individuals with social anxiety who express their negative emotions do so in an unhelpful or unskilled way, thereby maintaining their negative affect and increasing their vulnerability to depression.

Our exploratory analyses also yielded intriguing findings regarding the influence of BAS on CR frequency as a mediator. Higher baseline social anxiety was associated with less frequent CR for positive affect during the daily diary period, which, in turn, was predictive of higher depression at endpoint, but only for participants with lower levels of BAS. In the daily diaries, items pertaining to CR for positive affect specifically state, for example, “When I wanted to feel more positive emotion [emphasis in original], I changed the way I was thinking about the situation.” Thus, socially anxious individuals who were less sensitive to reward were less likely to utilize CR to up-regulate their positive emotions, contributing to the subsequent experience of depression. These findings provide additional evidence for the contribution of emotion dysregulation to positivity impairments in social anxiety (Gilboa-Schectman et al., 2014). Moreover, it may be that those who are less sensitive to reward are less motivated to capitalize on positive affective experiences, which in combination with lower baseline levels of positive emotion associated with social anxiety more broadly, may be an especially detrimental combination for the occurrence of depression in social anxiety.

Taken together, our two sets of analyses help to clarify the role of emotion regulation in the relationship of social anxiety and depression over time. Our daily diary findings highlight the day-to-day influence of ES and CR on depression, and our person-level findings provide preliminary evidence of the ways in which ES and CR may
contribute to the occurrence of depression among individuals with social anxiety. On a larger scale, maladaptive patterns of emotion regulation may represent an important transdiagnostic target for prevention and treatment efforts aimed at internalizing disorders. Although emotion dysregulation has been repeatedly identified as a key player in the development and maintenance of singular mood or anxiety disorders, further research efforts investigating emotion dysregulation as a vulnerability factor for comorbidity are still greatly needed.

The present study also underscores the importance of differentiating emotion regulation for positive versus negative emotions. Our exploratory analyses revealed significant and, in part, unexpected relationships among our variables of interest that had been obscured when collapsing across affective dimensions. These findings are in line with research by Kashdan and colleagues (2008, 2013), which demonstrated the unique effects of emotion regulation for positive versus negative emotion on subsequent positive affective experiences in social anxiety. Our findings suggest that CR also has differing effects when employed to manage positive versus negative emotion, which may impact the subsequent experience of depression. Continuing to disentangle the effects of dysregulated positive emotion from dysregulated negative emotion will be essential to developing effective interventions for emotion dysregulation, with the ultimate goal of more effectively addressing social anxiety and reducing the occurrence of secondary depression.

**Clinical Implications**

Our results suggest a number of potential targets for treatment interventions aimed at social anxiety, depression, and the combination of the two. For one, low CR
frequency played a relevant role in the prediction of later depression in both daily diary analyses and person-level analyses. These findings highlight the importance of the cognitive restructuring component of CBT, which encourages the reframing of automatic thoughts in a way that is less likely to generate negative emotion (Young, Rygh, Weinberger, & Beck, 2008). For individuals vulnerable to depression, such as those with social anxiety, direct and repeated cognitive restructuring practice may serve to increase the frequency of CR use as well as enhance confidence in using this technique for emotion regulation purposes. Importantly, our findings suggest that low CR frequency for positive emotions may be especially relevant to the occurrence of depression in social anxiety. Broadening the application of cognitive restructuring to other emotions, such as up-regulating happiness or enjoyment, will be an important step towards acknowledging and addressing positivity impairments inherent in social anxiety and reducing vulnerability to depression (Gilboa-Schectman et al., 2014).

Our findings also underscore the importance of directly targeting ES in treatment for social anxiety and depression. Individuals with social anxiety are reluctant to show emotion in front of others, and they may be especially good at hiding their experience of positive emotions, perhaps due to their belief that expressing emotion will lead to social rejection. Our results suggest that ES is closely tied to low positive affect and may increase vulnerability to depression for those with social anxiety. Thus, treatment for social anxiety may be improved by incorporating psychoeducation on the social benefits of expressing emotion as well as practice identifying and reacting to felt emotions. In-session exposures could be used to practice expressing positive emotions in social situations and sharing negative feelings in a more socially acceptable way. Such
exposures could help individuals with social anxiety challenge the belief that expressing emotion conveys weakness and leads to social rejection, in addition to reducing the likelihood of developing secondary depression in the future.

For both social anxiety and depression, directly targeting emotion regulation in treatment may be an important intervention. Preliminary research suggests that adding emotion regulation components to a traditional CBT protocol is a feasible next step. In an effort to improve the effectiveness of CBT for generalized anxiety disorder (GAD), Mennin and colleagues developed Emotion Regulation Therapy (ERT; Fresco, Mennin, Heimberg & Ritter, 2013; Mennin & Fresco, 2014). ERT incorporates psychoeducation, teaching, and practice implementing adaptive emotion regulation strategies along with more traditional CBT components, such as exposures. In an open trial with individuals with primary GAD and comorbid MDD, ERT produced moderate to large decreases in anxiety, as well as significant reductions in depressive symptoms, which were maintained over three- and nine-month follow-ups (Mennin, Fresco, Ritter, & Heimberg, 2015). Moreover, nine of the 11 participants with comorbid MDD at pretreatment fell below the clinical cutoff for MDD at post-treatment. ERT has not yet been examined in a socially anxious sample, but the present review suggests that individuals with SAD would benefit greatly from the addition of emotion regulation components to treatment. Moreover, given the positive effects of ERT for GAD with comorbid depression, ERT may be especially useful for prevention and treatment of comorbid depression in SAD.

**Strengths, Limitations, and Future Directions**

Our study was strengthened by the use of daily data collection, which, relative to previous cross-sectional research, provided a more robust test of within-person changes
in social anxiety, emotion regulation, and depression on a day-to-day basis. Daily diaries also allowed for data collection in a more naturalistic setting and over a shorter retrospective period, thereby reducing some of the response bias inherent in self-report questionnaires. Nonetheless, the limitations of daily diary sampling also must be recognized. For one, we sampled participants at the end of each day, and as such, their daily reports still may have been affected by biases in perception and memory over the course of the day. Participants may not have been able to accurately report on emotion regulatory efforts that occurred outside of conscious awareness, were forgotten, or were misremembered. Future research should consider using ecological momentary assessments for a more fine-grained analysis as well as more accurate reporting.

Additionally, although our data collection techniques were an improvement relative to cross-sectional research, our daily diaries were entirely self-report and thus vulnerable to participant response bias. Given that emotional experience is closely tied to psychophysiological functioning (Di Simplicio et al., 2012; Gross, 2014), future research should consider incorporating behavioral and physiological measures of emotion regulation that may confer risk for the occurrence of depression among individuals with social anxiety. For instance, recent research has shown respiratory sinus arrhythmia (RSA) to be associated with many indices of emotion regulation, including ES (Pu, Schmeichel, & Demaree, 2010) and CR (Denson, Grisham, & Moulds, 2011; Volokhov & Demaree, 2010). RSA also has emerged as a construct relevant to mood and anxiety disorders, with socially anxious individuals exhibiting reduced RSA at rest and during emotional processing (Gaebler et al., 2013; Miu, Heilman, & Miclea, 2009), and depressed individuals showing lower resting RSA and a less dynamic RSA response to
stressors (Rottenberg, 2007; Voss, Boettger, Schulz, Gross, & Bär, 2011). Thus, RSA represents an important psychophysiological target for future investigations of the overlapping relationships of internalizing disorders and emotion regulation.

Third, our failure to find support for any of our hypothesized mediation models within our daily diary data may have resulted from our data collection period being too short to observe significant change over time. Previous research has utilized a two-week daily diary period with positive results (Blalock et al., 2016; Farmer & Kashdan, 2012; Kashdan & Farmer, 2014), although the large majority of previous research compared high versus low socially anxious groups or used baseline rather than daily levels of social anxiety. The present study differed from previous daily diary efforts in considering social anxiety dimensionally rather than categorically, and changes on a dimensional and day-to-day level may be more difficult to detect over such a brief period of time. Extending the data collection period to a month or more may provide a broader scope for capturing the interconnected relationships of daily social anxiety, emotion regulation, and depression without being overly burdensome for participants.

Our person-level data analyses had the advantage of examining social anxiety, emotion regulation, and depression over the full four-week study period, and indeed, several of our hypothesized models were supported across this longer study period. However, this data analytic methodology also had its limitations. For one, our mediator variables were calculated by averaging across the daily diary period rather than being measured at a single point in time, and as such, could be seen as being fundamentally different from our baseline and endpoint data. The process of averaging across the daily diary period also may have been problematic for our person-level double mediation
models, which treated the mediator variables serially when they were in fact measured simultaneously. We attempted to address this limitation by testing an alternate model with the mediator variables entered in the reverse order (which did not yield a significant indirect effect). Nonetheless, these person-level findings should be interpreted with caution.

Additionally, our significant findings within the person-level data analyses were entirely eliminated when controlling for baseline depression, in part because of the strong correlation between social anxiety and depression at baseline. The high co-occurrence of social anxiety and depression is what initially sparked our interest in the present study, and the overlapping variance between these two constructs in our dataset highlights the difficulty of disentangling them, particularly in a non-clinical population. Of course, the elimination of our effects after controlling for baseline depression also could be interpreted as an indication that social anxiety in fact plays little to no role in the experience of later depression, at least during the relatively short time period of our study. This interpretation also matches with our daily diary analyses, in which daily experiences of ES and CR predicted next-day depressed mood over the two-week study period but daily social anxiety did not. Future research would benefit from capturing individuals with clinically significant social anxiety at an early age and tracking the impact of emotion regulation patterns and the development of depression longitudinally.

Conclusions

In conclusion, our study was the first to examine the influence of emotion regulation on the relationship between social anxiety and depression over time. Across the two-week daily diary period, emotion regulation exhibited unique relationships with
daily depressed mood but did not act as a mediator along the pathway from social anxiety to depression. Our person-level analyses found evidence of mediation by both ES and CR, which were further clarified by exploratory analyses that differentiated between positive and negative affect. Thus, the present study underscores the importance of distinguishing between positive and negative affective processes in future emotion regulation research, while also providing support for targeting emotion regulation in prevention and treatment efforts for internalizing disorders. Future research examining social anxiety, depression, and emotion regulation over longer periods of time and at clinically significant levels will be essential to enhancing our understanding of the interconnectedness of these processes.
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